CHEMISTRY

BOOKS - G.R. BATHLA & SONS CHEMISTRY (HINGLISH)

BASIC PRINCIPLES

SOME SOLVED PROBLEMS

1. Arrange the following groups in order of increasing $+I$ effect:

$CH_3^-, \quad (CH_3)_2CH^-, \quad (CH_3)_3C^-$

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2. Select the most stable carboncation from the following:

$CH_3^+, (CH_3)_2CH^+, CH_3CH_2^+, (CH_3)_3C^+$

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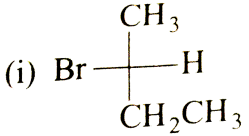
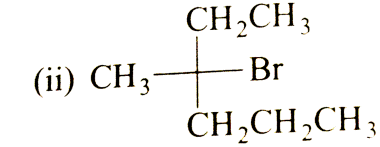
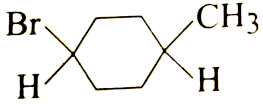
3. What is the major product(s) in each of the following :

(i) 

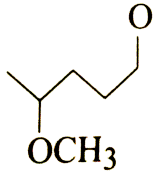
$\xrightarrow[S_N2]{KOH,\ H_2O}$ (A)

(ii) 

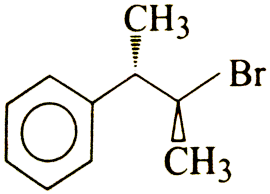
$\xrightarrow[S_N1]{CH_3CH_2OH}$ (B)

(iii) 

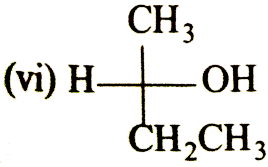
$+ OH^- \xrightarrow{S_N2}$ (C)

(iv) 

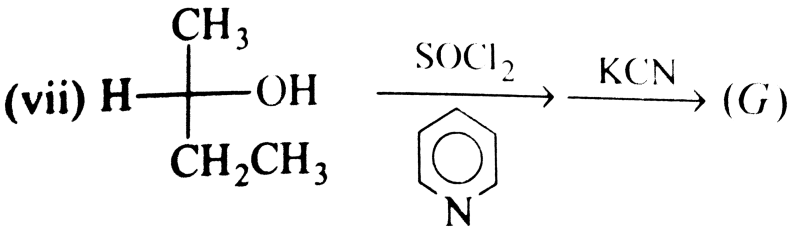
$\xrightarrow{CH_3OH}$ (D)

(v) 

$\xrightarrow{CH_3COOH}$ (E)

(vi) 

$\xrightarrow{SOCl_2}$ $\xrightarrow{KCN}$ (F)

(vii) 

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4. Explain why alkyl groups act as electron donors when attacted to a π - *system.*

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5. Explain the reaction mechanism of the addition of HBr on acetylene by equations only.

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6. Explain the reaction mechanism of the addition of bromine on acetylene by equations only.

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7. Explain the reaction mechanism of the following reaction by equations only :

$$CH_3 - CH - CH - CH_3 \xrightarrow[\text{Heat}]{H_2SO_4} CH_3 - C = CH - CH_3$$

| | |

CH$_3$ OH CH$_3$

3-Methylbutan-2-ol 2-Methylbut-2-er

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8. Classify the following reactions as S_{N^1}, S_{N^2}, E_1 and E_2:

(i) A first order reaction between an alkyl halide and alkali, to give alcohol, the order in alkali being zero.

(ii) The formation of an olefin from an alkyl halide and alkali, the reaction being first order in each of the reactants.

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9. Calculate the pK values of the following organic acids and bases from their given K constants:

(a) $CH_3COOH, K_a = 1.8 \times 10^{-5}$

(b) $CH_3OH, K_a = 3.1 \times 10^{-16}$

(c) $CH_3NH_2, K_b = 4.5 \times 10^{-4}$

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10. Explain that, unlike other amines $\left(RNH_2\right)$, guanidine, $\left(H_2N - C(=NH) - NH_2\right)$, is a strong base.

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11. 3,3-dimethylbutan-2-ol losses a molecule of water in the presence of concentrated sulphuric acid to give tertramethylethylene as a major product. Suggest a suitable mechanism.

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12. Explain a possible mechanism for the S_N1 reaction of Me_3C - Br and MeOH.

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13. Suggest the possible pathways of coverting (R) - n - $C_3H_7CH(OH)CH_3(A)$ into its ethyl ether n - $C_3H_7CH\left(OC_2H_5\right)CH_3$ using Fischer projections and give their R, S designations.

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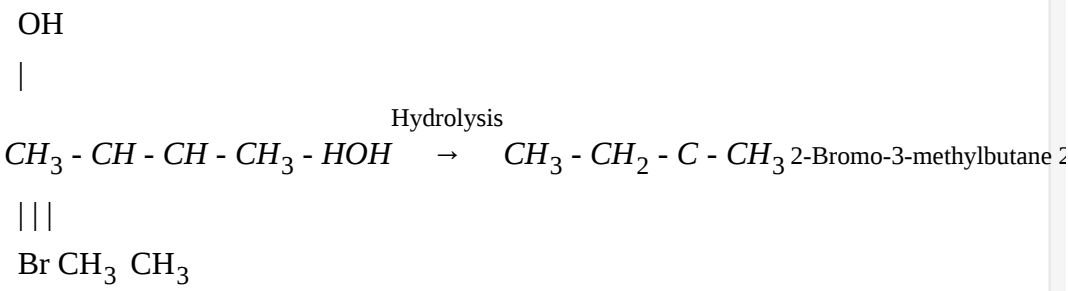
14. Explain the S_{N^1} reaction mechanism of the following by equations only.



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15. Explain a suitable mechanism for the following addition of HBr to hexa-2, 4-diene.

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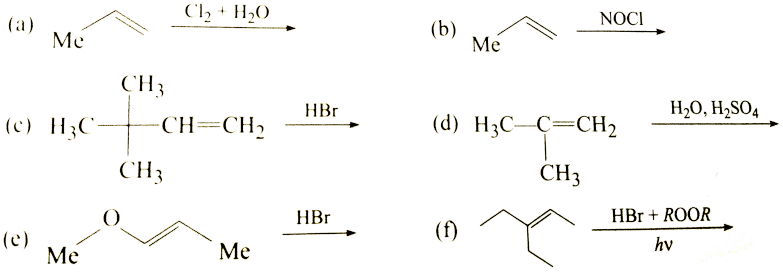
16. Complete the following reactions :



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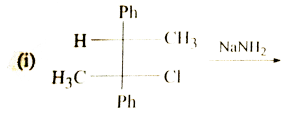
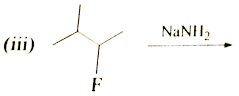
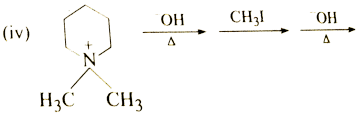
17. Explain the mechanism of elimination of the HBr in the given reaction

$$CH_3CH = CHCH_2 - \underset{|}{\overset{Br}{CH}} - CH_2CH_2$$

(b) Given the major products following reactions.







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18. Complete the following and identify the type for the intertmediate species:

(a) $CH_3—N\equiv N \xrightarrow{\text{Heat}} \text{-------} + N_2$

(b) $C_6H_5—N_3 \xrightarrow{\text{Light}} \text{-------} + N_2$

(c) $CH_3—N=C=O \xrightarrow{\text{Light}} \text{-------} + CO$

(d) $CH_3CON_3 \xrightarrow{\text{Light}} \text{-------} + N_2$

(e) $CH_3CH=CHCH_3 + \text{---} \longrightarrow CH_3—CH(N(H))—CHCH_3$

(f) $(CH_3)_3CH + \text{------} \longrightarrow (CH_3)_3CNHCOCH_3$

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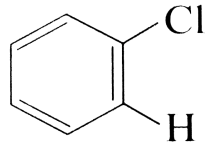
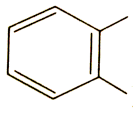
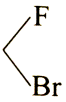
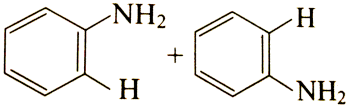
19. Complete the following and identify the type for the intermediate species:

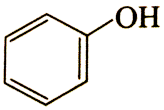
(a) $N_3H \xrightarrow{h\nu} \text{-------} + N_2$

(b)  $+ \bar{N}H_2 \longrightarrow \text{----} + NH_3 + Cl$

(c)  $\xrightarrow{\text{Heat}}$ ---- + Mg 

(d) ---- + NH_3(liquid) $\longrightarrow$ 

(e) $CH_3CH_2CH_3 + \text{------} \longrightarrow CH_3CH_2CH_2CH_3 + (CH_3)_3CH$

(f) ------ + HOH $\longrightarrow$ 

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20. Choose the member of each of the following pairs of compounds that is likely to be the stronger base :

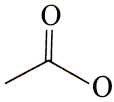
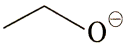
(a) NH_3 *or* $\overset{\ominus}{N}H_2$

(b) H_2O *or* $\overset{\ominus}{O}H$

(c) NH_3 *or* $\overset{\oplus}{N}H_4$

(d) H_2O *or* $\overset{\oplus}{H_3}O$

(e) $\overset{\ominus}{O}H$ *or* $\overset{\ominus}{S}H$

(f)  *or* 

(g) $C_6H_5\overset{\ominus}{O}$ *or* C_5H_5N

(h) $I^{\ominus}$ *or* $F^{\ominus}$

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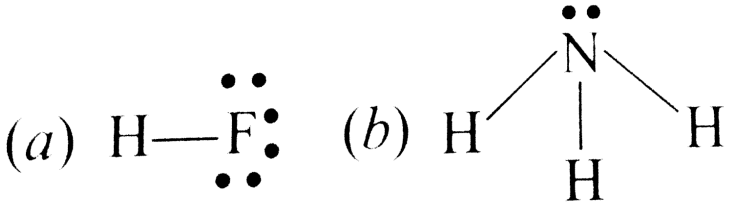
21. Write equations showing ambiphilic nature of the following molecules

:



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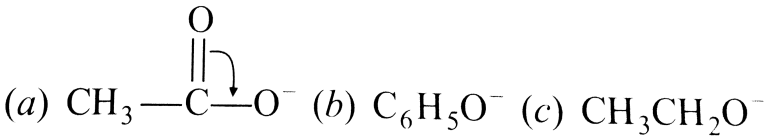
22. Which one of the following is a batter nucleophile and why?



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23. The decreasing order of basicity of nitrogen in the following compounds is :

(a) $CH_3 - CH_2 - NH_2, C_6H_5 - NH_2, H_2C = CH - NH_2$

(b) $\left(C_6H_5\right)_3N, \left(C_6H_5\right)_2NH, C_6H_5NH_2$

(c) $H_2C = NH, HCN, CH_3NH_2$

(d) $C_6H_5NH_2, C_6H_{11}NH_2, C_6H_5CONH_2$

(e) $C_5H_5N, C_4H_4NH, C_6H_5NH_2, CH_3CONH_2$

(f) $C_6H_5N\left(CH_3\right)_2, C_6H_3\left(CH_3\right)_2N\left(CH_3\right)_2, C_6H_5NH_2$

(g) $H_2N - C_6H_4 - OCH_3, C_6H_5NH_2,$

$H_2N - C_6H_4 - NO_2, H_2N - C_6H_4 - CH_2,$

$H_2N - C_6H_4 - Cl$

(h) $C_6H_5 - C(=NH) - NH_2,\ O_2N - C_6H_4 - C(=NH) - NH_2$

$Cl - C_6H_4 - C(=NH) - NH_2,\ H_2N - C_6H_4 - C(=NH) - NH_2$

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ILLUSTRATIONS OF OBJECTIVE QUESTIONS

1. Among the following which acid is strongest?

A. Acetic acid

B. Monochloroacetic acid

C. Dichloroacetic acid

D. Trichloroacetic acid

Answer: D

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2. Which of the following acid is strongest?

A. $HCOOH$

B. CH_3COOH

C. CH_3CH_2COOH

D. $CH_3CH_2CH_2COOH$

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3. Which of the following alkyl groups has the maximum $+I$ effect?

A. CH_3 -

B. CH_3CH_2 -

C. $\left(CH_3\right)_2CH$ -

D. $\left(CH_3\right)_3C$ -

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4. Considering the following alkene:

The correct decreasing order of stability is:

$CH_3CH_2 = CH_2$But-l-ene(I), $\left(CH_3\right)_2C = C\left(CH_3\right)_2$,2,3-Dimethylbut-2-ene(II)

$\left(CH_3\right)_2C = CHCH_3$2-Methylbut-2-ene(III), $\left(CH_3\right)_2C = CH_2$2-Methylpropene(IV)

A. I gt II gt III gt IV

B. II gt III gt IV gt I

C. IV gt III gt II gt I

D. III gt IV gt I gt II

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5. The decreasing order of basic strength in

$C_6H_5NH_2$, $\left(C_6H_5\right)_2NH$, CH_3NH_2, NH_3

(I) (II) (III) (IV)

A. $IV > III > II > I$

B. $I > II > III > IV$

C. $III > IV > I > II$

D. $II > I > III > IV$

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6. Benzyne is:

A. 1,2-dihydrobenzene

B. 1,2-dehydrobenzene

C. 1,2,3,4-tetrahydrobenzene

D. imidogenes

Answer: B

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7. Which of the following is true about the cycloheptatrienyl free radical ?

A. it is an isolated stable free radical

B. it is an aromatic free radical

C. it has $4n + 2\pi$ electrons

D. none of the above.

Answer: D

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8. Heterolysis of propane gives:

A. methyl and ethyl free radicals

B. methylium ion and ethyl anion

C. methyl anion and ethylium cation

D. methylium and ethylium ions

Answer: C

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9. Which of the following pairs of ions is more stable?

(a) $CH_3CH_2O^{\ominus}$ and $CH_2 = CH(II) - O^{\ominus}$

(b) $\left(CH_3\right)_2 \overset{\ominus}{C}(I) - CH = O$ and $\left(CH_3\right)_2 \overset{\ominus}{C} - CH(II) = CH_2$

(c) $Me\ddot{N} - CH = CH - CH(I) = \overset{\oplus}{N}Me_2$

and $MeO\ddot{} - CH = CH - CH = \overset{\oplus}{N}Me_2$

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10. Which among the following compounds behave both as an electrophile as well a nucleophile?

$CH_2 = CH_2(1)$ $CH_2 = \overset{+}{C}H - CH_2(2)$

$CH_3 - \overset{O}{\overset{||}{C}} - CH_3(3)$ $CH_3 - \overset{O}{\overset{||}{C}} - Cl(4)$

Answer using the following codes:

A. only (1)

B. (1) and (2)

C. (3) and (4)

D. (2), (3) and (4)

Answer: C

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11. Which of the following species is an ambident nucleophile?

A. $CH_3\overset{\ominus}{C}H_2$

B. $H_2C = CH_2$

C. $\overset{\ominus}{O} - N = O$

D. $\overset{\ominus}{N}H_2$

Answer: C

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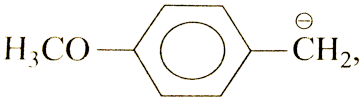
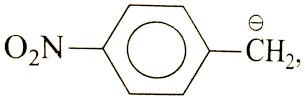
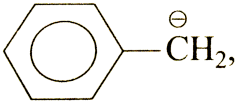
12. Consider the following carbanions:



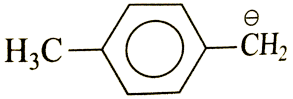
(I)



(II)



(III)



(IV)

Correct decreasing order of stability is :

A. II gt III gt I gt IV

B. III gt IV gt I gt II

C. IV gt I gt II gt III

D. I gt II gt III gt IV

Answer: A

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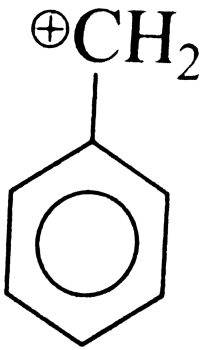
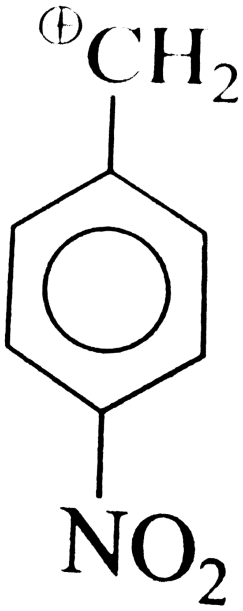
13. Which one of the following carbocations are most stable?

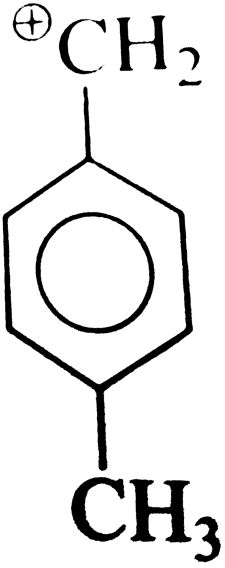


A.

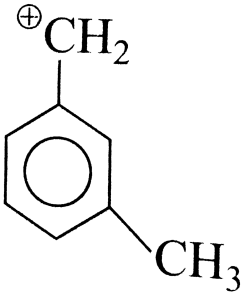


B.

C.



D.



Answer: C

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14. Which of the following is not a nucleophile ?

A. H_2

B. CH_3OH

C. H_2O

D. NH_3

Answer: A

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15. Nucleophilicity of which species is least?

A. $N\overset{\ominus}{H}_2$

B. $CH_3 - \overset{\ominus}{N}H$

C. $C_6H_5 - \overset{\ominus}{N}H$

D. $CH_3 - \overset{\ominus}{N} - CH_3$

Answer: D

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16. The nitration of benzene is :

A. S_{N^1} reaction

B. S_{N^2} reaction

C. S_{E^1} reaction

D. S_{E^2} reaction

Answer: D

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17. Classify the following as electrophiles and nucleophiles:

(a) CN^- (b) H_2O (c) Br^+ (d) NO_2^- (e) $\overset{+}{N}O_2$

(f) CH_3OH (g) $H_2C = CH_2$ (h) $RCOCl$ (i) H_2N - OH

(j) : $\left(CCl_2$ (k) H_3O^+ (l) NH_3 (m) BF_3 (n) $AlCl_3$

(o) OH^- (p) R_3N

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18. Which of the following most readily undergoes E_2 elimination with a strong base?

A. 2-Bromopentane

B. 2-Bromo-2-methylbutane

C. 1-Bromo-2,2-dimethylpropane

D. 2-Bromo-3-methylbutane

Answer: B

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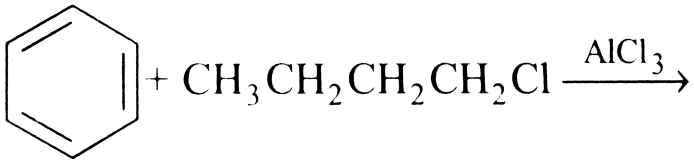
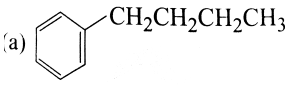
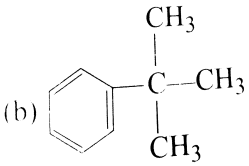
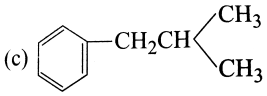
19. In the reaction:



the product formed will be:

A. 

B. 

C. 

D. all of these

Answer: B

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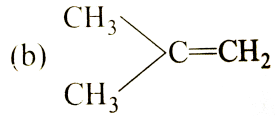
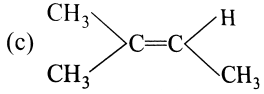
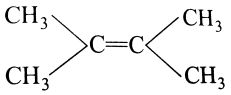
20. Which of the following alkene is most statble?

A. $CH_3CH = CH_2$

B. 

C. 

D. (d) 

Answer: D

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PROBLEMS FOR PRACTICE

1. Classify the following into electrophilic and nucleophilic reagents:

(a)H^+ (b) Cl^- (d) NH_3 (d)NO_2^+ (e)$C\bar{N}$ (f)H_2O

(g) Br^+ (h)ROH (i)BF_3 (j)RNH_2 (k)$AlCl_3$

(l) ROR (m) Carbocations (n) Carbanions (o) SO_3H

(p) $BeCl_2$ (q) I^- (r) $SnCl_4$ (s) $:CCl_2$ (t) $:P\left(CH_3\right)_3$

(u)$H_2C = CH_2$

(B) Classify the following as Lewis acids and Lewis bases :

(a)CH_3NH_2 (b)CN^- (c)$AlCl_3$ (d)Fe^{3+} (e) CO_2^-

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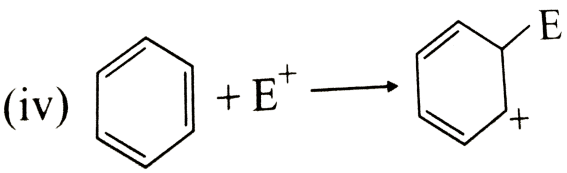
2. For the following bond cleavages, use curved arrows to show the electron flow and classify each as homolysis or heterolysis. Identify reactive intermediate produced during the fission.

(i) $CH_3O—OCH_3 \longrightarrow CH_3\dot{O} + \dot{O}CH_3$

(ii) $>C=O + CN^- \longrightarrow >C<^{O^-}_{CN}$

(iii) 

(iv) 

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3. Identify each of the following as carbon-intermediates:

$(a) CH_3 - CH = \overset{+}{C}H$ $(b) \left(CH_3\right)_3 \dot{C}$

$(c) \left(CH_3\right)_3 \bar{C}$ $(d) C_2H_5\dot{C}CH_3$

$(e) CH_3 - \bar{C}H - CH_3$ $(d) C_2H_5\dot{C}CH_3$

$(e) CH_3 - \bar{C}H - CH_3$ $(f) C_2H_5\dot{\dot{C}} - H$

$(g) C_6H_5 - \dot{\dot{N}}..$ $(h) : CCl_2$

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4. Classsify the following reactions by type:

(a) $HCHO + HCN \longrightarrow CH_2(OH)CN$

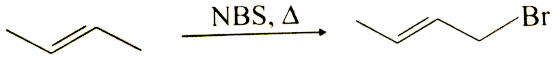
(b) $(CH_3)_2CHOH \xrightarrow{\text{Heat, Cu}} (CH_3)_2C{=}O + H_2$

(c) $CH_3Cl + KOH\,(aq.) \longrightarrow CH_3OH + KCl$

(d) $CH_2{=}CH_2 + Br_2 \longrightarrow CH_2(Br){-}CH_2(Br)$

(e) $CH_3{-}C(=NOH){-}CH_2CH_3 \longrightarrow CH_3NHC(=O)CH_2CH_3$

Ethyl methyl ketoxime — *N*-Methylpropionamide

(f) 

(g) $CHCl_3 + OH^- \longrightarrow :CCl_2 + H_2O + Cl^-$

(h) $CH_3CH(Br){-}CHBrCH_3 + Zn \longrightarrow CH_3CH{=}CHCH_3 + ZnBr_2$

(i) $CH_2(I){-}CH_2{-}CH_2(I) + Zn \longrightarrow CH_2{-}CH_2{-}CH_2 + ZnI_2$

(j) $NH_4NCO \longrightarrow O{=}C(NH_2)_2$

(k) $(CH_3)_2NH_2^+ + CH_3O^- \longrightarrow (CH_3)_2NH + CH_3OH$

(l) $H_3C{-}N{=}N{-}CH_3 \xrightarrow{\text{Heat}} H_3C{-}CH_3 + N_2$

(m) $C_2H_5Br + OH^- \longrightarrow C_2H_5OH + Br^-$

(n) $H_2C{-}CH_2{-}O + H_2O \xrightarrow{H^+} H_2C(OH){-}CH_2(OH)$

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5. Arrange the following according to their stability:

$CH_3\overset{+}{C}H_2CH_2CH_2$, $(CH_3)_3\overset{+}{C}$, $CH_3CH_2\overset{+}{C}H_2$,

$CH_3CH_2\overset{+}{C}HCH_3$, $CH_3\overset{+}{C}H_2$, $\overset{+}{C}H_3$

(b) Arrange the following according to their stability:

$C_6H_5\overset{-}{C}H_2$, $(CH_3)_3\overset{-}{C}$, $\overset{-}{C}Cl_3$, $\overset{-}{C}H_3$, $(CH_3)_2\overset{-}{C}H$

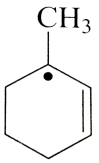
(c) Arrange the following according to their stability:

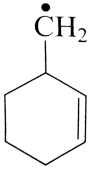
(i) $\dot{C}H_3$, $(CH_3)_3\dot{C}$, $(C_6H_5)_3\dot{C}$, $C_6H_5\dot{C}H_2$, $CH_3\dot{C}H_2$

(ii) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-\dot{C}HCH_3$ (I), $CH_3-\underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle \dot{}}{C}}}-CH_2CH_3$ (II)

$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2\dot{C}H_2$ (III)

(iii) $H_2C=\dot{C}H$ (I), $H_2C=CH\dot{C}H_2$ (II),


(III)


(IV)

(d) Arrange the following in order of their :

(i) increasing basicity:

H_2O, OH^-, CH_3OH, CH_3O^-

(ii) increasing reactivity in nucleophilic substitution reaction:

CH_3F, CH_3I, CH_3Br, CH_3Cl.

(iii) increasing order of expected enol content:

CH_3COCH_2CHO, CH_3COCH_3, CH_3CHO,

$CH_3COCH_2COCH_3$.

decreasing order of S_{N^2} reactivity:

RCH_2X, R_2CHX, R_3CX, MeX.

(v) decreasing order of S_{N^1} reactivity:

(i) 2-bromopentane (A), 1-bromopentane (B), 2-bromo-2-methylbutane (C).

(ii) 1-bromo-3-methylbutane(A),

2-bromo-2-met-hylbutane (B),

2-bromo-3-methylbutane(C)

(vi) decreasing order of S_{N^2} reactivity:

1-bromobutane, (A), 1-bromo-2,2-dimethyl-propane (B), 1-bromo-2-methylbutane (C), 1-bromo-3-methylbutane (D).

(vii) decreasing order of S_{N^2} reactivity in alkoxide nucleophiles:

Me_2CHO^-, Me_3CO^-, $MeCH_2^-$, O^-, MeO^-

(c) Arrange the following as stated:

(i) increasing order of acid strength:

$ClCH_2COOH$, CH_3CH_2COOH, $ClCH_2CH_2COOH$,

$\left(CH_3\right)_2CHCOOH$, CH_3COOH

(ii) increasing order of acidity : $HClO, HClO_2, HClO_3, HClO_4$

(iii) increasing strength of H-bonding (X - - - - H - X):

O, S, F, Cl, N

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6. Answer the following :

(a) How many types of fission are possible of a covalent bond?

(b) how many types of ions are formed by heterolytic fission and what are their names?

(c) What are the names and nature of the parts formed by homolytic fission?

(d) How many electrons are present in the valence shell of the carbon atom of the carbonium ion?

(e) How many electrons are present in the valence shell of carbon atom of the carbanion ion?

(f) Name the attacking reagents and give their nature.

(g) Write the names of the parts obtained when C - Cl bond of ethyl chloride undergoes heterolytic fission.

(h) What is the major factor that influences the relatives stabilities of carbocations, carbanions and free radicals.

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7. Explain:

(i) Why trichloroacetic acid is stronger than acetic acid?

(ii) Why formic acid is stronger than butyric acid?

(iii) Why alkyl amines are stonger bases than ammonia?

(iv) Why benzyl carbocation is more stable than ethyl caebocation?

(v) What is the effect of introduction of an alkyl group or the stability of the carbocation?

(vi) Why allyl cation is more stabe than ethyl cation?

(vii) Why does tert-butyl chloride react with sodium hydroxide solution bt S_{N^1} mechanism while n-butyl chloride react by S_{N^2} mechanism?

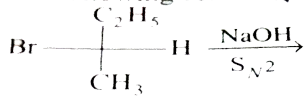
(viii) In acylium ion, the structure $R - C \equiv \overset{+}{O}:$ is more stable than $R - \overset{+}{C} = O.$

(ix) Why toluene reacts with bromine is presence of light gives benzyl bromide while in presence of $FeBr_3$, it gives p-bromotoluene?

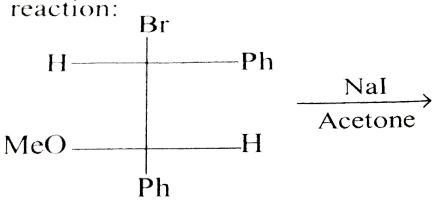
(x) Why aryl halides are less reactive than alkyl halides towards nucleophilic reagents?

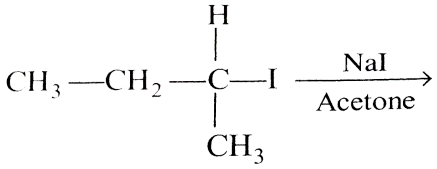
(xi) Draw the stereochemical structures of the products in the following reaction:

(xi) Draw the stereochemical structures of the products in the following reaction:



(xii) Predict the structure of the product in the following reaction:



(xiii) 

(xvii) Predict the relative yields of the product of Me_3CBr in 80 % EtOH and 20 % H_2O.

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8. Complete the following and identify the type for the inter-mediate species:

(a) $CH_3CH(OH)CH_3 + H^+ \xrightarrow{\text{Heat}} \ldots\ldots\ldots + HOH$

(b) $CH_3 - C \equiv C - H + Na^+NH_2^- \rightarrow \ldots\ldots\ldots + Na^+ + NH_3$

(c) $CH_3CH_2 - N = N - CH_2CH_3 \xrightarrow{\text{Heat}} \ldots\ldots + N_2$

(d) $CH_3 - CH = CH - CH_3 + HI \rightarrow \ldots\ldots\ldots + I^-$

(e) $CH_3CHI_2 + Zn \rightarrow \ldots\ldots\ldots + ZnI_2$

(f) $CH_3CH_2Cl + AlCl_3 \rightarrow \ldots\ldots + AlCl_4$

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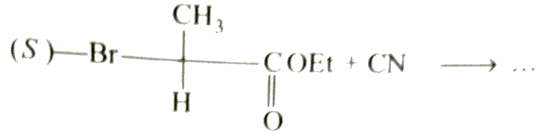
9. Complete the following and identify the type of displacement reactions:

(a) (R)—$CH_3CH(Br)CH_2CH_3 + MeO^- \longrightarrow$ ...

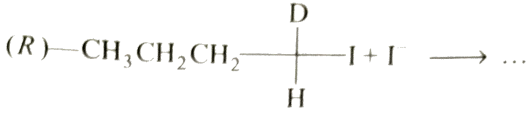
(b) (S)—$CH_3CH(Br)CH_2CH_3 + MeO^- \longrightarrow$ ...

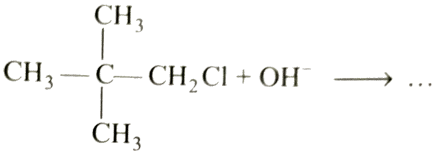
(c) $(CH_3)_3C—Br + MeOH \longrightarrow$ ...

(d) $[Me_3C—SMe_2]^+Cl^- + 2MeOH \longrightarrow$ ...
A sulphonium salt

(e) 

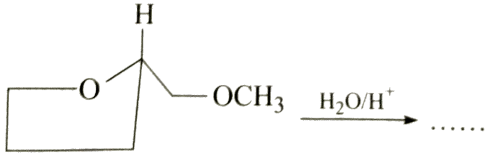
(f) $CH_3CH_2—O—CH_2Cl + C_2H_5OH \longrightarrow$ ...

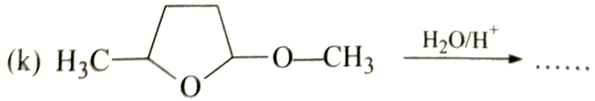
(g) 

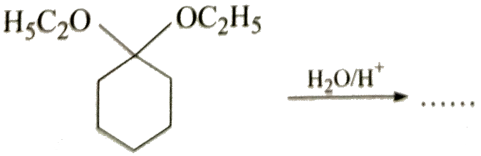
(h) 

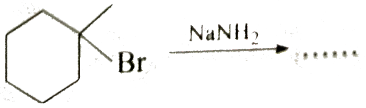
(i) $Me_3C—Br + HCOOH \longrightarrow$ ...

(B) Complete the followings :

(j) 

(k) 

(l) 

(m) 

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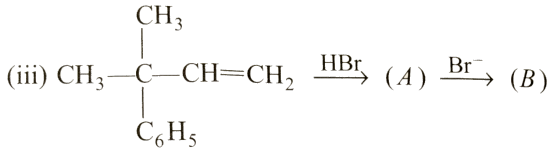
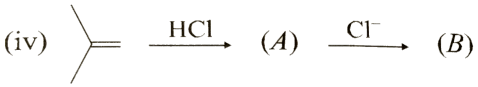
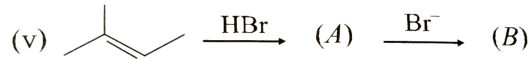
10. Complete the following addition reactions through the intermediate formation of stable carbocation (A) :

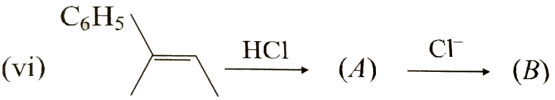
(i) $CH_3-\underset{\displaystyle CH_3}{\overset{|}{CH}}-CH=CH_2 \xrightarrow{HCl} (A) \xrightarrow{Cl^-} (B)$

(ii) $CH_3-\underset{\displaystyle CH_3}{\overset{CH_3}{\overset{|}{C}}}-CH=CH_2 \xrightarrow{HCl} (A) \xrightarrow{Cl^-} (B)$

(iii) 

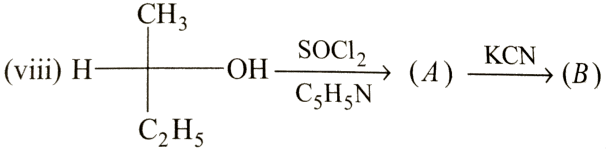
(iv) 

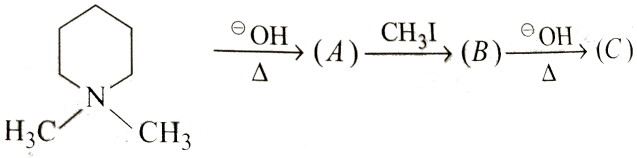
(v) 

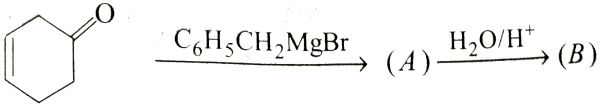
(vi) 

(vii) $H_2C=CH-CH=CH_2 \xrightarrow{HBr} (A) \xrightarrow{Br^-} (B)$.

(B) Complete the following reactions :

(viii) 

(ix) 

(x) 

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11. What are the various alkanes obtained due to insertion when 2-methylbutane reacts with singlet methylene $\left(:CH_2\right)$?

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12. Suggest a possible mechanism for the formation of R - Li from R - X by equation only.

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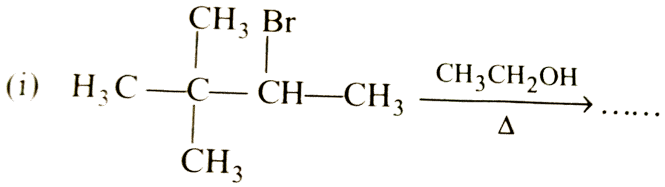
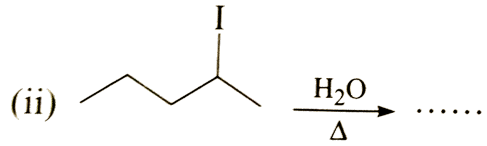
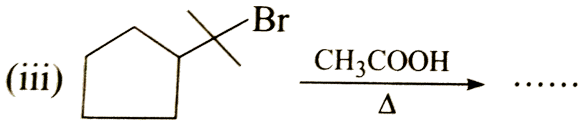
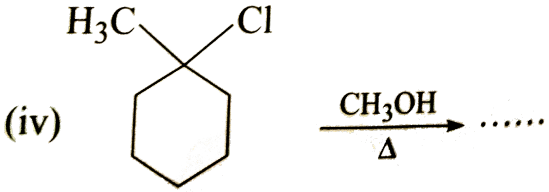
13. Give the major E_1 product of the following reactions :









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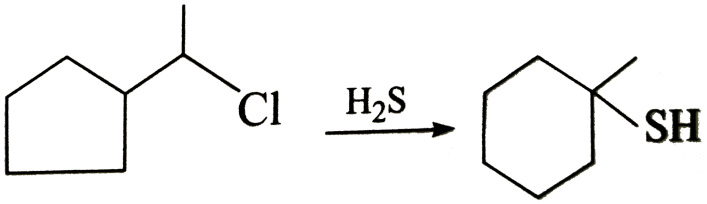
14. Give possible mechanism of the given reaction using carbocation rearrangement.



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15. Which the resonance structure of the following species :

(i) $:\overset{-}{C}H_2 - C \equiv N:$

(ii) $CH_3CH = CH - \overset{+}{C}H - CH_3$

(iii) $\overset{+}{C}H_2 - CH = CH - \overset{-}{C}H_2$

(iv) $CH_3 - \underset{\underset{:O:}{|\,|}}{C} - \overset{-}{C}..H_2$

(B) Write resonance structure for the intermediate carbocation in the aromatic chlorination of benzene.

(C) Write the main resonance structure of the conjugate base of a 1, 3-diketone.

(D) Write the resonance structure of $CH_2 = CH - CHO$. Indicate relative stability of the contributing structures.

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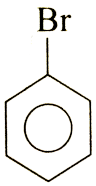
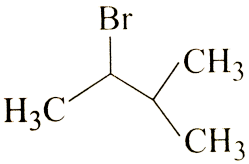
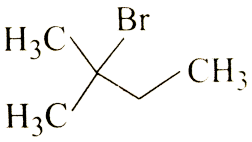
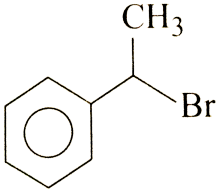
16. Which one hydrolysis at a faster rate by S_N1 mechanism?

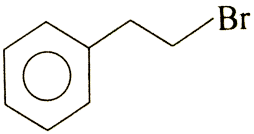
(a) (i) 

(ii) 

(b) (i) 

(ii) 

(c) (i) 

(ii) 

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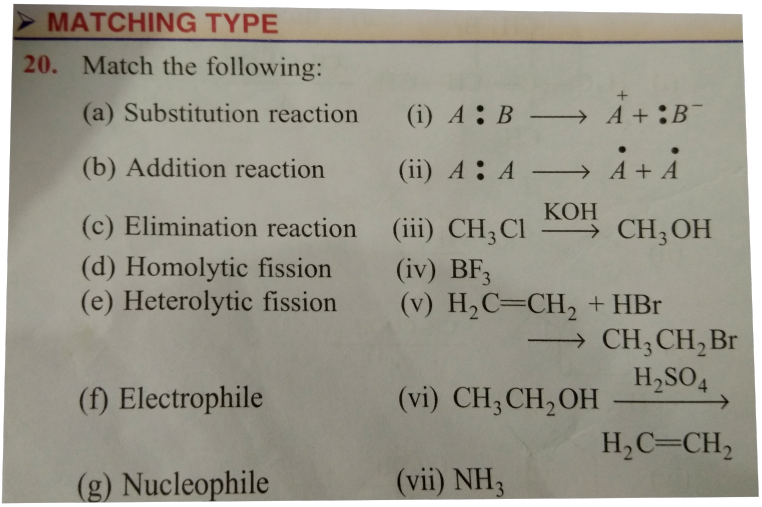
17. Match the following columns



MATCHING TYPE

20. Match the following:

(a) Substitution reaction	(i) $A:B \longrightarrow \overset{+}{A} + :B^-$
(b) Addition reaction	(ii) $A:A \longrightarrow \dot{A} + \dot{A}$
(c) Elimination reaction	(iii) $CH_3Cl \xrightarrow{KOH} CH_3OH$
(d) Homolytic fission	(iv) BF_3
(e) Heterolytic fission	(v) $H_2C{=}CH_2 + HBr \longrightarrow CH_3CH_2Br$
(f) Electrophile	(vi) $CH_3CH_2OH \xrightarrow{H_2SO_4} H_2C{=}CH_2$
(g) Nucleophile	(vii) NH_3

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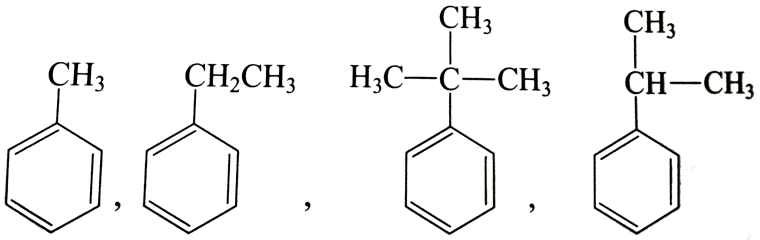
BRAIN STORMING PROBLEMS

1. Arrange the following in decreasing order of reactivity towards electrophilic substitution:



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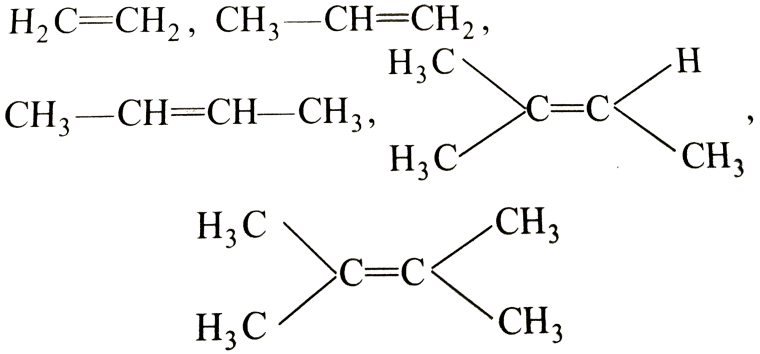
2. Arrange the following in decreasing order of stability:



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3. Arrange the following carbonyl compounds in decreasing order of reactivity towards nucleophilic addition:

(a) $HCHO, CH_3CHO, CH_3COCH_3, CCl_3CHO$

(b) $C_6H_5COC_6H_5, CH_3COC_6H_5, CH_3COCH_3$

(c) ltimg

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width="80%"gt

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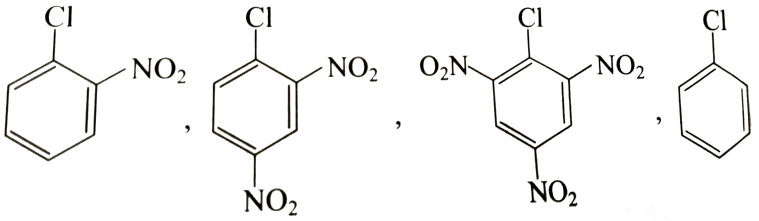
4. Arrange the following compounds in increasing order of reactivity towards nucleophilic substitution:



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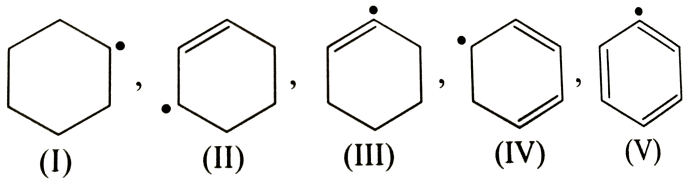
5. Arrange the following free radicals in increasing order of stability:



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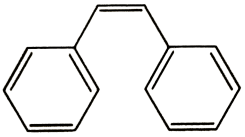
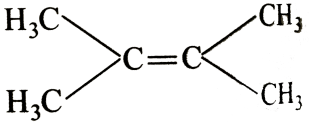
6. Which compound in each of the following pairs will add HCl readily?

I II

(a) $H_2C{=}CH_2$ OR $CH_3{-}CH{=}CH{-}CH_3$

(b) $CH_3{-}CH{=}CH{-}CH_3$ OR $H_2C{=}CH{-}CH{=}CH_2$

(c)  OR $CH_3{-}CH{=}CH{-}CH_3$

(d) $CH_3{-}CH{=}CH{-}CH_3$ OR 

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7. Complete the following reactions:

(a) $CH_3 - CH = CH_2 + CCl_4 \xrightarrow{\text{Peroxide}} ?$

(b) $H_2C = CH - \left(CH_2\right)_5 - CH_3 + CHCl_3 \xrightarrow{\text{Peroxide}} ?$

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8. Which product will be obtained when CCl_4 adds on $R - CH = CH_2$? Give the mechanism of formation of the products.

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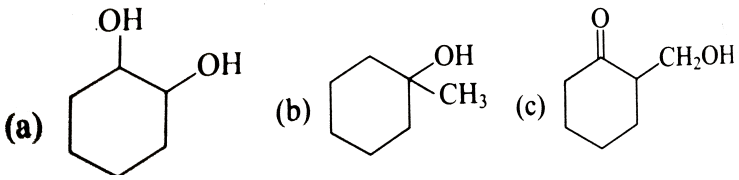
9. Which down the dehydration products of the following alcohols:



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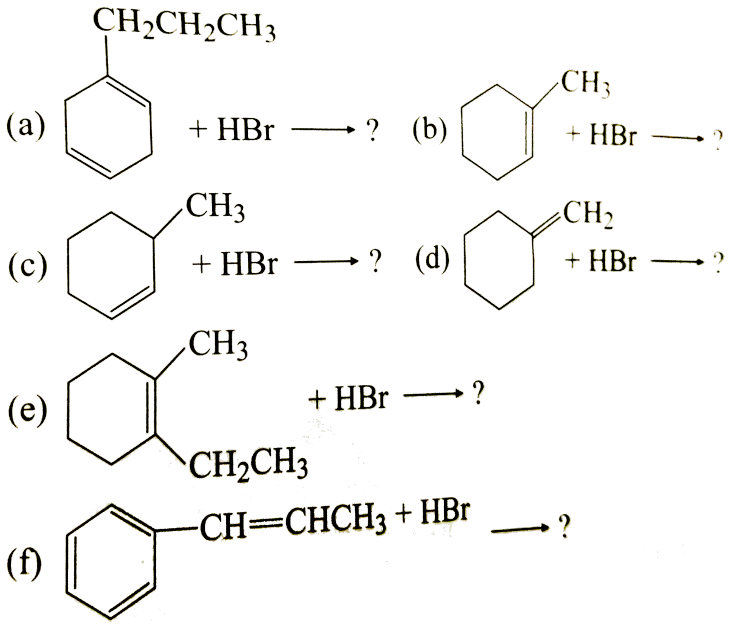
10. Give the major product of the following electrophilic addition reactons:



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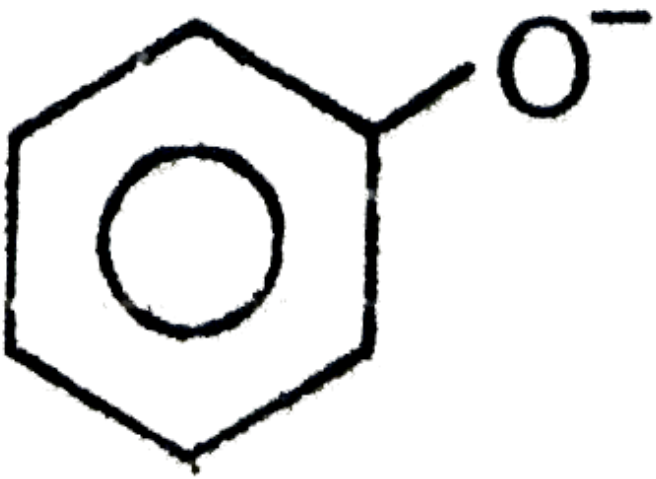
11. Consider the following anions.

(I) $CF_3 - S(=O)(=O) - O^-$ (II) $C_6H_5 - S(=O)(=O) - O^-$ (III)



(III)

(IV)

$$CH_3 - \overset{\overset{O}{||}}{C} - O^-$$

When attached to sp^3-hybridized carbon, their leaving group ability in nucleophilic substitution reactions decreases in the order

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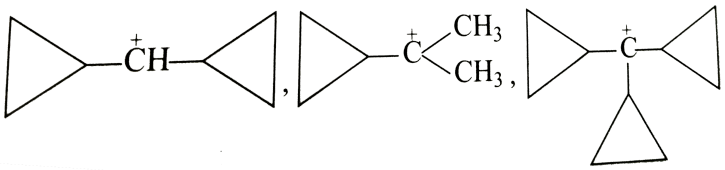
12. Arrange the following carbocations in increasing order of stability:



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13. Designate the type of each set of hydrogens in $\left(CH_3\right)_2C = CHCH_2CH_2CH\left(CH_3\right)_2$ and arrange them in order of decreasing reastivity towards radical substitution.

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14. Match the following reactions :

(a) $CH_4 + Cl_2 \longrightarrow CH_3Cl + HCl$ (i) Electrophilic addition

(b) $C_6H_6 + HNO_3 \xrightarrow{H_2SO_4} C_6H_5NO_2 + H_2O$ (ii) Free radical addition

(c) $CH_3CH{=}CH_2 + HBr \longrightarrow CH_3CH(Br)CH_3$ (iii) Free radical substitution

(d) $CH_3CH{=}CH_2 + HBr \xrightarrow{\text{Peroxide}} CH_3CH_2CH_2Br$ (iv) Electrophilic substitution

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OBJECTIVE QUESTIONS (Level-A)

1. Inductive effect refers to-

A. electron displacement along a carbon chain

B. complete transfer of one of the shared pair of electrons to one of the atoms joined by a double bond

C. complete transfer of electrons hitherto unshared

D. none of the above

Answer: A

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2. $+I$ effect is shown by:

A. $-NO_2$

B. $-Cl$

C. $-Br$

D. $-CH_3$

Answer: D

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3. Polarization of electrons in acrolein may be written as:

A. $\overset{\delta+}{H_2C} = CH - CH = \overset{\delta-}{O}$

B. $H_2\overset{\delta+}{C} = CH - \overset{+\delta-}{C}H = O$

C. $H_2\overset{\delta-}{C} = \overset{\delta+}{C}H - CH = O$

D. $H_2\overset{\delta-}{C} = CH - CH = \overset{\delta+}{O}$

Answer: A

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4. Choose the weakest acid among the following :

A. F_3CCOOH

B. FCH_2COOH

C. CH_3COOH

D. $\left(CH_3\right)_2CHCOOH$

Answer: D

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5. Among the following which one is most basic in aqueous solution ?

A. NH_3

B. CH_3NH_2

C. $\left(CH_3\right)_2NH$

D. $\left(CH_3\right)_3N$

Answer: C

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6. Most acidic compound is :

A. CH_3COOH

B. C_6H_5COOH

C. $O_2NC_6H_4CO_2H$

D. C_6H_5OH

Answer: C

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7. Maximum -I effect is exerted by the group-

A. C_6H_5 -

B. $-OCH_3$

C. Cl

D. NO_2

Answer: D

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8. Zero inductive effect is exerted by:

A. C_6H_5 -

B. H

C. CH_3 -

D. Cl

Answer: B

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9. Electromeric effect:

A. comes into play at the demand of attacking reagent

B. involves displacement of electrons in a sigma bond

C. comes into play in the molecule when atleast one atom has unshared pair of electrons

D. involves the distortion of the electron cloud

Answer: A

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10. The reaction intermediate produce by homolytic cleavage of bond is called,

A. carbocations

B. carbanions

C. free radicals

D. carbenes

Answer: C

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11. The stablest free radical among the following is :

A. $CH_3\dot{C}H_2$

B. CH_3 - $\dot{C}H_2$ - CH_3

C. CH_3 - CH_2 - $\dot{C}H_2$

D. $C_6H_5 - \dot{C}H_2 - CH_3$

Answer: D

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12. In CH_3CH_2OH, the bond that undergoes heterolytic cleavage most readily is:

A. $C - C$

B. $C - O$

C. $C - H$

D. $O - H$

Answer: B

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13. The most stable carbocation is :

A. methyl carbocation

B. primary carbocation

C. secondary carbocation

D. tertiary carbocation

Answer: D

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14. The most stable carbanion is :

A. methyl carbanion

B. primary carbanion

C. secondary carbonion

D. tertiary carbanion

Answer: A

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15. Which of the following ions is most stable?

A. $CH_3\overset{+}{C}H_2CH_2$

B. $CH_3\overset{+}{C}HCH_2CH_3$

C. $\left(CH_3\right)_3\overset{+}{C}$

D. $\left(CH_3\right)_3C\overset{+}{C}H_2$

Answer: C

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16. In which of the following, homolytic bond fission takes place :

A. Nitration of benzene

B. Alkaline hydrolysis of ethyl chloride

C. Addition of HBr to double bond

D. Free radical chlorination of methane

Answer: D

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17. The temporary effect in which there is a complete transfer of shared pair of π - electrons to one of the atoms joined by a multiple bond on the demand of an attacking reagent is called:

A. inductive effect

B. electromeric effect

C. hyperconjugation

D. negative resonance effect

Answer: B

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18. The number of electrons present in the valence shell of carbon of $CH_3\overset{+}{C}H_2$ ion bearing $+ve$ charge:

A. 8

B. 7

C. 6

D. 4

Answer: C

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19. The number of electrons, present in the valence shell of carbon of carbanion bearing $-ve$ charge, is:

A. 8

B. 7

C. 6

D. 4

Answer: A

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20. In which of the following compounds the carbon marked with asterisk is expected to have greatest positive charge ?

A. . $^{*}CH_3 - CH_2 - Br$

B. . $^{*}CH_3 - CH_2 - Cl$

C. . $^{*}CH_3 - CH_2 - CH_3$

D. $CH_3 - CH_2 - \overset{+}{M}g\bar{C}l$

Answer: B

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21. Electronegativity of carbon atoms depends upon their state of hybridisation. In which of the following compounds, the carbon marked with asterisk is most electronegative ?

A. $CH_3 - CH_2 - CH = \overset{*}{C}H_2$

B. $CH_3CH_2 - C \equiv \overset{*}{C}H$

C. $CH_3 - \overset{*}{C}H = CH - CH_3$

D. $CH_3 - CH_2 - \overset{*}{C}H_2 - CH_3$

Answer: B

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22. The strongest acid amongst the following compound is

A. CH_3COOH

B. $HCOOH$

C. $CH_3CH_2CH(Cl)COOH$

D. $ClCH_2CH_2CH_2COOH$

Answer: C

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23. The shape of CH_3^+ is .....

A. triangular planar

B. square planar

C. tetrahedral

D. none of these

Answer: A

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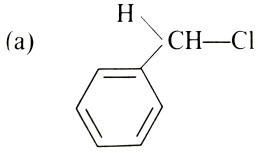
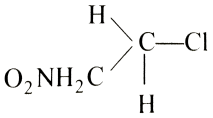
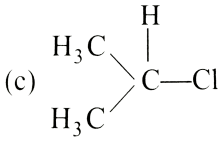
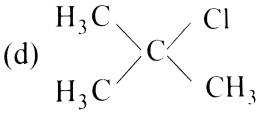
24. In which of the following compounds, the *C* - *Cl* bond ion-isation shall give most stable carbonium ion?

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: D

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25. Most stable carbocation is:

A. $CH_3 - \overset{+}{C}H_2$

B. $\overset{+}{C}H_2CHCl_2$

C. $\overset{+}{C}H_2CH_2Cl$

D. $\overset{+}{C}H_2 - CH_2NO_2$

Answer: A

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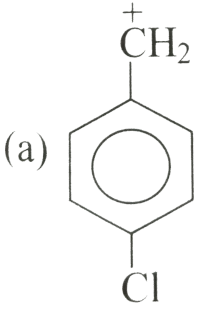
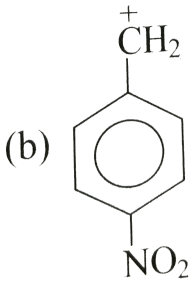
26. Most stable carbocation is:

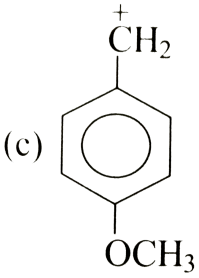
A.



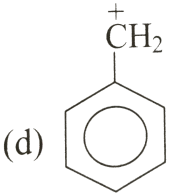
B.



C.



D.



Answer: C

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27. The shape of carbanion, $\left[CH_3\right]^-$ is :

A. linear

B. pyramidal

C. planar

D. tetrahedral

Answer: B

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28. Carbon atom in methyl carbocation and methyl carbanion is _____ and _____ hybridised :

A. sp, sp^2

B. sp^3, sp

C. sp^3, sp^2

D. sp^2, sp^3

Answer: D

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29. An electrophilic reagent is:

A. electron-rich species

B. electron-deficient spcies

C. a Lewis base

D. negatively charged species

Answer: B

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30. A nucleophile is:

A. electron-rich species

B. electron-deficient species

C. a Lewis base

D. positively charged species

Answer: A

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31. Which of the following compounds prossesses the C - H bonds with the lowest bond dissociation energy?

A. Benzene

B. n-Pentane

C. Toluene

D. 2,2-Dimethylpropane

Answer: C

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32. The pair of electrons in the given carbanion, $CH_3C \equiv C^{\Theta}$ is present in which of the following orbitals?

A. sp^3

B. sp^2

C. $2p$

D. sp

Answer: D

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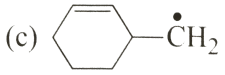
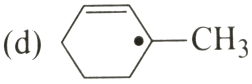
33. Most stable radical is

A. $CH_2 = \dot{C}H$

B. $CH_2 = CH - \dot{C}H_2$

C. 

D. 

Answer: B

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34. Which of the following reactions is an example of S_{N^2} reaction?

A. $\left(CH_3\right)_3C - Br + OH^- \rightarrow \left(CH_3\right)_3C - OH + Br^-$

B. $\left(CH_3\right)_2CH - Br + OH^- \rightarrow \left(CH_3\right)_2CH - OH + Br^-$

C. $CH_3 - Br + OH^- \rightarrow CH_3 - OH + Br^-$

D. $CH_3CH_2OH \rightarrow \left(-H_2O\right)H_2C = CH_2$

Answer: C

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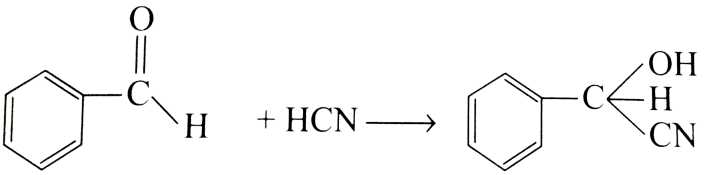
35. The following reaction is an example of:



A. nucleophilic substitution

B. electrophilic substitution

C. electrophilic addition

D. nucleophilic addition

Answer: D

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36. The reaction between ethylene and bromine is an example of:

A. electrophilic additon

B. electrophilic substitution

C. nucleophilic addition

D. nucleophilic substitution

Answer: A

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37. In the nitration of benzene with a mixture of conc. HNO_3 and conc. H_2SO_4, the active species involved is :

A. nitrite ion

B. nitrate ion

C. nitronium ion

D. nitrogen dioxide

Answer: C

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38. Nitration of benzene is:

A. nucleophilic substitution

B. nucleophilic addition

C. electrophilic substitution

D. free radical substitution

Answer: C

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39. Consider the following structure

$CH_2C = \overset{+}{C}H_{I}$, $CH_3 - \overset{+}{C}H_{2II}$

$H_2C = CH - \overset{+}{C}H_{2III}$, $C_6H_5 - \overset{+}{C}H - C_6H_{5IV}$

The correct sequence of these carbocations in the decreasing order of their stability is :

A. I, II, III, IV

B. IV, III, II, I

C. IV, II, III, I

D. I, III, II, IV

Answer: B

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40. Addition of HI on the double bond of propene yields isopropyl iodide and not n-propyl iodide as the major product. This is because the addition proceeds through:

A. a more stable carbonium ion

B. a more stable carbanion ion

C. a more stable free radical

D. none of the above is a correct statement

Answer: A

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41. Which of the following alkyl halides is hydrolysed by S_{N^1} mechanism?

A. CH_3Cl

B. CH_3CH_2Cl

C. $CH_3CH_2CH_2Cl$

D. $\left(CH_3\right)_3CCl$

Answer: D

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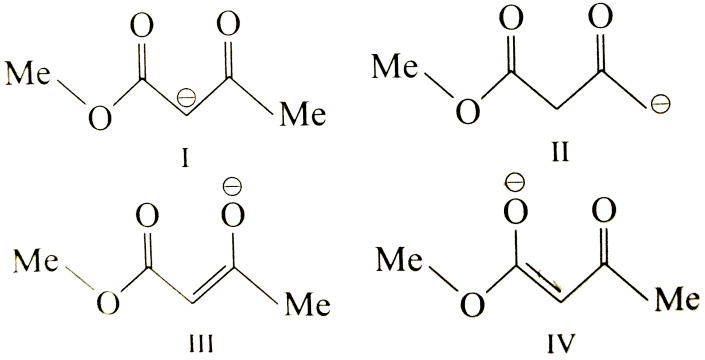
42. Among the following structures the one which is not a resonating structure of other is :



A. *IV*

B. *II*

C. *III*

D. I

Answer: B

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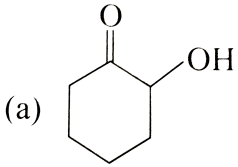
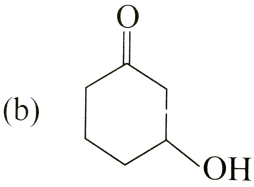
43. Which is dehydrated to maximum extent using conc. H_2SO_4?

A.



B.



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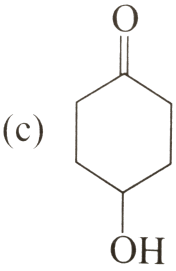
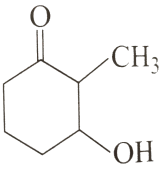


(d) 

D.

Answer: D

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44. Which one of the following statements wrong about S_{N^2} reaction?

A. The rate of reaction is independent of the concentration of nucleophile

B. Nucleophilic attacks the carbon from the side opposite to where the leaving group is attached

C. Only in one step the bond formation and bond breaking takes place

D. The rate of reaction $\propto$ [substrate] [nucleophile]

Answer: A

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45. Which of the following statements is not correct for a nucleophiles?

A. Nucleophiles are not electron seeking

B. Nucleophile attack low e^- density sites

C. Nucleophile is a Lewis acid

D. Ammonia is a nucleophile

Answer: C

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46. The addition of HBr to propylene takes place opposite to Markownikoff's rule in presence of:

A. sunlight

B. hydrogen peroxide

C. platinum catalyst

D. none of these

Answer: B

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47. Anti-Markownikoff's addition is not observed in:

A. propene

B. 1-butene

C. 2-pentene

D. 2-butene

Answer: D

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48. Ammonia is iso-structural with:

A. carbanion

B. free radical

C. carbocation

D. carbene

Answer: A

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49. Which of the following statements is correct?

A. Allyl carbocation $\left(H_2C = CH - \overset{+}{C}H_2\right)$ is more stable than propyl carbocation

B. Propyl carbocation is more stable than allyl carbocation

C. Both are equally stable

D. None of the above

Answer: A

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50. Which of the following statements is correct about a carbocation?

A. It reacts with nucleophile

B. It can undergo rearrangement

C. It can eliminate H^+ to form an olefin

D. All are correct

Answer: D

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51. S_{N^1} mechanism for the hydrolysis of an alkyl halide involves the formation of intermediate:

A. free radical

B. carbocation

C. carbanion

D. none of these

Answer: B

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52. Stability of $\overset{+}{C}H_2 - CH = CH_2$ can be explained by:

A. inductive effect

B. electromeric effect

C. resonance

D. polar effect

Answer: C

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53. Nucleophilic part of the reagent attacks the substrate $CH_3CH_2COCH_3$ on the :

A. carbon atom of carbonyl group

B. oxygen atom of carbonyl group

C. methyl group

D. CH_2 group

Answer: A

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54. Which of the following is electron deficient ?

A. PH_3

B. $\left(BH_3\right)_2$

C. $\left(SiH_3\right)_2$

D. $\left(CH_3\right)_2$

Answer: B

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55. Hyperconjugation is most useful for stabilizing which of the following carbocations?

A. Neopentyl

B. tert-Butyl

C. Isopropyl

D. Ethyl

Answer: B

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56. Arrange the following in order of decreasing tendency towards S_{N^2} reaction :

$CH_3CH_2CH_2CH_2Cl$(I), $CH_3CH_2CHClCH_3$,(II)

$\left(CH_3\right)_2CHCH_2Cl$(III), $\left(CH_3\right)_3C$ - Cl(IV)

A. $IV > III > II > I$

B. $III > IV > II > I$

C. $I > III > II > IV$

D. $II > I > III > IV$

Answer: C

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57. The peroxide effect in anti-Markownikoff's additon involves:

A. ionic mechanism

B. free radical mechanism

C. heterolytic fission of double bond

D. homolytic fission of double bond

Answer: B

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58. The decreasing order of strength of the bases, $OH^-, NH_2^-, H-C\equiv C^-$ and $CH_3-CH_2^-$:

A. IV > II > III > I

B. III > IV > II > I

C. I > II > III > IV

D. II > III > I > IV

Answer: A

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59. Which one of the following reactions proceeds through free radical chain mechanism?

A. Hydrolysis of tert-butyl chloride with aqueous KOH

B. Photochemical chlorination of methane

C. Addition of HBr to ethene

D. Addition of $NaHSO_3$ on acetone

Answer: B

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60. Which is the decreasing oreder of acidity in the following compounds?

CH_3CH_2OH(I) CF_3CH_2OH(II)

CCl_3 - CH_2OH(III) $\left(NO_2\right)_3C$ - CH_2OH(IV

A. $I > II > III > IV$

B. $II > I > III > IV$

C. $IV > II > I > III$

D. $IV > II > III > I$

Answer: D

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61. Carbocation is a reaction intermediate in which of the following reactions?

A. E_1 reactions

B. Electrophilic addition reactions of alkenes and alkynes

C. S_{N^1} reaction

D. All of the above

Answer: D

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62. The compound that does not undergo hydrolysis by S_{N^1} mechanism is

:

A. $H_2C = CHCH_2Cl$

B. C_6H_5Cl

C. $C_6H_5CH_2Cl$

D. $C_6H_5CH\left(C_6H_5\right)Cl$

Answer: B

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63. Which one is a nucleophilic substitution reaction among the following

?

A. $CH_3CH = CH_2 + H_2O \xrightarrow{H^+} CH_3 - C(OH)H - CH_3$

B. $RCHO + R'MgX \rightarrow RC(OH)H - R'$

C. $CH_3 - CH_2 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}} - CH_2Br + NH_3 \rightarrow CH_3CH_2 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}} - CH_2NH_2$

D. $CH_3CHO + HCN \rightarrow CH_3CH(OH)CN$

Answer: C

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64. Hypercojnugation is not possible in :

A. $H_3C - CH = CH_2$

B. $H_2C = CH_2$

C. (c) $H_3C-\overset{+}{C}(CH_3)(CH_3)$

D. $\left(CH_3\right)_2C = C\left(CH_3\right)_2$

Answer: B

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65. Reimer-Tiemann reaction of phenol with cholorform and aqueous alkali takes place through the intermediate formation of:

A. carbocations

B. carbanions

C. carbon radicals

D. carbenes

Answer: D

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66. The reaction intermediate carbenes are produced from"

A. diazo methane

B. ketene

C. $CHCl_3/C_2H_5ONa$

D. all of these

Answer: D

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67. In the following group :

$-OAc(I),\ -OMe(II),\ -OSO_2(III),\ -OSO_2CF_3(IV)$

The order of leaving group ability is :

A. $IV > III > I > II$

B. $I > II > III > IV$

C. $III > II > I > IV$

D. $II > III > IV > I$

Answer: A

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68. $:CCl_2$ is :

A. a free radical

B. a nucleophile

C. an electrophilie

D. none of these

Answer: C

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69. In additon reactions of alkenes, the Markownikoff's rule follow:

A. ionic mechanism

B. radical mechanism

C. substitution mechanism

D. rearrangement mechanism

Answer: A

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70. Addition of HBr to propene in presence of peroxide (antiMarkownikoff's additon) occurs when:

A. Br^+ first adds to propene

B. Br^- first adds to propene

C. H^+ first adds to propene

D. $Br^\cdot$ first adds to propene

Answer: D

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71. A nucleophile must have :

A. a negative charge

B. a positive charge

C. a lone pair of electron

D. an electron deficient centre

Answer: C

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72. In a Friedel-Crafts reaction, the electrophile is:

A. Cl^- or X^-

B. CH_3^+ or CH_3CO^+

C. CH_3Cl

D. CH_3COCl

Answer: B

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73. Arrange the following carbanions in decreasing orde of stability:

$HC \equiv \bar{C}(I), \quad H_3C - C \equiv \bar{C}(II),$

$H_2C = \bar{C}H(III), \quad H_3C - \bar{C}H_2(IV)$

A. $IV > III > I > II$

B. $II > I > III > IV$

C. $IV > III > II > I$

D. $I > II > III > IV$

Answer: D

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74. Arrange the following carbocations in order of increasing stability :

$(CH_3)_3\overset{+}{C}CH_2(I), \quad (CH_3)_3\overset{+}{C}(II),$

$CH_3CH_2\overset{+}{C}H_2(III), \quad CH_3\overset{+}{C}HCH_2CH_3(IV)$

A. $IV < III < II < I$

B. $III < IV < I < II$

C. $I < III < IV < II$

D. $II < IV < III < I$

Answer: C

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75. Which one of the following behaves both as a nucleophile and an electrophile ?

A. CH_3NH_2

B. CH_3OH

C. CH_3CN

D. CH_3Cl

Answer: C

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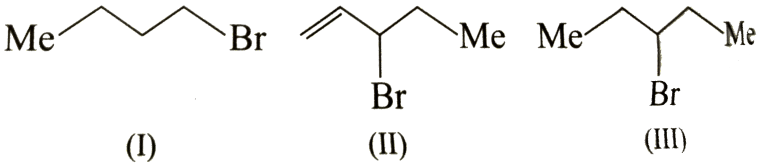
76. Consider the following bromides:



(I) (II) (III)

The correct order of S_{N^1} reactivity is :

A. $I > II > III$

B. $II > III > I$

C. $II > I > III$

D. $III > II > I$

Answer: B

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77. Which one is the correct order of decreasing stability of car banions?

A. $P > S > T > C_6H_5CH_2$

B. $C_6H_5CH_2 > P > S > T$

C. $T > S > P > C_6H_5CH_2$

D. $C_6H_5CH_2 > T > S > P$

Answer: B

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78. The stability order in the following carbocations,

$CH_3\overset{+}{C}H_2$ (I), $\left(CH_3\right)_2\overset{+}{C}H$(II), $\left(CH_3\right)_3C^+$(III) $\overset{+}{C}H_3$(IV) is :

A. $I > IV > III > II$

B. $I > II > III > IV$

C. $III > IV > I > II$

D. $III > II > I > IV$

Answer: D

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79. Which one of the following carbocations is most stable?

A. $C_6H_5 - \overset{+}{C}H - C_6H_5$

B. $CH_3 - \overset{+}{C}H - CH_3$

C. $H_2C = CH - \overset{+}{C}H_2$

D. $H_2C = CH - \overset{+}{C}H - CH_3$

Answer: A

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80. Which is the weakest base of the following whose pK_b val-use are?

A. 4.75

B. 3.23

C. 3.12

D. 3.07

Answer: A

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81. Which is decreasing order of acidity in,

$HCOOH(I), CH_3COOH(II), CH_3CH_2COOH(III)$ and $C_6H_5COOH(IV)$?

A. $I > II > III > IV$

B. $IV > III > II > I$

C. $IV > I > II > III$

D. $I > IV > II > III$

Answer: D

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82. Which one of the following is the weakest base in queous medium ?

A. NH_3

B. $\left(C_2H_5\right)_2NH$

C. $C_2H_5NH_2$

D. $\left(C_2H_5\right)_3N$

Answer: A

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83. Which of the following compounds prossesses the C - H bonds with the lowest bond dissociation energy?

A. 2,2-Dimethylpropane

B. n-pentane

C. Benzene

D. Toluene

Answer: D

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84. Which one of the following compounds is most acidic?

A. Phenol

B. Trichloroacetaldehyde

C. Trichloroacetic acid

D. Benzoic acid

Answer: C

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85. Arragne basicity of the following compounds in decreasing order:

$CH_3CH_2NH_2(I), \quad H_2C = CH - NH_2(II),$

$HC \equiv C - NH_2(III), \quad C_6H_5NH_2(IV)$

A. $I > II > III > IV$

B. $IV > III > II > I$

C. $III > II > I > IV$

D. $I > III > II > IV$

Answer: A

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86. Which is the increasing order of acidic strength in the following compounds ?

$CH_3CH_2CH_2COOH(I), \mathrm{NCCH_2}COOH(II), H_2C = CHCH_2COOH(III)$

A. $I < II < III$

B. $I < III < II$

C. $III < II < I$

D. $II < I < III$

Answer: B

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87. Which of the following compounds is not a Lewis acids?

A. BF_3

B. $SnCl_4$

C. R - OR

D. P - MgX

Answer: C

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88. Which of the following contains three pairs of electron?

A. Carbocation

B. Carbanion

C. Free radical

D. None of these

Answer: A

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89. In the following compounds phenol (I), p-cresol (II), m-nitrophenol (III) and p-nitrophenol (IV), the order of acidity is:

A. $III > IV > I > II$

B. $I > IV > III > II$

C. $II > I > III > IV$

D. $IV > III > I > II$

Answer: D

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90. In the following compounds piperidine (I), pyridine (II), morpholine (III) and pyerrole (IV), the order of basicity is :

A. $IV > I > III > II$

B. $III > I > IV > II$

C. $II > I > III > IV$

D. $I > III > II > IV$

Answer: D

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91. The kind of delocalization involving sigma bond orbitals is called:

A. hybridization

B. conjugation

C. hyperconjugation

D. conformation

Answer: C

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92. Hyperconjugation phenomenon is possible in:

A. $H_2C = CH_2$

B. $CH_3CH_2 - CH = CH_2$

C. $C_6H_5CH = CH_2$

D. $\left(CH_3\right)_3C - CH = CH_2$

Answer: B

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93. In the following compounds, anisole (I), benzene (II) and nitrobenzene (III), the ease of reaction with electrophiles is:

A. $II > III > I$

B. $III > II > I$

C. $II > I > III$

D. $I > II > III$

Answer: D

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94. Among the given compounds, the most susceptible to nucleophilic attack at the cabonyl group is:

A. $MeCOCl$

B. $MeCHO$

C. $MeCOOMe$

D. $MeCOOCOMe$

Answer: A

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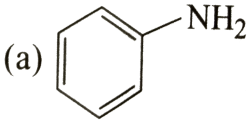
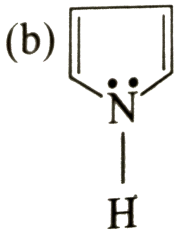
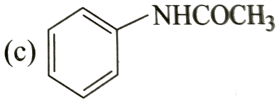
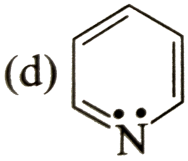
95. The most nucleophilic nitrogen is in:

A. 

B. 

C. 

D. 

Answer: D

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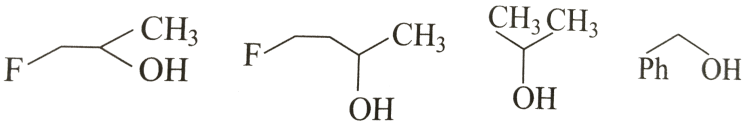
96. The order of reactivity of following alcohols, towards conc. HCl is :



(I) (II) (III) (IV)

A. $I > II > III > IV$

B. $I > III > II > IV$

C. $IV > III > II > I$

D. $IV > III > I > II$

Answer: C

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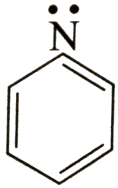
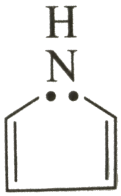
97. Strongest base is :

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: A

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98. In the reaction of phenol with $CHCl_3$ and aqueous $NaOH$ at 70°, the electrophile attacking the ring is:

A. $CHCl_3$

B. $CHCl_2$

C. $:CCl_2$

D. $COCl_2$

Answer: C

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99. A solution of $(+)$-2-chloro-2-phenyl ethane in toluene racemises slowly in the presence of small amount of $SbCl_5$, due to the formation of:

A. carbanion

B. carbene

C. free radical

D. carbocation

Answer: D

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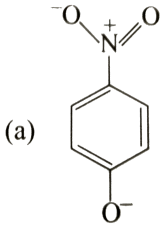
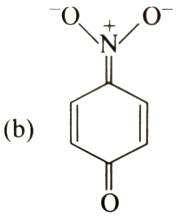
100. The most unlikely representation of resonance structure of p-nitrophenoxide ion is:

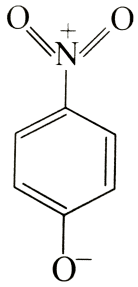
A.



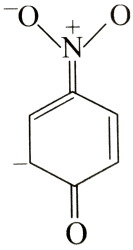
B.



C. (c)



D. (d)



Answer: C

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101. Among the following anions, the order of basicity is :

$CH_3^-(I), NH_2^-(II), OH^-(III), F^-(IV)$

A. I > II > III > IV

B. II > I > III > IV

C. III > II > I > IV

D. III > I > II > IV

Answer: A

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102. Which of the following has the highest nucleophilicity ?

A. F^-

B. OH^-

C. CH_3^-

D. NH_2^-

Answer: C

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103. Among the following the strongest base is

A. $C_6H_5NH_2$

B. p - NO_2 - $C_6H_4NH_2$

C. m - NO_2 - $C_6H_4NH_2$

D. $C_6H_5CH_2NH_2$

Answer: D

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104. The order of reactivities of the following alkyl halides for a S_{N^2} reaction is :

A. RF > RCl > RBr > RI

B. RF > RBr > RCl > RI

C. RCl > RBr > RF > RI

D. RI > RBr > RCl > RF

Answer: D

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105. which of the following has the most acidic hydrogen?

A. 3-Hexanone

B. 2,4-Hexanedione

C. 2,5-Hexanedione

D. 2,3-Hexanedione

Answer: B

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106. Which of the following is the correct order of acidic strength ?

A.

$CF_3COOH > CHCl_2COOH > HCOOH > C_6H_5CH_2COOH > CH_3COOH$

B.

$CH_3COOH > HCOOH > CF_3COOH > CHCl_2COOH > C_6H_5CH_2COOH$

C.

$HCOOH > C_6H_5CH_2COOH > CHCl_2COOH > CHCl_2COOH > CH_3COO$

D.

$CF_3COOH > CH_3COOH > HCOOH > CHCl_2COOH > C_6H_5CH_2COOH$

Answer: A

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107. The set with correct order of acidity is :

A. $HClO < HClO_2 < HClO_3 < HClO_4$

B. $HClO_4 < HClO_3 < HClO_2 < HClO$

C. $HClO < HClO_4 < HClO_3 < HClO_2$

D. $HClO_4 < HClO_2 < HClO_3 < HClO$

Answer: A

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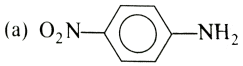
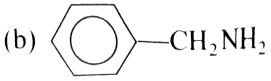
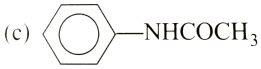
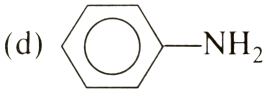
108. Which of the follwing compounds is most basic ? .

A. 

B. 

C. 

D. 

Answer: B

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109. Consider the following carbocations :

(I) $C_6H_5\overset{+}{C}H_2$

(II) $C_6H_5CH_2\overset{+}{C}H_2$

(III) $C_6H_5\overset{+}{C}HCH_3$

(IV) $C_6H_5\overset{+}{C}\left(CH_3\right)_2$

The correct sequance of the stability of these is :

A. II < I < III < IV

B. II < III < I < IV

C. III < I < II < IV

D. IV < III < I < II

Answer: A

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110. : CH_2 - C | | O: . . - CH_3 and H_2C = C|: O: . . - CH_3 are :

A. resonating structures

B. tautomers

C. geometrical isomers

D. optical isomers

Answer: A

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111. Arrangements of $\left(CH_3\right)_3C\text{-}$, $\left(CH_3\right)_2CH\text{-}$, $CH_3.CH_2\text{-}$ when attached to benzyl or n unsaturated group in increasing order of inductive effects is:

A. $\left(CH_3\right)_3C\text{-} < \left(CH_3\right)_2CH\text{-} < CH_3CH_2\text{-}$

B. $CH_3CH_2\text{-} < \left(CH_3\right)_2CH\text{-} < \left(CH_3\right)_3C\text{-}$

C. $\left(CH_3\right)_2CH\text{-} < \left(CH_3\right)_3C\text{-} < CH_3CH_2\text{-}$

D. $\left(CH_3\right)_3C\text{-} < CH_3CH_2\text{-} < \left(CH_3\right)_2CH\text{-}$

Answer: B

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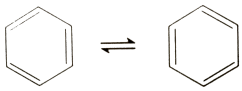
112. Which of the following statements regarding the resonance energy of benzene is correct?

A. The energy required to break the C - H bond in benzene

B. The energy required to break the C - C bond in benzene

C. The energy is a measure of stability of benzene

D. The energy required to convert



Answer: C

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113. The strongest base in aqueous solution among the following amines is :

A. N,N-diethylethanamine

B. N-ethylethanamine

C. M-methylmethanamine

D. ethanamine

Answer: B

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114. As S_{N^2} reaction at an asymmetric carbon of a compound always gives:

A. an enantiomer of the substrate

B. a product with opposite optical rotation

C. a mixture of diastereomers

D. a single stereoisomer

Answer: D

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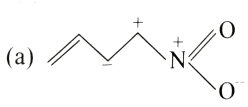
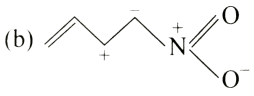
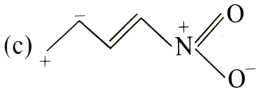
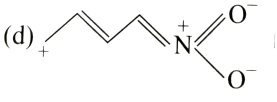
115. Among the following, the least stable resonance structure is :

A. 

B. 

C. 

D. 

Answer: A

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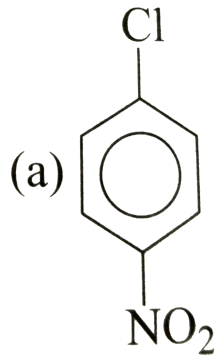
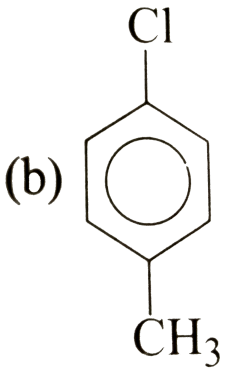
116. Which the following compound undergoes nucleophilic substitution reaction most easily

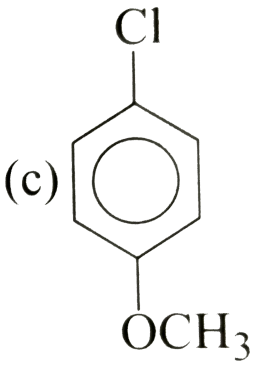
A.

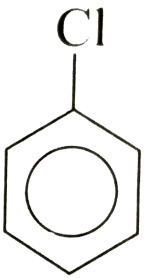


B.



C.



D. (d) 

Answer: A

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117. The corret order of increasing basicity of the given conjugated bases $\left(R = CH_3\right)$ is :

A. $RCOO^- < HC \equiv C^- < NH_2^- < R^-$

B. $RCOO^- < HC \equiv C^- < R^- < NH_2^-$

C. $R^- < HC \equiv C^- < RCOO^- < NH_2^-$

D. $RCOO^- < NH_2^- < HC \equiv C^- < R^-$

Answer: A

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118. Which of the following is correct for stability of phenoxide ion?

A. Resonating structure of benzene ring

B. Localization of π-electrons in phenoxide ion

C. Delocalization of π-electrons in phenoxide ion

D. All of the above

Answer: C

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119. In the anion $HCOO^-$, the two carbon-oxygen bonds are found to be equal length. What is the reason for it?

A. The $C = O$ bond is weaker than the C - O bond

B. The anion $HCOO^-$ has two resonating structures

C. The electronic orbitals of carbon atom are hybridized

D. The anion is obtained by removal of a proton from the acid molecule

Answer: B

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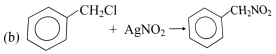
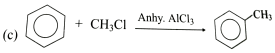
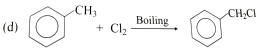
120. Which of the following is a free radical substitution reaction?

A. $CH_3CHO + HCN \rightarrow CH_3CH(OH)CN$

B. 

C. 

D. 

Answer: D

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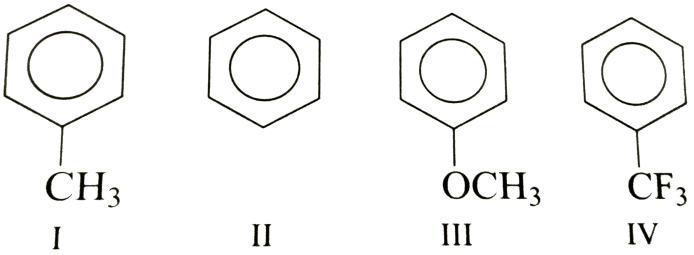
121. Among the following compounds, the decreasing order of reactivity towards electrophilic substitution is :



A. $I > II > III > IV$

B. $II > I > III > IV$

C. $IV > I > II > III$

D. $III > I > II > IV$

Answer: D

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122. Arrange the following nucleophiles in the order of their nucleophilic strength.

A. $OH^- > CH_3COO^- > CH_3O^- > C_6H_5O^-$

B. $CH_3COO^- < C_6H_5O^- < CH_3O^- < OH^-$

C. $C_6H_5O^- < CH_3COO^- < CH_3O^- < OH^-$

D. $CH_3COO^- < C_6H_5O^- < OH^- < CH_3O^-$

Answer: C

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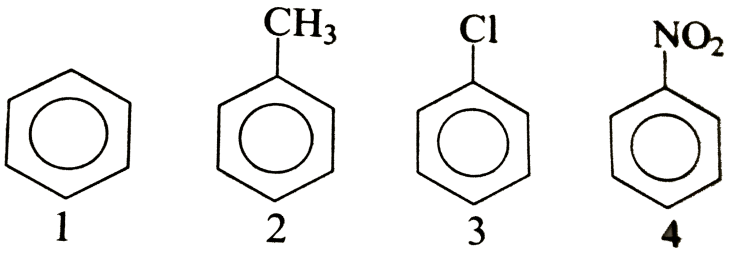
123. Identify the correct order of reactivity in electrophilic substitution reactions of the following compounds :



A. 1 > 2 > 3 > 4

B. 4 > 3 > 2 > 1

C. $2 > 1 > 3 > 4$

D. $2 > 3 > 1 > 4$

Answer: C

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124. Which one of the following is not true regarding electromeric effect?

A. It required an attacking reagent

B. It results in the appearance of partial charges on the carbon atoms

C. It operates on multiple bonds.

D. It is a temporary effect

Answer: B

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125. Which of the following acids has the smallest dissociation constant?

A. $CH_3CHFCOOH$

B. FCH_2CH_2COOH

C. $BrCH_2CH_2COOH$

D. $CH_3CHBrCOOH$

Answer: C

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126. $H_3C - C|_D H - C|_{CH_3} H_3 + Br^{\cdot} \rightarrow 'X' + HBr$:

Identify the structure of the major product 'X':

A. $H_3C - \underset{\underset{D}{|}}{CH} - \underset{\underset{CH_3}{|}}{CH} - \dot{C}H_2$

B. $H_3C - \underset{\underset{D}{|}}{CH} - \underset{\underset{CH_3}{|}}{\dot{C}} - CH_3$

$H_3C - \overset{\cdot}{C} - CH - CH_3$

C. $H_3C - \underset{D}{\overset{*}{C}}H - \underset{CH_3}{CH} - CH_3$

D. $H_3C - \underset{CH_3}{\underset{|}{C}} - CH - CH_3$

Answer: B

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127. Among the following carbocations :

(I) $Ph_2\overset{+}{C}CH_2Me$ (II) $PhCH_2\overset{+}{C}H_2CHPh$

(III) $Ph_2\overset{+}{C}HCHMe$ (IV) $Ph_2\overset{+}{C}(Me)CH_2$ the order of stability is :

A. $IV > II > I > III$

B. $I > II > III > IV$

C. $II > I > IV > III$

D. $I > IV > III > II$

Answer: B

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128. Which one of the following characteristics belongs to an electrophile?

A. It is any species having electron deficiency, which reacts at an electron rich C-centre

B. It is any species having electron enrichment, that reacts at an electron deficient C-centre

C. It is cationic in nature

D. It is anionic in nature

Answer: A

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129. Carbocation as an intermediate is likely to be formed in the reaction :

A. Hexene $\xrightarrow{\text{Anhyd. } AlCl_3/HCl}$ 2-chloro-2-methylpentane

B. Propene $+ Cl_2 \xrightarrow{h\nu}$ 2-chloropropane

C. Ethyl bromide $+ KOH(aq.) \xrightarrow{\Delta}$ ethyl alcohol

D. Acetone + HCN $\xrightarrow{.^-OH}$ acetonecyanohydrin

Answer: A

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130. Which of the following pK_a values, represents the strongest acid?

A. 10^{-4}

B. 10^{-8}

C. 10^{-5}

D. 10^{-2}

Answer: D

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131. Which of the following orders regarding relative stability of free radicals is correct?

A. $3^\circ < 2^\circ < 1^\circ$

B. $3^\circ > 2^\circ > 1^\circ$

C. $1^\circ < 2^\circ > 3^\circ$

D. $3^\circ > 2^\circ < 1^\circ$

Answer: B

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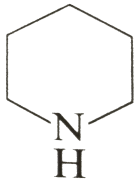
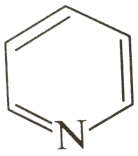
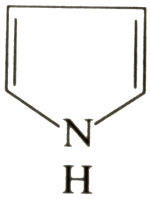
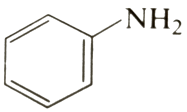
132. Which of the following is the strongest base?

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: A

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133. Which of the following is least reactive in a nucleophilic substitution reaction?

A. $\left(CH_3\right)_3C$ - Cl

B. $CH_2 = CHCl$

C. CH_3CH_2Cl

D. $CH_2 = CHCH_2Cl$

Answer: B

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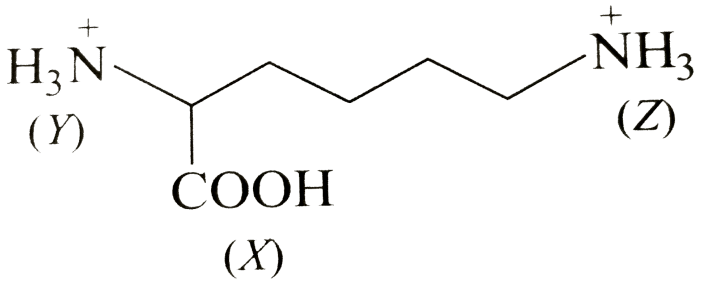
134. In the compound given below: the correct order of acidity of the positions



(X), (Y) and (Z) is :

A. (Z) gt (X) gt (Y)

B. (X) gt (Y) gt (Z)

C. (X) gt (Z) gt (Y)

D. (Y) gt (X) gt (Z)

Answer: B

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135. Due to the presence of an unpaired electron, free radicals are:

A. chemically reactive

B. chemically inactive

C. anions

D. cations

Answer: A

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136. Among the following the strongest nucleophilic is

A. C_2H_5SH

B. CH_3COO^-

C. CH_3NH_2

D. $NCCH_2^-$

Answer: A

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137. Which one of the following is most reactive towards nucleophilic substitution reaction ?

A. $H_2C = CH - Cl$

B. C_6H_5Cl

C. $CH_3CH = CHCl$

D. $ClCH_2 - CH = CH_2$

Answer: D

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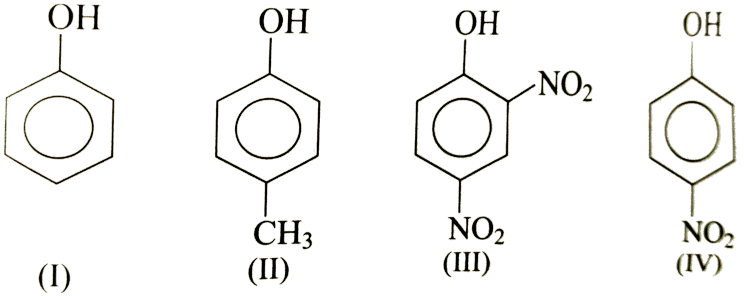
138. Strength of acidity is in order:



(I) (II) (III) (IV)

A. II gt I gt III gt IV

B. III gt IV gt I gt II

C. I gt IV gt III gt II

D. IV gt III gt I gt II

Answer: B

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139. Which is most stable carbocation?

A. n-Propyl cation

B. Isopropyl cation

C. Ethyl cation

D. Triphenylmethyl cation

Answer: D

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140. Which of the following undergoes nucleophilic substitution exclusively by S_{N^1} mechanism?

A. Ethyl chloride

B. Isopropyl chloride

C. Chlorobenzene

D. Benzyl chloride

Answer: D

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141. In the S_{N^1} reaction on chiral centres there is :

A. $100\ \%$ racemization

B. inversion more than retention leading to partial racemization

C. $100\ \%$ retention

D. $100\ \%$ inversion

Answer: B

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142. Which one of the following halogen compounds is difficult to be hydrolysed by S_{N^1} mechanism?

A. tert-Butyl chloride

B. Isopropyl chloride

C. Benzyl chloride

D. Chlorobenzene

Answer: D

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143. The stability of $Me_2C = CH_2$ is more than that of $MeCH_2CH = CH_2$ due to :

A. inductive effect of the Me group

B. resonance effecta of the Me group

C. hypercojugative effect of the Me group

D. resonance as well as inductive effect of the Me group

Answer: C

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144. $CH_3Br + Nu^- \rightarrow CH_3Nu + Br^-$

The decreasing order of the rate of the above reaction with nucleophiles $\left(Nu^-\right)$ A to D is :

$\left[Nu^- = (A)PhO^-, (B)AcO^-, (C)HO^-, (D)CH_3O^-\right]$

A. D gt C gt A gt B

B. D gt C gt B gt A

C. A gt B gt C gt D

D. B gt D gt C gt A

Answer: A

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145. The increasing order of stability of the following free radicals is :

A. $\left(CH_3\right)_2\dot{C}H < \left(CH_3\right)_3\dot{C} < \left(C_6H_5\right)_2\dot{C}H < \left(C_6H_5\right)_3\dot{C}$

B. $\left(C_6H_5\right)_3\dot{C} < \left(C_6H_5\right)_2\dot{C}H < \left(CH_3\right)_3\dot{C} < \left(CH_3\right)_2\dot{C}H$

C. $\left(C_6H_5\right)_2\dot{C}H < \left(C_6H_5\right)_3\dot{C} < \left(CH_3\right)_3\dot{C} < \left(CH_3\right)_2\dot{C}H$

D. $\left(CH_3\right)_2\dot{C}H < \left(CH_3\right)_3\dot{C} < \left(C_6H_5\right)_3\dot{C} < \left(C_6H_5\right)_2\dot{C}H$

Answer: A

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146. Which of the following is more basic than aniline?

A. p-Nitroaniline

B. Benzyl amine

C. Diphenyl amine

D. Triphenyl amine

Answer: B

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147. Nucleophilic addition reaction will be most favoured in

A. CH_3CH_2CHO

B. CH_3CHO

C. $CH_3CH_2CH_2 - \overset{\overset{O}{\|}}{C} - CH_3$

D. $\left(CH_3\right)_2C = O$

Answer: B

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148. The correct increasing order of the reactivity of halides for S_{N^1} reaction is:

A. $CH_3CH_2 - X < \left(CH_3\right)_2CH - X < H_2C = CHCH_2 - X < PhCH_2 - X$

B. $\left(CH_3\right)_2CH - X < CH_3CH_2 - X < H_2C = CHCH_2 < PhCH_2 - X$

C. $PhCH_2 - X < \left(CH_3\right)_2 CH - X < CH_3CH_2 - X < H_2C = CH - CH_2X$

D. $H_2C = CHCH_2 - X < PhCH_2 - X < \left(CH_3\right)_2 CH - X < CH_3CH_2 - X$

Answer: A

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149. Inductive effect involve

A. partial displacement of σ - electrons

B. delocalisation of π - electrons

C. delocalisation of σ - electrons

D. displacement of π - electrons

Answer: A

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150. The basicity of aniline is less than that of cyclohexylamine. This is due to :

A. -R effect of -NH_2 group

B. -I effect of -NH_2 group

C. +R effect of -NH_2 group

D. hyperconjugation effect

Answer: C

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151. In the solvolysis of 3-methyl-3-bromohexane, which of the following statements is not correct?

A. It involves carbocation intermediate

B. The intermediate involves sp^2 -carbon

C. Polar solvents accelerates the reaction

D. It involves inversion of configuration

Answer: D

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152. Neopentyl bromide undergoes dehydrohalogenation to give alkene even though it has no β -hydrogen. This is due to :

A. E_2 mechanism

B. E_1 mechanism

C. Hofmann elimination

D. rearrangement of carbocation by E_1 mechanism

Answer: D

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153. Which one is most reactive towards S_{N^1} reaction?

A. $C_6H_5CH\left(C_6H_5\right)Br$

B. $C_6H_5C\left(CH_3\right)\left(C_6H_5\right)Br$

C. $C_6H_5CH\left(CH_3\right)Br$

D. $C_6H_5CH_2Br$

Answer: D

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154. What is the correct order of decreasing stability of the following cations ?

$$CH_3\text{-}\overset{\oplus}{C}H\text{-}CH_3$$

II $CH_3\text{-}\overset{\oplus}{C}H\text{-}OCH_3$

III $CH_3\text{-}\overset{\oplus}{C}H\text{-}CH_2\text{-}OCH_3$

A. I gt II gt III

B. III gt I gt II

C. II gt I gt III

D. II gt III gt I

Answer: C

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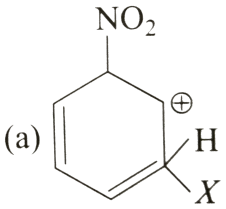
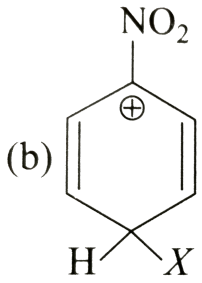
155. Which of the following carbocations is most stable?

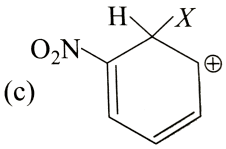
A.



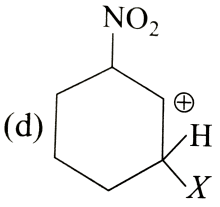
B.



C.



D.



Answer: A

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156. CH_3 - O - CH_3 is:

A. Lewis acid

B. Arrhenius acid

C. Lewis base

D. Bronsted acid

Answer: C

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157. Which one is ambidentate ligand?

A. SO_3^{2-}

B. CN^-

C. NH_3

D. H_2O

Answer: B

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158. The decreasing order of acidity among the following compounds is :

ethanol(I), 2,2,2-trifluoroethanol(II), trifluoroacetic(III), acetic acid(IV)

A. III gt IV gt II gt I

B. IV gt III gt II gt I

C. III gt II gt IV gt I

D. I gt II gt III gt IV

Answer: A

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159. Which of the following intermediates have the complete octet around the carbon atom?

A. Carbonium ion

B. Carbanion

C. Free radical

D. Carbene

Answer: B

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160. Which of the following is the correct order of decreasing S_{N^2} reactivity ?

A. $R_2CHX > R_3CX > RCH_2X$

B. $RCH_2X > R_3CX > R_2CHX$

C. $RCH_2X > R_2CHX > R_3CX$

D. $R_3CX > R_2CHX > RCH_2X$(X is a halogen)

Answer: C

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161. Which of the following presents the correct order of the acidity in the given compounds?

A. $BrCH_2COOH > ClCH_2COOH > FCH_2COOH > CH_3COOH$

B. $FCH_2COOH > ClCH_2COOH > BCH_2COOH > CH_3COOH$

C. $CH_3COOH > BrCH_2 > BrCH_2COOH > ClCH_2COOH > FCH_2COOH$

D. $FCH_2COOH > CH_3COOH > BrCH_2COOG > ClCH_2COOH$

Answer: B

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162. For the following

$(i)I^-(ii)Cl^-(iii)Br^-$

the increasing order of nucleophilicity would be:

A. $I^- < Cl^- < Br^-$

B. $Br^- < Cl^- < I^-$

C. $I^- < Br^- < Cl^-$

D. $Cl^- < Br^- < I^-$

Answer: D

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163. Which one of the following is correct?

Formic acid has lower pK_a than that of CH_3COOH because:

A. formic acid does not dissociate

B. formic acid does not have an alkyl group

C. formic acid is smaller is size than acetic acid

D. formic acid is a strong reducing agent

Answer: B

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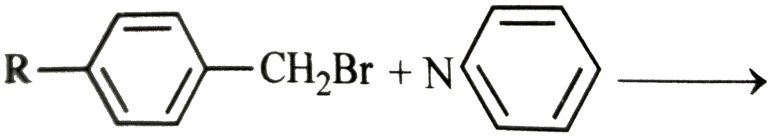
164. The rate of the reaction



is influenced by the hyperconjugation effect of group R. If R is sequentially

CH_3^- (II) CH_3 - CH_2

(III) CH_3 - C | CH_3H - , (IV) H_3C - $\overset{CH_3}{\underset{|}{C}}$ | CH_3 -

the increasing order of speed of above reaction is

A. (iv), (iii), (ii), (i)

B. (i),(ii), (iii), (iv)

C. (i), (Iv), (iii), (ii)

D. (iii), (ii), (i), (iv)

Answer: A

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165. The S_{N^1} reactivity of the following halides will be in the order:

(i) $\left(CH_3\right)_3C$ - Br

(ii) $\left(C_6H_5\right)CHBr$

(iii) $\left(C_6H_5\right)_2C\left(CH_3\right)Br$

(iv) $\left(CH_3\right)_2CHBr$

(v) C_2H_5Br

A. (v) gt (iv) gt (iv) gt (iii)

B. (ii) gt (i) gt (iii) gt (v) gt (iv)

C. (i) gt (iii) gt (v) gt (ii) gt (iv)

D. (iii) gt (ii) gt (i) gt (iv) gt (v)

Answer: D

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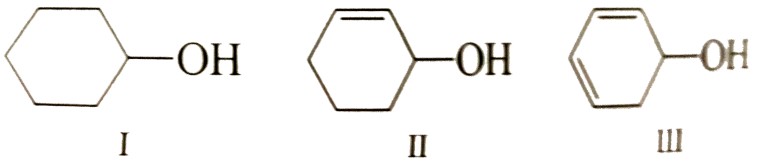
166. The correct order of case of dehydration of following is:



I II III

A. I gt II gt III

B. III gt II gt I

C. I gt III gt II

D. III gt I gt II

Answer: B

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167. The effect that makes 2,3-dimethyl-2-butene more stable than 2-butene is :

A. hyperconjugation

B. reseonce

C. steric effect

D. inductive effect

Answer: A

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168. Condiser the reactions,

(i) $\left(CH_3\right)_2CH - CH_2Br \xrightarrow{C_2H_5OH} \left(CH_3\right)_2CH - CH_2OC_2H_5 + HBr$

(ii) $\left(CH_3\right)_2CH - CH_2Br \xrightarrow{C_2H_5O^-} \left(CH_3\right)_2CH - CH_2OC_2H_5 + Br^-$

The mechanism of reactions (i) and (ii) are respectively :

A. S_{N^1} and S_{N^2}

B. S_{N^1} and S_{N^1}

C. S_{N^2} and S_{N^1}

D. S_{N^2} and S_{N^2}

Answer: D

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169. Which of the following is the most stable compound?

A. Ph_3C^+

B. $Ph_2\overset{+}{C}H$

C. $Ph_2\overset{+}{C}H$

D. $Ph\overset{+}{C}H_2$

Answer: A

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170. Hyperconjugation involves overlap of which of the following orbitals?

A. σ - σ

B. σ - p

C. p - p

D. π - π

Answer: B

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171. Mesomeric effect invloves the :

A. partical displacement of electrons

B. delocalization of sigma electrons

C. delocalization of pi electrons

D. delocalization of pi and sigma electrons

Answer: C

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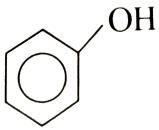
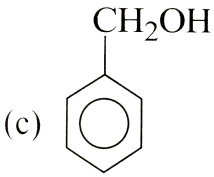
172. Which one of the following is most reactive towards electrophilic attack?

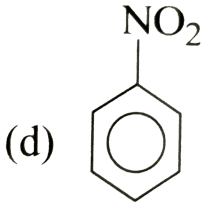
A. (a) 

B. (b) 

C.



D.



Answer: A

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173. Which among the following statements are true with respect to electronic displacement in a covalent bond?

(1) Inductive effect operates through a π - bond

(2) Resonance effect operates through a σ-bond

(3) Inductive effect operates through a σ -bond

(4) Resonance effect operates through a π - bond

(5) Resonance and inductive effects operate through σ-bond

A. 1 and 2

B. 1 and 3

C. 2 and 3

D. 3 and 4

Answer: D

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174. The hydrolysis of 2-bromo-3-methylbutane by S_{N^1} mechanism gives meinly:

A. 3-methyl-2-butanol

B. 2-methyl-2-butanol

C. 2,2-dimethyl-2-propanol

D. 2-methyl-1-butanol

Answer: B

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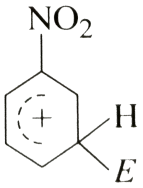
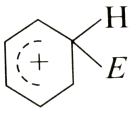
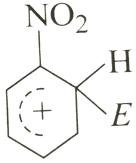
175. The electrophile, $E^{(\oplus)}$ attacks the benzene ring to generate the intermediate σ-complex. Of the following which σ-complex is of lowest energy?

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: C

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176. Which one of the following carbanions is the least stable?

A. $CH_3CH_2^-$

B. $HC \equiv C^-$

C. CH_3^-

D. $\left(CH_3\right)_3\bar{C}$

Answer: D

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177. CH_3CH_2Cl undergoes homolytic fission produces:

A. $\dot{C}H_3CH_2$ and $Cl^{\cdot}$

B. $CH_3\overset{+}{C}H_2$ and Cl^-

C. $CH_3\overset{+}{C}H_2$ and $Cl\cdot$

D. $CH_3\overset{\cdot}{C}H_2$ and Cl^-

Answer: A

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178. Tertiary butyl chloride preferably undergo hydrolysis by:

A. S_{N^1} mechanism

B. S_{N^2} mechanism

C. and of (a) and (b)

D. none of these

Answer: A

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179. In a S_{N^2} substitution reaction of the type

$$R\text{-}Br + Cl^- \xrightarrow{DMF} R\text{-}Cl + Br^-$$

Which one of the following has the highest relative rate?

A. $\left(CH_3\right)_3C\text{-}CH_2Br$

B. CH_3CH_2Br

C. $CH_3CH_2CH_2Br$

D. $\left(CH_3\right)_2CH\text{-}CH_2Br$

Answer: B

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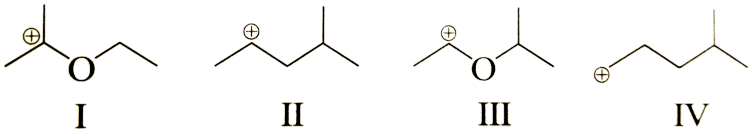
180. The correct stability order for the following speceis is :



I II III IV

A. II gt IV gt I gt III

B. I gt II gt III gt IV

C. II gt I gt IV gt III

D. I gt III gt II gt IV

Answer: D

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181. Arrange the carbanions, $\left(CH_3\right)_3\bar{C}, \bar{C}Cl_3, \left(CH_3\right)_2\bar{C}H, C_6H_5\bar{C}H_2$, in order of their decreasing stability

A. $C_6H_5\bar{C}H_2 > \bar{C}Cl_3 > \left(CH_3\right)_3\bar{C} > \left(CH_3\right)_2\bar{C}H$

B. $\left(CH_3\right)_2\bar{C}H > \bar{C}Cl > C_6H_5\bar{C}H_2 > \left(CH_3\right)_3\bar{C}$

C. $\bar{C}Cl_3 > C_6H_5\bar{C}H_2 > \left(CH_3\right)_2\bar{C}H > \left(CH_3\right)_3\bar{C}$

D. $\left(CH_3\right)_3\bar{C} > \left(CH_3\right)_2\bar{C}H > C_6H_5\bar{C}H_2 > \bar{C}Cl_3$

Answer: C

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182. Which of the following carbocations will be more stable?

A. Ph_3C^+

B. $CH_3 - \overset{+}{C}H_2$

C. $\left(CH_3\right)_2\overset{+}{C}H$

D. $CH_2 = CH - \overset{+}{C}H_2$

Answer: A

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183. Arrange the following free radicals in order of decreasing stability:

Methyl(I), Vinly(II), Allyl(III), Benzyl(IV)

A. I gt II gt III gt IV

B. III gt II gt I gt IV

C. II gt I gt IV gt III

D. IV gt III gt I gt II

Answer: D

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184. The most easily hydrolysed molecule under S_{N^1} condition is:

A. allyl chloride

B. benzyl chloride

C. ethyl chloride

D. isopropyl chloride

Answer: B

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185. Least active electrophile is :

A. $CH_3 - \overset{O}{\overset{||}{C}} - OCH_3$

B. $CH_3 - \overset{O}{\overset{||}{C}} - Cl$

C. $CH_3 - \overset{O}{\overset{||}{C}} - NMe_2$

D. $CH_3 - \overset{O}{\overset{||}{C}} - SCH_3$

Answer: C

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186. In the following carbocation, H/CH_3 that is most likely to migrate to the positve charged carbon is :

$$\overset{1}{H_3C} - \overset{H}{\overset{|2}{C}}|\ OH - \overset{+}{C}3\ |\ H - \overset{H}{\overset{|4}{C}}\ |\ CH_3 - \overset{5}{CH_3}$$

A. CH_3 at C-4

B. H at C-4

C. CH_3 at C-2

D. H at C-2

Answer: D

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187. Arrange the following resonating structures in order of increasing stability

$CH_2 = \overset{+}{N} = \overset{-}{N}(I)$ $H_2C = \overset{+}{N} = \overset{-}{N}(II)$ $H_2C - \overset{+}{N} \equiv \overset{-}{N}(III)$ $H_2C - \overset{+}{N} = \overset{-}{N}(IV)$

A. I gt II gt IV gt III

B. I gt III gt II gt IV

C. II gt I gt III gt IV

D. III gt I gt IV gt II

Answer: B

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188. Identify a species which is not a Bronsted acid but a Lewis acid:

A. HCl

B. NH_3

C. BF_3

D. H_3^+O

Answer: C

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189. A solution of (-l)- chloro -1 phenyletane in toluene recemises slowly in the presence of a small amunt of $SbCI_5$ due to the formation of .

A. free radical

B. carbanion

C. carbene

D. carbocation

Answer: D

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190. The order of stability of the following carbocations:

$CH_2C = CH - \overset{\oplus}{C}H_{2I}$, $CH_3 - CH_2 - \overset{\oplus}{C}H_{2II}$, $C_6H_5 - \overset{\oplus}{C}H_{2III}$

A. III gt I gt II

B. III gt II gt I

C. II gt III gt I

D. I gt II gt III

Answer: A

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191. The hyperconjugative stabilities of tert-butyl cation and 2-butene, respectively, are due to

A. $\sigma \rightarrow p$ (empty) and $\sigma \rightarrow \pi^*$ electron delocalizations

B. $\sigma \rightarrow \sigma^*$ and $\sigma \rightarrow \pi$ delectron delocalizations

C. $\sigma \rightarrow p$ (filled) and $\sigma \rightarrow \pi$ electron delocalizations

D. p(fillled) $\rightarrow \sigma^*$ and $\sigma \rightarrow \pi^*$ electron delocalizations

Answer: A

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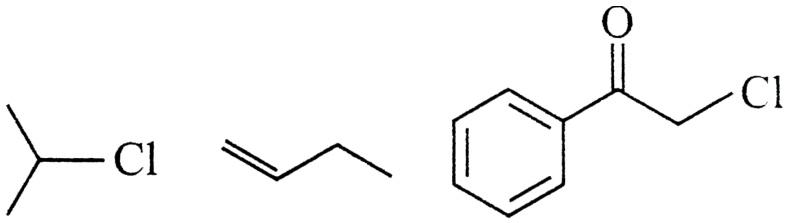
192. KI in acetone, undergoes S_N2 reaction with each of P, Q, R and S The rates of the reaction very as



H_3C - ClP Q R S .

A. P gt Q gt R gt S

B. S gt P gt R gt Q

C. P gt R gt Q gt S

D. R gt P gt S gt Q

Answer: B

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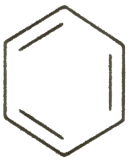
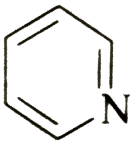
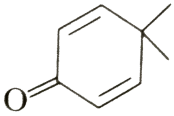
193. Which of the following molecules is least resonance stabilised?

A. (a) 

B. (b) 

C. (c) 

(d) 

D.

Answer: D

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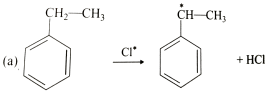
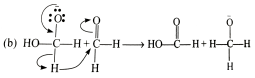
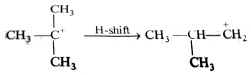
OBJECTIVE QUESTIONS (Level-B)

1. Which of the following is incorrect?

A. 

B. 

C. 

D. $CH_3CH_2CHO \xrightarrow{\bar{O}H} CH_3 - \overset{-}{C}H - CHO + H_2O$

Answer: C

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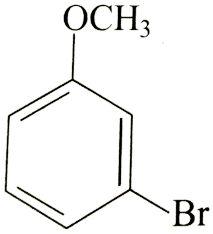
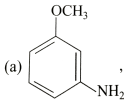
2. 

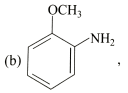
$\xrightarrow{NaNH_2}$ Product (A) by the reaction is:

Product (A)

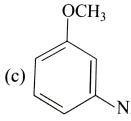
by the reaction is :

A. 

, elimination addition

B. 

, elimination addition

C. 

, substitution

D. none of the above

Answer: A

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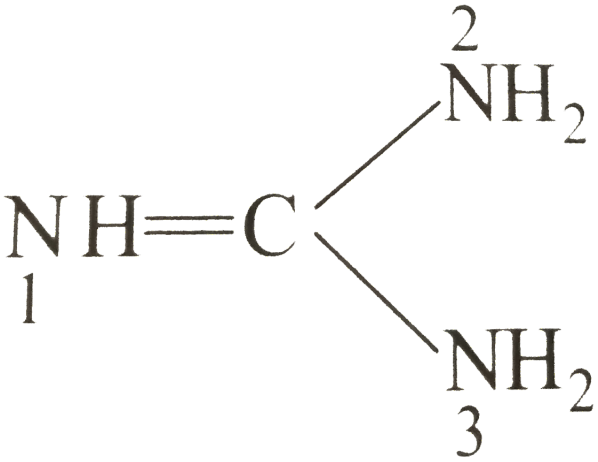
3. Which nitrogen is protonated readily in the guanidine?



A. 1

B. 2

C. 3

D. none of the above

Answer: A

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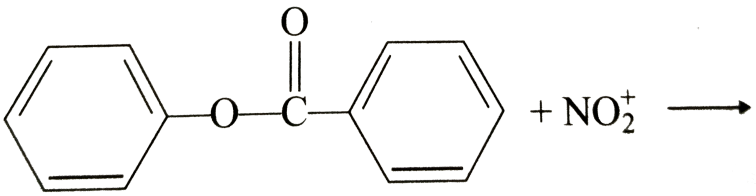
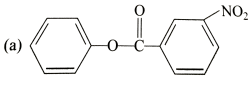
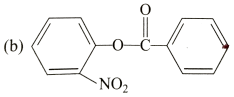
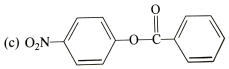
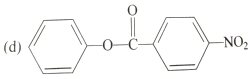
4. 

Product of this reaction by single $\left(S_E\right)$ electrophilic substitution is :

A. 

B. 

C. 

D. 

Answer: C

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5. Which of the following can undergo nucleophilic substitution under ordinary conditions?

I Allyl chloride

II Benzyl chloride

III n-Propyl chloride

IV Vinyl chloride

A. I, II and III are correct

B. I and II are correct

C. II and IV are correct

D. I and III are correct

Answer: A

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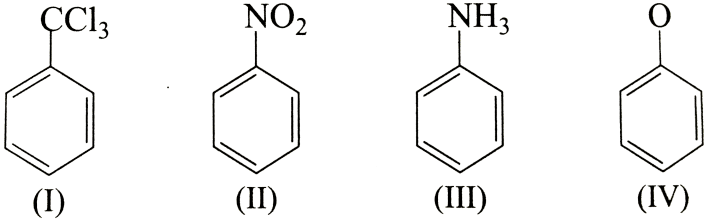
6. Electrophile NO_2^+ attacks on the following:



(I) (II) (III) (IV)

In which cases will NO_2^+ be at meta-position?

A. II and IV

B. I, II and III

C. II and III

D. I only

Answer: B

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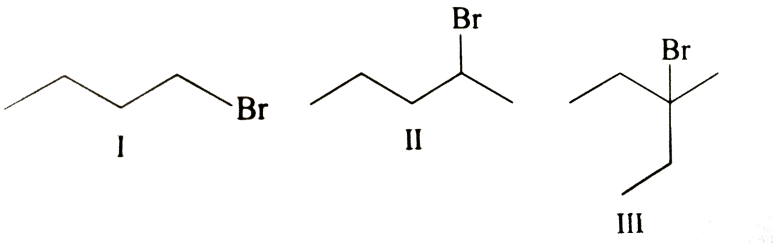
7. Dehydrobromination (- HBr) of the following in increasing order will be :



A. $I < II < III$

B. $III < II < I$

C. $I = II < III$

D. $III < I = II$

Answer: A

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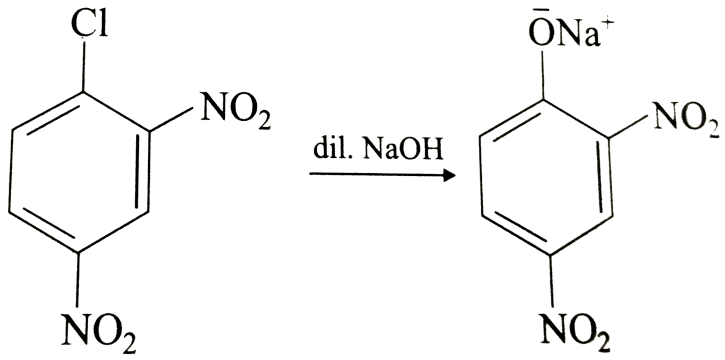
8.



The above trasformation proceeds through:

A. electrophilic addition

B. benzyne intermediate

C. activated nucleophilic substitution

D. elimination

Answer: C

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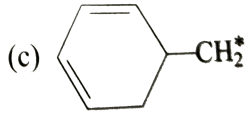
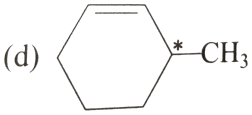
9. Maximum stability will be in which of the following free radicals?

A. $H_2C = \overset{*}{C}H$

B. $H_2C = CH - \overset{*}{C}H_2$

C. 

D. 

Answer: D

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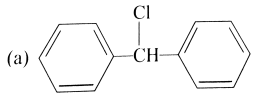
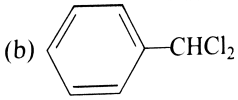
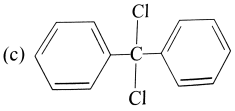
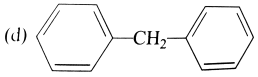
10. Which of the following structures correspond to the product expected, when excess of C_6H_6 reacts with CH_2Cl_2 in presence of anhydrous $AlCl_3$?

A. 

B. 

C. 

D. 

Answer: D

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11. The intermediate during the addition of HCl to propene in the presence of peroxide is :

A. $CH_3 - \overset{*}{C}H - CH_2Cl$

B. $CH_3 - \overset{+}{C}H - CH_3$

C. $CH_3 - CH_2 - \overset{*}{C}H_2$

D. $CH_3 - CH_2 - \overset{+}{C}H_2$

Answer: B

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12. A covalently strated host group present in the benzene nucleus is ortho and para-directing, if unsaturated group is present, it is meta-directing. This rule is known as:

A. Vorlander's rule

B. Crum Brown Gibson rule

C. Korner's rule

D. Huckel rule

Answer: A

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13. Select the incorrect statement among the following

A. Benzene undergoes predominant reactions by electrophilic substitution

B. Toluene is more easily sulphonated than benzene

C. Benzene reacts with CCl_4 in the presence of anhydrous $AlCl_3$ to give trichloromethyl benzene

D. Benzene reacts with chlorine $\left(Cl_2\right)$ in presence of light to give benzyl chloride

Answer: D

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14. Kharasch effect regarding addition of HBr is not observed in:

A. hex-1-ene

B. hex-2-ene

C. hex-3-ene

D. pent-1-ene

Answer: C

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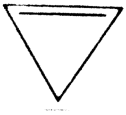
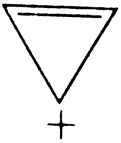
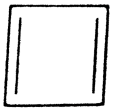
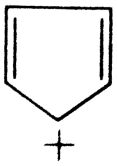
15. Among the following the aromatic compound is

A. (a) 

B. (b) 

C. (c) 

(d) 

D.

Answer: B

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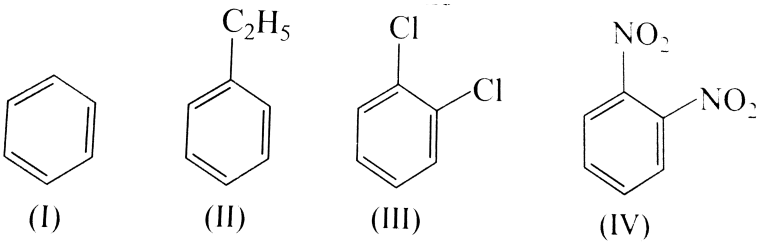
16. Identify the correct order of reactivity in electrophilic substitution reactions of the following compounds:



(I) (II) (III) (IV)

A. $I > II > III > IV$

B. $IV > III > II > I$

C. $II > I > III > IV$

D. $II > III > I > IV$

Answer: C

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17. In which of the following, first memeber is more stable than second?

A. $\left(C_6H_5\right)_2\overset{*}{C}CH_3,\ \left(C_6H_5\right)_3\overset{*}{C}$

B. $:CH_2,\ \cdot CH_2\cdot$

C. $\left(C_6H_5\right)_3\overset{+}{C},\ \overset{+}{C}H_3$

D. $\left(C_2H_5\right)_3,\ \overset{*}{C},\ \left(CH_3\right)_3\overset{*}{C}$

Answer: C

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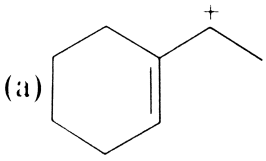
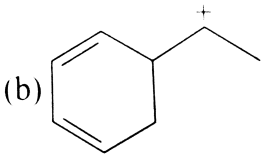
18. Most stable carbocation is:

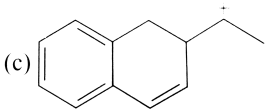
A.



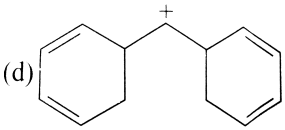
B.



C.



D.



Answer: A

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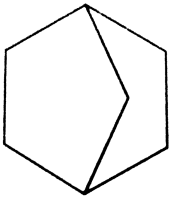
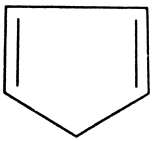
19. Which of the following is least stable ?

A. (a)



(–)

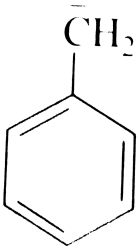
B. (b)



(–)

C. $HC \equiv \overset{-}{C}$

D. (d)



Answer: A

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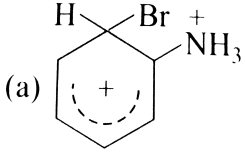
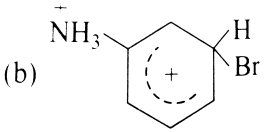
20. The structure of Wheland intermediate obtained after the attack of Br^+ on anilinium ion is:

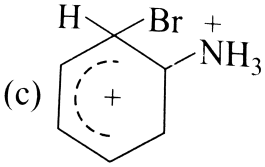
A.



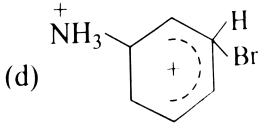
B.



C.



D.



Answer: B

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21. Which of the following halides will be most reactive towards S_{N^2} reaction?

A. $C_6H_5CH_2CH_2CH_2Br$

B. $C_6H_5 - \underset{|}{CH} - \underset{|}{CH_3} - CH_2Br$

C. $C_6H_5\overset{\overset{CH_3}{|}}{\underset{|}{C}} - \underset{|}{CH_3} - Br$

D. $C_6H_5 - CH_2 - \underset{|}{CH} - \underset{|}{Br} - CH_3$

Answer: A

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22. Conjugation of electron withdrawing groups, e.g., $-CHO$, $-\overset{\overset{O}{|}}{C} - R$, $-\overset{\overset{O}{||}}{C} - OR$, $-C \equiv N$, $-NO_2$ activates nucleophilic addition. The order of reactivity of these groups is:

A. $-NO_2 > -C \equiv N > -\overset{\overset{O}{||}}{C} - OR > -\overset{\overset{O}{||}}{C} - R > -\overset{\overset{O}{||}}{C} - H$

B. $-\overset{\overset{O}{||}}{C} - H > -\overset{\overset{O}{||}}{C} - R > -\overset{\overset{O}{||}}{C} - OR > -C \equiv N > -NO_2$

C. $-C \equiv N > -NO_2 > -\overset{\overset{O}{||}}{C} - H > -\overset{\overset{O}{||}}{C} - R > -\overset{\overset{O}{||}}{C} - OR$

D. $-\overset{O}{\overset{||}{C}}-H > -NO_2 > -C \equiv N > -\overset{O}{\overset{||}{C}}-OR > -\overset{O}{\overset{||}{C}}-R$

Answer: B

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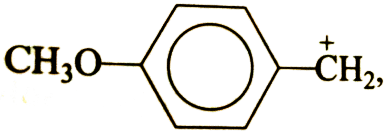
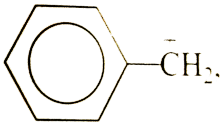
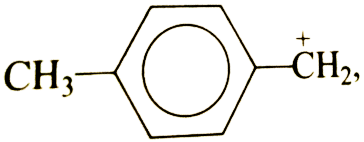
23. Relative stabilities of the following carbocations will be in the order:



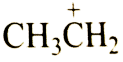
(I)



(II)



(III)



(IV)

A. I lt II lt III lt IV

B. IV lt III lt II lt I

C. IV lt II lt III lt I

D. II lt IV lt III lt I

Answer: C

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24. Consider the reaction :

$CH_3CH_2CH_2Br + NaCN \rightarrow CH_3CH_2CH_2CN + NaBr$

This reaction will be the fastest in :

A. water

B. ethanol

C. methanol

D. N,N' - dimethyl formamide (DMF)

Answer: D

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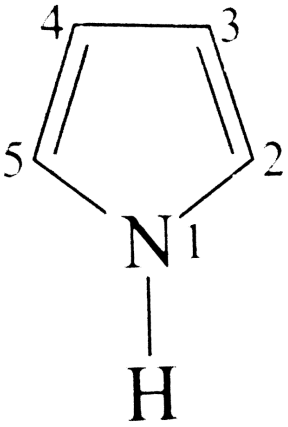
In pyrrole,



25. In pyrrole,

The electron density is maximum on :

A. 2 and 3

B. 2 and 4

C. 2 and 5

D. 3 and 4

Answer: B

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SET II

1. Compound which shows positive mesomeric effect:

A. $H_2C = CH - Cl$

B. $C_6H_5 - \overset{+}{N} - Me_3$

C. $H_2C = CH - CH_2Cl$

D. $C_6H_5 - CH = CHCl$

Answer: A::B

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2. Which of the following are nucleophile?

A. NH_3

B. OH^-

C. $R - O - R$

D. $AlCl_3$

Answer: A::B::C

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3. Which of the following are electrophile?

A. CN^-

B. BF_3

C. NO_2^+

D. $AlCl_3$

Answer: B::C::D

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4. Which types of mechanism take place in sec-halides, $\left(CH_3\right)_2CH$ - X?

A. S_{N^1}

B. S_{N^2}

C. S_{N^1} and S_{N^2}

D. None of these

Answer: A::B::C

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5. The correct statement(s) about , $HClO_4$ and $HClO$, is

A. $HClO_4$ is more acidic than HClO because of resonance stabilization of its anion

B. The central atom in both $HClO_4$ and $HClO$ is sp^3 hybridized

C. $HClO_4$ is formed in the reaction between Cl_2 and H_2O

D. The conjugate base of $HClO_4$ is weaker base than H_2O

Answer: A::B::D

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6. Which gives nucleophilic addition reaction?

A. Methanal

B. Ethanal

C. Propanone

D. Propene

Answer: A::B::C

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7. Acetyl nitrene has been proposed as possible intermediate in:

A. Reimer-Tiemann reaction

B. Hofmann's rearrangement

C. Lossen's rearrangement

D. Curtius rearrangement

Answer: B::C::D

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8. Carbenes are the reactive intermediates in:

A. Carbyamine reaction

B. ReimerTiemann reaction

C. Hofmann's bromamide reaction

D. Witting reaction

Answer: A::B::D

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9. Which of the statements are correct?

A. $-NH_2$ is ortho-para directing group

B. $-CHO$ is meta directing group

C. $:CCl_2$ is an electrophile

D. $-\ddot{O}..H$ is $(-M)$ group

Answer: A::B

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10. Which of the following are aprotic solvents?

A. $DMSO$

B. DMF

C. H_2O

D. CH_3COOH

Answer: A::B

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11. On treatment with strong NaOH at 613K, p-chlorotoluene gives:

A. ortho-cresol

B. meta-cresol

C. para-cresol

D. none of these

Answer: B::C::D

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12. In which of the following reacations is there a possibility of rearrangement?

A. S_{N^1}

B. S_{N^2}

C. E_1

D. E_2

Answer: A::C

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13. In the reaction

$$CH_3 - CH = CH_2 \xrightarrow[\text{Benzoyl peroxide}]{HX} CH_3CH_2CH_2X(\text{A})$$

The product (A) cannot be obtained by using:

A. HBr

B. HCl

C. HI

D. HF

Answer: B::C::D

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14. Which of the following are examples of electrophilic addition?

A. $CH_3 - HC = CH_2 + H_2O \rightarrow CH_3 - \overset{OH}{\overset{|}{C}}H - CH_3$

B. $CH_3 - HC = CH_2 + HBr \xrightarrow{\text{Peroxides}} CH_3 - CH(Br) - CH_3$

C. $CH_3 - HC = CH - CH_3 + Cl_2 \rightarrow CH_3 - CH(Cl) - CH(Cl) - CH_3$

D. None of these

Answer: A::C

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15. Which of the following statements are correct?

A. The addition of HBr to propene gives 2-bromo propane

B. The addition of HBr to propene gives 1-bromo propane

C. The addition of HCl to vinyl chloride gives ethylidene chloride

D. The addition of HCl to vinyl chloride gives ethylene chloride

Answer: A::C

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16. Which of the following is an example of nucleophilic addition of acetone?

A. Ketal formation

B. Reduction with hydrogen gas

C. Cyanohydrin formation

D. Bisulphite additon

Answer: A::C::D

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17. Which of the following are correct for S_{N^2} reaction?

A. The reaction intermediate is carbocation

B. In this reaction the complete inversion takes place

C. It is favoured by polar solvents

D. It is favoured by stability of carbocation

Answer: B

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18. Which of the following are statements regarding anti-Markownifoff's rule is correct?

A. It is catalysed by peroxide

B. Only HBr shows this effect

C. Br adds to more substituted radical

D. CF_3 - $CH = CH_2$ forms anti-Markownikoff's product

Answer: A::B::C::D

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19. Reaction involving carbanion formation is/are:

A. Cannizzaro's reaction

B. Addition reaction of Grignard reagent

C. Perkin's reaction

D. Beckmann's reaction

Answer: B::C

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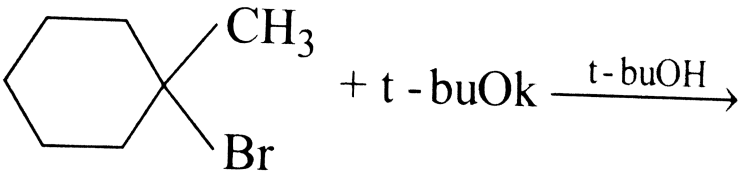
20. Which of the following statements are incorrect regarding following reaction?



A. Product is exocyclic alkene formed according to Saytzeff

B. Product is exocyclic alkene formed according to Hofmann

C. Product is endocyclic alkene formed according to Saytzeff

D. Product is endocyclic alkene formed according to Hofmann

Answer: A::C::D

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21. Which is/are correctly linked here?

	List I		List II
(*a*)	E_1Cb	(*a*)	Carbanion formation
(*b*)	E_2	(*b*)	Stereo specific
(*c*)	S_{N^1}	(*c*)	Presence of non-polar solvent
(*d*)	E_1	(*d*)	Carbocation formation

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22. Toluene when treated with $Br_2/Fe,$ give p-bromotoluene as the major product because of the $-CH_3$ group:

A. is p-directing

B. deactivates the ring

C. is m-directing

D. activates the ring by hyperconjugation

Answer: A::D

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23. $-CX_3$ group is associated with:

A. m-directing

B. increasing acidic

C. ring deactivation

D. increase of stability of carbocation

Answer: A::B::C

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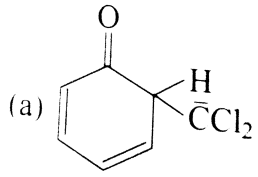
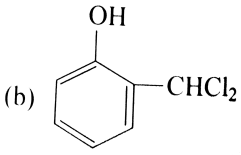
24. When phenol reactes with $CHCl_3$ and NaOH followed by acidification, salicyladehyde is obtained. Which of the following species are involed in the above-mentioned reaction as intermediates ?

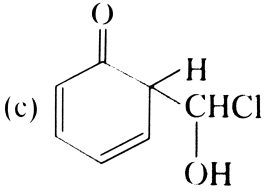
A.

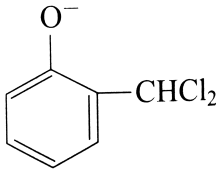


B.



C.



(d) 

D.

Answer: A::D

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ASSERTION-REASON TYPE QUESTIONS

1. (A) S_{N^2} reactioin takes place in single step.

(R) S_{N^2} reaction involves transition state intermediate.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: B

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2. (A) Ethyl chloride is more reactive than vinyl chloride towards nucleophilic substitution reactions.

(R) Vinyl chloride is $+I$ electron pushing group.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: C

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3. (A) $-NO_2$, $-CN$, $-CNO$ act as ambident nucleophles.

(R) These consist atoms of same period.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: A

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4. (A) Nucleophiles attack the regions of high electron density.

(R) Nucleophiles act as Lewis bases.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: D

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5. (A) Cation carriers, e.g., H - Br, Cl - OH and Br - Br and oxidising agents such as O_3 and R - O - O - R, etc. act as electrophilic reagents.

(R) Electrophilec are Lewis bases.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: B

View Text Solution

6. (A) Inductive and electromeric effects require polar nature in the molecule.

(R) Polar nature in inductive effect is a must but not necessarily in electromeric effect.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: D

View Text Solution

7. (A) Singlet carbenes have opposite spin (antiparallel).

(R) They have a bent structure.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: A

Watch Video Solution

8. (A) Carbenes act as free radicals.

(R) Only triplet carbenes act as biradical (divalent free radical).

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: D

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9. (A) Tertiary carbocations are generally formed more easily than primary carbocations.

(R) Hyperconjugation as well as inductive effect due to additional alkyl groups stabilize tertiary cabocations.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: A

Watch Video Solution

10. (A) Allyl free radical is more stable than simple alkyl free radical.

(R) The allyl free radical is stabilized by resonance.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: A

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11. (A) Heterolytic fission involves the breaking of a covalent bond in such a way that both the electrons of the shared pair are carried away by one

of tha atoms.

(R) Heterolytic fission occurs readily in polar covalent bonds.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: B

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12. (A) Tertiary butyl carbonion is more stable than methyl carbanion.

(R) $+I$ effect of the three methyl groups in tertiary butyl carbanion tends to make it more stable than methyl carbanion.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: D

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13. (A) In S_{N^2} reactions, complete inversion of configuration takes place.

(R) In S_{N^1} reactions, retention but not the inversion takes place,

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: C

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14. (A) In allylic substitution propene gives allyl bromide.

(R) NBS is a selective brominating agent and gives substitution at the alpha carbon with respect to the double bond.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: A

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15. Alkene $A\left(Me_2C = CMe_2\right)$ is more stable than alkene $B\left(Et_2C = Cet_2\right)$.

Baker-Nathan effect.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. IF (A) is incorrect but (R) is correct.

Answer: A

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MATRIX-MATCH TYPE QUESTIONS

1. Match the following :

Column I	Column II
(a) Singlet carbene	(p) Diamagnetic
(b) Triplet carbene	(q) Paramagnetic
(c) Free radical	(r) Formed by homolytic fission
(d) Carbocation	(s) Formed by heterolytic fission

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PASSAGE-I

1. Nuclephilic substitution reaction is given by those compounds which have nucleophilic groups as leaving groups. The weaker the basicity of a group of the substrate, the better is its leaving ability.

In nucleophilic substitution reactions, the basicity of leaving group should be less than the incoming nucleophilic group. Nucleophilc

substitution reaction at sp^3 -hybridised carbon is either bimolecular $\left(S_{N^2}\right)$ or unimolecular $\left(S_{N^1}\right)$. Bimolecular reaction takes place in single step, involving transition state intermediate. In S_{N^2} reaction is preferred if the compound has less steric hindrance.

Unimolecular $\left(S_{N^2}\right)$ reaction involves two steps and carbonium ion intermediate. Optically active substrates give recemic mixture in these reactions.

Which compound will give Walden inversion in S_{N^2} reaction?

A. CH_3CH_2Br

B. CH_3 - CHD - Br

C. CH_3 - Br

D. $C_6H_5CH_2CH_2Cl$

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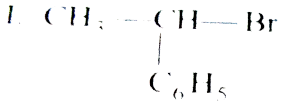
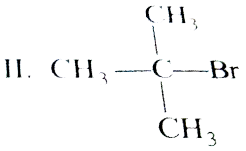
2. Nuclephilic substitution reaction is given by those compounds which have nucleophilic groups as leaving groups. The weaker the basicity of a group of the substrate, the better is its leaving ability.

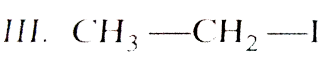
In nucleophilic substitution reactions, the basicity of leaving group should be less than the incoming nucleophilic group. Nucleophilc substitution reaction at sp^3 -hybridised carbon is either bimolecular $\left(S_{N^2}\right)$ or unimolecular $\left(S_{N^1}\right)$. Bimolecular reaction takes place in single step, involving transition state intermediate. In S_{N^2} reaction is preferred if the compound has less steric hindrance.

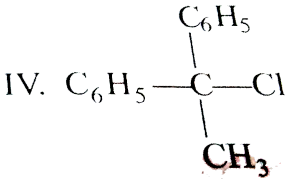
Unimolecular $\left(S_{N^2}\right)$ reaction involves two steps and carbonium ion intermediate. Optically active substrates give recemic mixture in these reactions.

Which among the following will give S_{N^1} reaction?

I. 

II. 

III. 

IV. 

A. I,II,III

B. I,II,IV

C. III

D. II and IV

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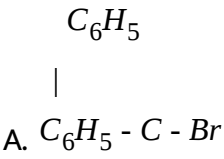
3. Nuclephilic substitution reaction is given by those compounds which have nucleophilic groups as leaving groups. The weaker the basicity of a group of the substrate, the better is its leaving ability.

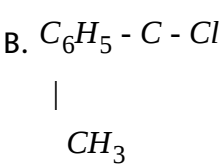
In nucleophilic substitution reactions, the basicity of leaving group should be less than the incoming nucleophilic group. Nucleophilc substitution reaction at sp^3 -hybridised carbon is either bimolecular $\left(S_{N^2}\right)$ or unimolecular $\left(S_{N^1}\right)$. Bimolecular reaction takes place in single step, involving transition state intermediate. In S_{N^2} reaction is preferred if the compound has less steric hindrance.

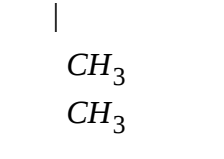
Unimolecular $\left(S_{N^2}\right)$ reaction involves two steps and carbonium ion

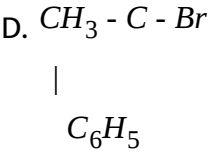
intermediate. Optically active substrates give recemic mixture in these reactions.

Which among the following will give enantiomeric pair on treatment with HOH?

A. 

B. 

C. 

D. 

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4. Nuclephilic substitution reaction is given by those compounds which have nucleophilic groups as leaving groups. The weaker the basicity of a group of the substrate, the better is its leaving ability.

In nucleophilic substitution reactions, the basicity of leaving group should be less than the incoming nucleophilic group. Nucleophilc substitution reaction at sp^3 -hybridised carbon is either bimolecular $\left(S_{N^2}\right)$ or unimolecular $\left(S_{N^1}\right)$. Bimolecular reaction takes place in single step, involving transition state intermediate. In S_{N^2} reaction is preferred if the compound has less steric hindrance.

Unimolecular $\left(S_{N^2}\right)$ reaction involves two steps and carbonium ion intermediate. Optically active substrates give recemic mixture in these reactions.

Select the correct statements among the following:

A. carbocation rearrangement takes place in S_{N^1} reaction

B. S_{N^2} mechanism is favoured when nucleophile is neutral

C. S_{N^1} mechanism is favoured when nucleophile is neutral

D. tertiary alkyl halides give only S_{N^1} reaction

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5. Nuclephilic substitution reaction is given by those compounds which have nucleophilic groups as leaving groups. The weaker the basicity of a group of the substrate, the better is its leaving ability.

In nucleophilic substitution reactions, the basicity of leaving group should be less than the incoming nucleophilic group. Nucleophilc substitution reaction at sp^3 -hybridised carbon is either bimolecular $\left(S_{N^2}\right)$ or unimolecular $\left(S_{N^1}\right)$. Bimolecular reaction takes place in single step, involving transition state intermediate. In S_{N^2} reaction is preferred if the compound has less steric hindrance.

Unimolecular $\left(S_{N^2}\right)$ reaction involves two steps and carbonium ion intermediate. Optically active substrates give recemic mixture in these reactions.

S_{N^2} reaction involves transition state intermediate, hence it is favoured in which of the following solvents?

A. Polar protic solvent

B. Non-polar solvent

C. Polar aprotic solvent

D. All of these

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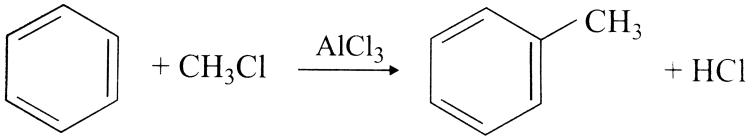
PASSAGE-II

1. Alkylation of aromatic compounds with aliphatic compounds like halides in presence of Lewis acid catalyst is known as Friedel-Crafts alkylation. It is an exapmle of electrophilic substitution.



In the process of acylation, $R-\overset{\overset{O}{\|}}{C}-$ group is introduced to the ring.

Compounds having (+ mesomeric groups) like -NH_2 do not give Friedel-Crafts reaction because these compounds undergo conjugation with the catalyst. In the alkylation process, most branched alkyl group is substituted because isomerisation of carbonium ion takes place. In some Friedel-Crafts reactions, the nature of product changes with the solvent used in the reaction.

Predict whether the following statements are ture or false:

$AlCl_3$ (aq.) is used as catalst in Frieded-Crafts reaction:

(a) True (b) False

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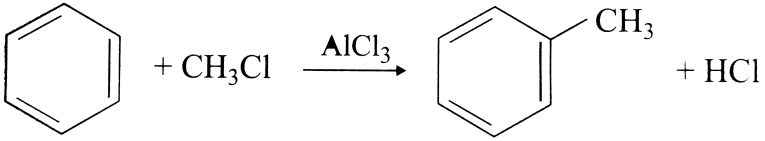
2. Alkylation of aromatic compounds with aliphatic compounds like halides in presence of Lewis acid catalyst is known as Friedel-Crafts alkylation. It is an exapmle of electrophilic substitution.

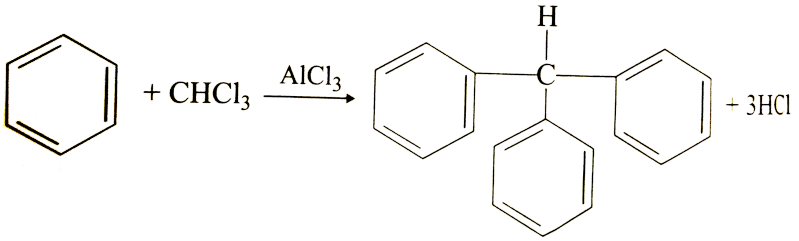


In the process of acylation, $R-\overset{O}{\overset{\|}{C}}-$ group is introduced to the ring.

Compounds having (+ mesomeric groups) like -NH_2 do not give Friedel-Crafts reaction because these compounds undergo conjugation with the catalyst. In the alkylation process, most branched alkyl group is substituted because isomerisation of carbonium ion takes place. In some Friedel-Crafts reactions, the nature of product changes with the solvent used in the reaction.

Predict whether the following statements are ture or false:

When benzene is treated with $CHCl_3$ in presence of $AlCl_3$ catalyst, the following reaction takes place:



(a) True (b) False

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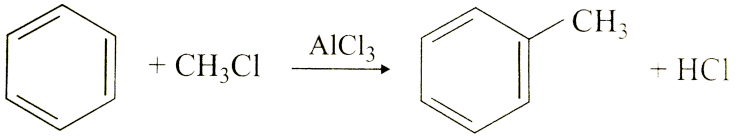
3. Alkylation of aromatic compounds with aliphatic compounds like halides in presence of Lewis acid catalyst is known as Friedel-Crafts

alkylation. It is an exapmle of electrophilic substitution.



In the process of acylation, $R - \overset{\overset{O}{\|}}{C} -$ group is introduced to the ring. Compounds having (+ mesomeric groups) like $-NH_2$ do not give Friedel-Crafts reaction because these compounds undergo conjugation with the catalyst. In the alkylation process, most branched alkyl group is substituted because isomerisation of carbonium ion takes place. In some Friedel-Crafts reactions, the nature of product changes with the solvent used in the reaction.

Predict whether the following statements are ture or false:

Carbocations undergo isomerisation in Frieded-Crafts reaction. In each of the following alkyl halides the isomerisation takes place:

$CH_3 - CH_2 - CH_2 - Cl$,

$CH_3 - CH_2 - CH_2 - CH_2 - Cl$

(a) True (b) False

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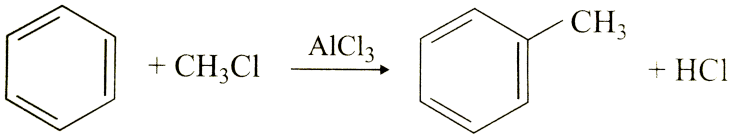
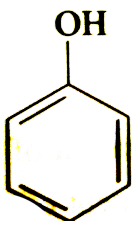
4. Alkylation of aromatic compounds with aliphatic compounds like halides in presence of Lewis acid catalyst is known as Friedel-Crafts alkylation. It is an exapmle of electrophilic substitution.

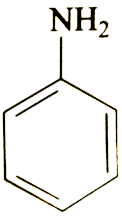


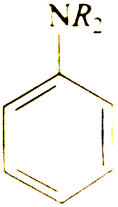
In the process of acylation, $R-\overset{\overset{O}{\|}}{C}-$ group is introduced to the ring. Compounds having (+ mesomeric groups) like -NH_2 do not give Friedel-Crafts reaction because these compounds undergo conjugation with the catalyst. In the alkylation process, most branched alkyl group is substituted because isomerisation of carbonium ion takes place. In some Friedel-Crafts reactions, the nature of product changes with the solvent used in the reaction.

Predict whether the following statements are ture or false:

Following compounds easily give Friedel-Crafts reaction:







(a) True (b) False

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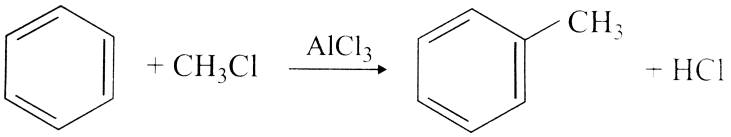
5. Alkylation of aromatic compounds with aliphatic compounds like halides in presence of Lewis acid catalyst is known as Friedel-Crafts alkylation. It is an exapmle of electrophilic substitution.



In the process of acylation, $R-\overset{\overset{O}{\|}}{C}-$ group is introduced to the ring. Compounds having (+ mesomeric groups) like $-NH_2$ do not give Friedel-Crafts reaction because these compounds undergo conjugation with the catalyst. In the alkylation process, most branched alkyl group is substituted because isomerisation of carbonium ion takes place. In some

Friedel-Crafts reactions, the nature of product changes with the solvent used in the reaction.

Predict whether the following statements are ture or false:

Diphenyl methane is obtained when benzene is treated with dichloro methane is presence of anhydrous $AlCl_3$:

(a) True (b) False

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PASSAGE-III

1. Hyperconjugation describes the orbital interactions between the π-system and the adjacent σ-bond of the substituent group(s) in organic compounds. Hyperconjugation is called as Baker and Nathan effect. The necessary and sufficient conditions for the hyperconjugation are:

(i) Compound should have at least one sp^2-hybrid carbon of either alkene, carbocation or alkyl free radical.

(ii) α-carbon with respect to sp^2 -hybrid carbon should have at least one hydrogen.

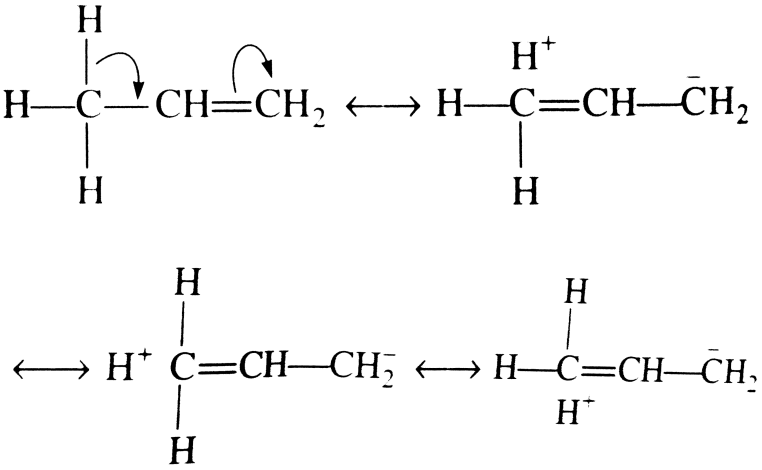
Hyperconjugation are of three types:

(i) $\sigma(C - H)$, π-conjugation,

(ii) $\sigma(C - H)$, positive charge conjugation,

(iii) $\sigma(C - H)$, odd electron conjugation.

The hyperconjugation may be represented as,



Number of resonating structures due to hyperconjugation $= (n + 1)$, where n is the numebr of α-hydrogen. Greater is the number of such forms, more is the stability of the species under consideration.

Hyperconjugation is possible in which of the following species?

A. $CH_3 - CH_2 -$

B. $C_6H_5 - CH_3$

C. $H_2C = CH_2$

D. $CH_3 - \underset{\underset{CH_3}{|}}{\overset{CH_3}{|}}{C} - CH = CH_2$

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2. Hyperconjugation describes the orbital interactions between the π-system and the adjacent σ-bond of the substituent group(s) in organic compounds. Hyperconjugation is called as Baker and Nathan effect. The necessary and sufficient conditions for the hyperconjugation are:

(i) Compound should have at least one sp^2-hybrid carbon of either alkene, carbocation or alkyl free radical.

(ii) α-carbon with respect to sp^2 -hybrid carbon should have at least one hydrogen.

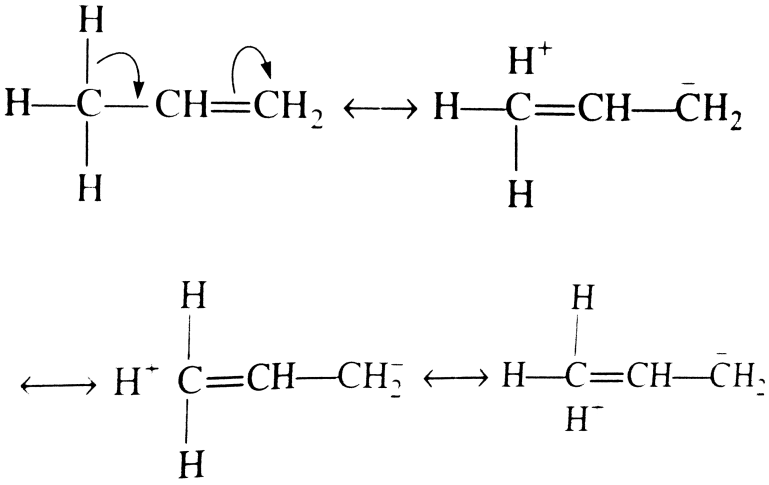
Hyperconjugation are of three types:

(i) $\sigma(C - H)$, π-conjugation,

(ii) $\sigma(C - H)$, positive charge conjugation,

(iii) $\sigma(C - H)$, odd electron conjugation.

The hyperconjugation may be represented as,



Number of resonating structures due to hyperconjugation $= (n + 1)$, where n is the numebr of α-hydrogen. Greater is the number of such forms, more is the stability of the species under consideration.

Which of the following carbocations will show highest number of hyperconjugative forms?

A. $CH_3 - \overset{+}{C}H_2$

B. $CH_3 - \overset{+}{C}(CH_3)_2$

C. $CH_3 - \overset{+}{C}(CH_3)_2$

D. $CH_3 - CH_2 - \overset{+}{C}(CH_3)_2$

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3. Hyperconjugation describes the orbital interactions between the π-system and the adjacent σ-bond of the substituent group(s) in organic compounds. Hyperconjugation is called as Baker and Nathan effect. The necessary and sufficient conditions for the hyperconjugation are:

(i) Compound should have at least one sp^2-hybrid carbon of either alkene, carbocation or alkyl free radical.

(ii) α-carbon with respect to sp^2 -hybrid carbon should have at least one hydrogen.

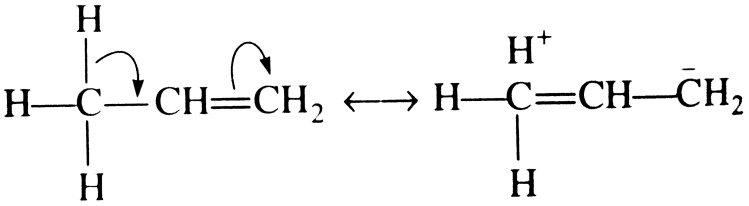
Hyperconjugation are of three types:

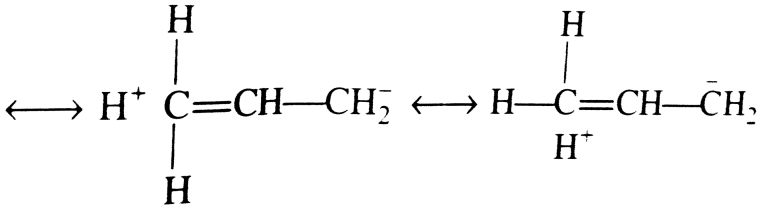
(i) $\sigma(C - H)$, π-conjugation,

(ii) $\sigma(C - H)$, positive charge conjugation,

(iii) $\sigma(C - H)$, odd electron conjugation.

The hyperconjugation may be represented as,

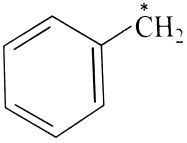




Number of resonating structures due to hyperconjugation $= (n + 1)$, where n is the numebr of α-hydrogen. Greater is the number of such forms, more is the stability of the species under consideration.

Which of the following free redicals will not show the phenomena of hyperconjugation?

A. $\overset{*}{C}H_3$

B. (b) 

C. $CH_3 - \overset{*}{C}H_2$

D. $CH_3 - \underset{CH_3}{\underset{|}{CH}}*$

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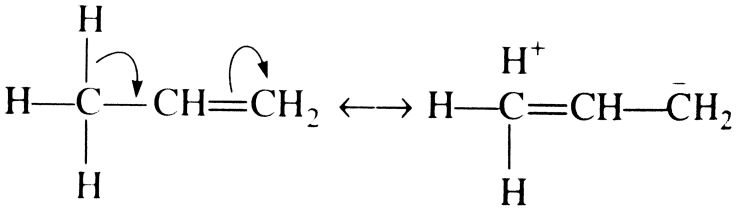

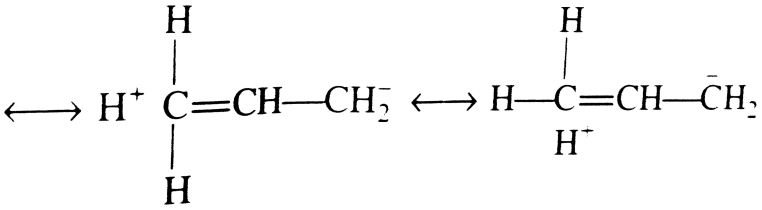

Number of resonating structures due to hyperconjugation $= (n + 1)$, where n is the numebr of α-hydrogen. Greater is the number of such forms, more is the stability of the species under consideration.

Which of the following alkenes will show maximum number of hyperconjugation forms?

A. $H_2C = CH_2$

B. $CH_3 - CH = CH_2$

C. $CH_3 - CH_2 - CH = CH_2$

D. $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{C}}H - CH = CH_2$

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5. Hyperconjugation describes the orbital interactions between the π-system and the adjacent σ-bond of the substituent group(s) in organic compounds. Hyperconjugation is called as Baker and Nathan effect. The necessary and sufficient conditions for the hyperconjugation are:

(i) Compound should have at least one sp^2-hybrid carbon of either alkene, carbocation or alkyl free radical.

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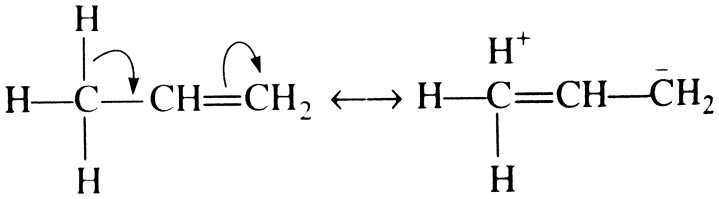

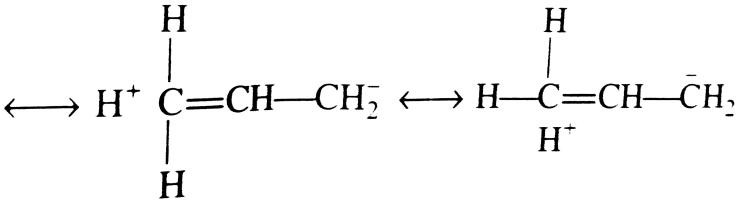

Number of resonating structures due to hyperconjugation $= (n + 1)$, where n is the numebr of α-hydrogen. Greater is the number of such forms, more is the stability of the species under consideration.

Stability of alkyl carbocations can be explained by

A. inductive effect

B. hyperconjugation

C. both inductive effect and hyperconjugation

D. electromeric effect

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PASSAGE-IV

1. Free redical halogenation takes place in presence of light or at high temperature (above $500^\circ C$). Formation of halogen free radical intermediate takes place in first step called chain initiation step.

$$Cl_2 \xrightarrow{hv} 2Cl*$$

This reaction is mainly given by those compounds which have at least one hydrogen atom present at sp^3 -hybrid carbon. Reactivity of sp^3-hybrid carbon depends on the reactivity of reaction intermediate.

The relative rate of formation of alkyl radicals by a chlorine radical is:

Tertiary(5) > secondary(3.8) > Primary(1)

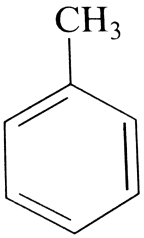
$$\text{Percentage yield of the product} = \frac{\text{Relative amount} \times 100}{\text{Sum of relative amounts}}$$

Relative amount = Number of hydrogen atoms on the respective carbon × relative r

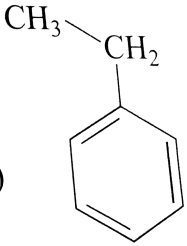
NBS(N-bromosuccinimide) is used for bromination at allylic and benzylic carbon, whereas Br_2/hv gives bromination at benzylic, allylic and allyl carbons.

Select most reactive compound for chlorination in presence of light:

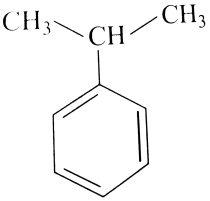
A. (a)



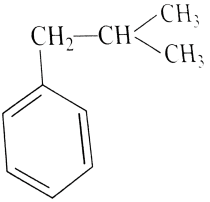
B. (b)



C. (c)



D. (d)



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2. Free redical halogenation takes place in presence of light or at high temperature (above $500^\circ C$). Formation of halogen free radical intermediate takes place in first step called chain initiation step.

$$Cl_2 \xrightarrow{hv} 2Cl*$$

This reaction is mainly given by those compounds which have at least one hydrogen atom present at sp^3 -hybrid carbon. Reactivity of sp^3-hybrid carbon depends on the reactivity of reaction intermediate.

The relative rate of formation of alkyl radicals by a chlorine radical is:

Tertiary(5) > secondary(3.8) > Primary(1)

$$\text{Percentage yield of the product} = \frac{\text{Relative amount} \times 100}{\text{Sum of relative amounts}}$$

Relative amount = Number of hydrogen atoms on the respective carbon × relative r

NBS(N-bromosuccinimide) is used for bromination at allylic and benzylic carbon, whereas Br_2/hv gives bromination at benzylic, allylic and allyl carbons.

Which one of the following compounds will react with NBS?

A. $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}} - CH = CH_2$

B. $C_6H_5 - \underset{\underset{CH_3}{|}}{C} - CH_3 - CH = CH_3$

C. $C_6H_5 - CH = CH_2$

D. $CH_3 - \underset{\underset{CH_3}{|}}{CH} - CH_3$

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3. Free redical halogenation takes place in presence of light or at high temperature (above $500^\circ C$). Formation of halogen free radical intermediate takes place in first step called chain initiation step.

$$Cl_2 \xrightarrow{hv} 2Cl*$$

This reaction is mainly given by those compounds which have at least one hydrogen atom present at sp^3 -hybrid carbon. Reactivity of sp^3-hybrid carbon depends on the reactivity of reaction intermediate.

The relative rate of formation of alkyl radicals by a chlorine radical is:

Tertiary(5) > secondary(3.8) > Primary(1)

$$\text{Percentage yield of the product} = \frac{\text{Relative amount} \times 100}{\text{Sum of relative amounts}}$$

Relative amount = Number of hydrogen atoms on the respective carbon × relative r

NBS(N-bromosuccinimide) is used for bromination at allylic and benzylic carbon, whereas Br_2/hv gives bromination at benzylic, allylic and allyl carbons.

Arrange decreasisng order of reactivity of given compounds with NBS (N-bromosuccinimide).

I. C_6H_5 - CH_3

II. C_6H_5 - CH_2 - CH_2 - CH_3

III. C_6H_5 - CH_2 - $CH = CH_2$

IV. C_6H_5 - CH| CH_3 - $CH = CH_2$

Select the correct answer from the codes given below:

A. *IV, III, I, II*

B. *IV, III, II, I*

C. *I, II, III, IV*

D. *I, III, II, IV*

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PASSAGE-V

1. The electronic displacements in covalent bonds may occur either in the ground state under the influence of an atom or a substituent group or in presence of an appropriate attacking reagent. As a result of these electron displacements, centres of different electron densities are created and these centres are susceptible to attack by the reagents. These electron displacements occur through inductive electromeric, resonance and hyperconjugation effects. Whereas inductive effect involves displacement of *sigam*-electrons towards the substituent, resonance effect involves delocalization of π - electrons transmitted through the chain and both are permanent effect. Electromeric effect is the complete transfer of a shared pair of π- electrons to one of the atoms joined by a multiple bond on the demand of an attacking reagent. Hyperconjugation effects on the other hand involve delocalization of σ-electrons of C - H bond of an alkyl group directly attached to an atom of unsaturated system (i.e., σ - π-conjugation). Both inductive and hyperconjugation effects can be used to explain the stability of carbocations and free radicals which follow the stability order :

$3^{\circ} > 2^{\circ} > 1^{\circ}$. The stability or carbanions, however, follows the reverse order.

An organic reaction occurs through making and breaking of bonds. The breaking of a covalent bond may occur either homolytic leading to the formation of free radicals or heterolytic forming positively (carbocations) or negatively (carbanions) charged species. Most of the attacking reagents carry either a positive or a negative charge. The positively charged species with electron deficient centre or neutral species (free radicals, carbenes, nitrene) are collectively called electrophiles, while negatively charged species with electron rich centre or neutral species (like water, alcohol, ammonia, etc.) are called nucleophiles.

Which of the following groups has highest inductive effect?

A. CH_3 -

B. CH_3CH_2 -

C. $\left(CH_3\right)_2CH$ -

D. $\left(CH_3\right)_3C$ -

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The decreasing order of basic strength in

$C_6H_5NH_{2(I)}, \quad \left(C_6H_5\right)_2NH_{(II)}, \quad CH_3NH_{2(III)}, \quad NH_{3(IV)}$ is:

A. (IV)gt(III)gt(II)gt(I)

B. (I)gt(II)gt(III)gt(IV)

C. (III)gt(IV)gt(I)gt(II)

D. (II)gt(I)gt(III)gt(IV)

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3. The electronic displacements in covalent bonds may occur either in the ground state under the influence of an atom or a substituent group or in presence of an appropriate attacking reagent. As a result of these electron displacements, centres of different electron densities are created and these centres are susceptible to attack by the reagents. These electron displacements occur through inductive electromeric, resonance and hyperconjugation effects. Whereas inductive effect involves displacement of *sigam*-electrons towards the substituent, resonance effect involves delocalization of π - electrons transmitted through the chain and both are permanent effect. Electromeric effect is the complete transfer of a shared pair of π- electrons to one of the atoms joined by a multiple bond on the demand of an attacking reagent. Hyperconjugation effects on the other hand involve delocalization of σ-electrons of C - H bond of an alkyl group directly attached to an atom of unsaturated system (i.e., σ - π-conjugation). Both inductive and hyperconjugation effects can be used to explain the stability of

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Out of the following series, the one containing only electrophiles is:

A. H_2O, Cl^+, NH_3

B. H_2O, RNH_2, H_3O^+

C. BF_3, SO_3, NO_2^+

D. $AlCl_3, NH_3, H_2O$

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4. The electronic displacements in covalent bonds may occur either in the ground state under the influence of an atom or a substituent group or in presence of an appropriate attacking reagent. As a result of these electron displacements, centres of different electron densities are created and these centres are susceptible to attack by the reagents. These electron displacements occur through inductive electromeric, resonance and hyperconjugation effects. Whereas inductive effect involves displacement of *sigam*-electrons towards the substituent, resonance effect involves delocalization of π - electrons transmitted through the chain and both are permanent effect. Electromeric effect is the complete transfer of a shared pair of π- electrons to one of the atoms joined by a multiple bond on the demand of an attacking reagent. Hyperconjugation effects on the other hand involve delocalization of σ-electrons of C - H bond of an alkyl group directly attached to an atom of unsaturated system (i.e., σ - π-conjugation). Both inductive and hyperconjugation effects can be used to explain the stability of

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Consider the following alkenes and what is correct decreasing order of stability?

$CH_3CH_2CH = CH_2$But-1-ene(I), $\left(CH_3\right)_2C = \left(CH_3\right)_2$2,3-Dimethylbut-2-ene(II),

$\left(CH_3\right)_2C = CHCH_3$2-Methylbut-2-ene(III), $\left(CH_3\right)_2C = CH_3$2-Methylpropene(IV)

A. (I) gt (II) gt (III) gt (IV)

B. (II) gt (III) gt (IV) gt (I)

C. (IV) gt (III) gt (II) gt (I)

D. (III) gt (IV) gt (I) gt (II)

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5. The electronic displacements in covalent bonds may occur either in the ground state under the influence of an atom or a substituent group or in presence of an appropriate attacking reagent. As a result of these electron displacements, centres of different electron densities are created and these centres are susceptible to attack by the reagents. These electron displacements occur through inductive electromeric, resonance and hyperconjugation effects. Whereas inductive effect involves displacement of σ-electrons towards the substituent, resonance effect involves delocalization of π - electrons transmitted through the chain and both are permanent effect. Electromeric effect is the complete transfer of a shared pair of π- electrons to one of the atoms joined by a multiple bond on the demand of an attacking reagent. Hyperconjugation

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Which of the following is most stable cation?

A. $\left(CH_3\right)_2\overset{+}{C}H$

B. $\overset{+}{C}H_2$

C. $\overset{+}{C}F_3$

D. $F_3C - \overset{+}{C}H_2$

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SINGLE INTEGER ANSWER TYPE QUESTIONS

1. Amongst following the total number of electrophiles is:

$Cl^+, OH^-, CN^-, H^+, H_3O^+, Na^+, R^-, NO_2^+, :CH_2, :NH_3$

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2. Amongst following the total number of nucleophiles is:

$R^-, OR^-, H_2O, SO_3, NH_2^-, CO_2, ROH, BF^3, AlCl_3, H^-$

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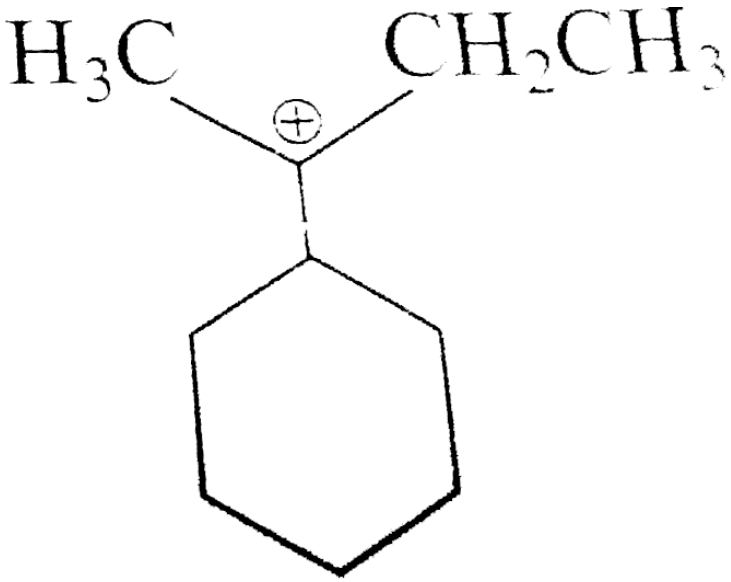
3. The total number of contributing structures showing hyperconjugation (involving $C-H$ bonds) for the following carbocation is:



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4. Total number of Lewis acids among the following is :

$BF_3, H_3PO_4, NH_3, SiF_4, CH_3COOH, NaOH, CO_2, HCl, SO_3.$

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Solved example

1. Calculate the amount of energy released in ergs, calories and in joules when 0.001 kg of mass disappears. [Given, Velocity of light $= 3 \times 10^{8} ms^{-1}$]

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2. How will you separate the following mixtures?

(a) Sulphur, potassium nitrate and charcoal

(b) Sand, common salt, iron filings and naphthalene

(c) Powdered glass, ammonium chloride and potassium chloride.

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3. What mass of sodium chloride would be decomposed by 9.8 g of sulphuric acid. If 12 g of sodium bisulphate and 2.75 g of hydrogen chloride were produced in a reaction assuming aht the law of conservation of mass is true?

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4. In an experiment, 2.4 g of iron oxide on reduction with hydrogen yield 1.68 g of iron. In another experiment. 2.9 g of iron oxide give 2.03 g of iron on reduction with hydrogen show that the above data illustrate the law of constant proportions.

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5. Carbon combines with hydrogen to form three compounds A,B and C . The percentages of hydrogen in A,B and C are 25,14.3 and 7.7 respectively. Which law of chemical combination is illustrated?

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6. Two compounds each containing only tin and oxygen had the following composition:

	Mass % of tin	Mass % of oxygen
Compound A	78.77	21.23
Compound B	88.12	11.88

Show how this data illustrate the law of multiple proportions?

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7. Illustrate the law of reciprocal proportions from the following data: KCl contains 52.0% potassium, KI contains 23.6% potassium and Icl contains 78.2% iodine.

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8. Zinc sulphate crystals contain 22.6% of zinc and 43.9% of water. Assuming the law of constant proportions to be true, how much zinc should be used to produce 13.7 g of zinc sulphate and how much water will they contain?

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9. Carbon monoxide reacts with oxygen to form carbon dioxide according to the equation $2CO + O_2 = 2CO_2$. In an experiment, 400mL of carbon monoxide and 180mL of oxygen were allowed to react , when 80% of

carbon monoxide was transformed to carbon dioxide.

All the volumes were measured under the same conditions of temperature and pressure. find out the composition of the final mixture.

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10. How much volume of oxygen will be required for complete combustion of 40 mL of acetylene $\left(C_2H_2\right)$ and how much volume of carbon dioxide will be formed? All volumes are measrued at NTP.

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11. Boron has two isotopes boron-10 and boron-11 whose percentage abundanes are 19.6% and 80.4% respectively. What is the average atomic mass of boron?

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12. Carbon occurs in nature as a mixture of carbon-12 and carbon-132. the average atomic mass of carbon is 12.011. what is the percentage abundance of carbon -12 in nature?

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13. Calculate the mass of 2.5 gram atoms of oxygen.

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14. Calculate the gram atoms in 2.3 g of sodium.

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15. Calculate the mass of 1.5 gram molecule of sulphuric acid.

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16. Calculate the actual mass of one molecule of carbon dioxide $\left(CO_2\right)$

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17. A piece of copper weighs 0.634g. How many atoms of copper does it contain?

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18. How many molecules of water and oxygen atoms are present in 0.9g of water?

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19. Calculate the mass of a single atom of sulphur and a single molecule of carbon dioxide.

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20. What is the mass of 3.01×10^{22} molecules of ammonia?

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21. From 200mg of CO_2, 10^{21} molecuels are removed. How many moles of CO_2 are left?

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22. How many molecuels and atoms of oxygen are present in 5.6 litres of oxygen $\left(O_2\right)$ at NTP.

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23. How many electrons are present in 1.6 g of methane?

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24. The electric charge on the electron is 1.602×10^{-19} coulomb. How much charge is present on 0.1 mole of Cu^{2+} ions?

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25. How many years it would take to spend one Avogadro number of rupees at a rate of 10 lakh of rupees in one second?

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26. A chloride of an element contains 49.5% chlorine. The specific heat of the element is 0.056. calcualte the equivalent mass, valency and atomic mass of the element.

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27. On dissolving 2.0g of metal in sulphuric acid. 4.51g of the metal sulphate was formed. The specific heat of the metal is 0.057 cal g^{-1}. What is the valency of the metal and exact atomic mass?

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28. Potassium chromate is isomorphous to potassium sulphate $\left(K_2SO_4\right)$ and is found to contain 26.78% chromium. Calculate the atomic mass of chromium (K=39.10)

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29. One gram of a chloride was found to contain 0.835 g of chlorine. Its vapour density is 85. calculate its molecular formula.

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30. The oxide of an element contains 32.33 per cent of the element and the vapour density of its chloride is 79. Calculate the atomic mass of the element.

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31. Calculate the percentage composition of calcium nitrate.

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32. Determine the percentage of water of crystallisation, iron , sulphur and oxygen in pure ferrous sulphate $\left(FeSO_4.7H_2O\right)$.

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33. It is found that 16.5 g of metal combine with oxygen to form 35.60 g of metal oxide. Calculate the percentage of metal and oxygen in the

compound.

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34. Hydrogen and oxygen are combined in the ratio 1:16 by mass in hydrogen peroxide. Calcualte the percentage of hydrogen and oxygen in hydrogen peroxide.

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35. On analysis of an impure sample of sodium chloride. The percentage of chlorine was found to be 45.5 What is the percentage of pure sodium chloride in the given sample?

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36. Calculate the empirical formula for a compound that contains 26.6% potassium, 35.4% chromium and 38.1% oxygen. [Given K=39.1,Cr=52,O=16]

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37. A compound contains 34.8% oxygen, 52.2% carbon and 13.0% hydrogen. What is the empirical formula mass of the compound?

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38. A compound of carbon, hydrogen and nitrogen contins these elements in the ratio 9:1:3.5. calcualte the empirical formula. If its molecular mass is 108, what is the molecular formula?

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39. A carbon compound containing only carbon and oxygen has an approximate molecular mass of 290. On analysis. It is found to contain 50% by mass of each element. What is the molecular formula of the compound?

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40. A compound on anayalysis , was found to have the following composition. (i) Sodium=14.31%. (ii) Sulphur =9.97% (iii) Oxygen=69.50%, (iv) Hydrogen =6.22%. Calcualte the molecular formula of the compound assuming that whole of hydrogen in the compound is present as water of crystallisation Molecualr mass of the compound is 322.

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MISCELLANGEOUS

1. 0.44 g of a hydrocarbon on complete combustion with oxygen gave 1.8g water and 0.88 g carbon dioxide. Show that these resutls are in asccordance with the law of conservation of mass.

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2. Calcium carbonate decomposes completely. On heating into lime (CaO) and carbon dioxide $\left(CO_2\right)$. 1kg of calcium carbonate is completely decomposed by heat, when 560g of lime are obtained. How much quantity of carbon dioxide in grams, moles and litres at NTP is produced in the process?

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3. 10mL of hydrogen combine with 5 mL of oxygen to yield water. When 200 mL of hydrogen at NTP are passed over heated CuO, the CuO loses 0.144 g of its mass. Do these resutls correspond to the law of constant proportions?

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4. On heating in air, 0.12 g of metal gave 0.20 g of its oxide. The carbonate and nitrate of the metal were found to contain 28.5% and 16.2% of the metal respectively. Calculate by applying law of constnat proportions, the

masses of oxide of the metal that will be obtained by heating 10 g each of the carbonate and the nitrate.

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5. 2.66 g chloride of a gmetal when treated with silver nitrate solution give 2.87g of silver chloride. 3.37 g of another chloride of the same metal give 5.74 g of silver chloride when treated with silver nitrate solution. Show that the results are in agreement with a law of chemical combination.

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6. Two oxides of a metal contain 30.0 and 27.6 per cent of oxygen respectively. If the formula of the first oxide be M_2O_3. Find that of the second oxide.

View Text Solution

7. AB_2 and A_2B_3 are two compounds of the elements A and B 0.15 mole of each of these compounds weights 9.3and 15.9g respectively. Find the atomic masses of A and B.

View Text Solution

8. Show that the following results illustrate the law of reciprocal proportions:

(i) 0.92g Mg produces 1.54g mangesium oxide.

(ii) 0.41 g Mg illustrates 380mL of hydrogen at NTP from on acid.

(iii) 1.25g of water results from the union of 1.11 g of oxygen with hydrogen.

(Density of hydrogen at NTP=0.00009g mL^{-1})

View Text Solution

9. HCl contains 97.26% chlorine, phosphine contains 91.1% phosphorus, Applying the suitable law of chemical combination . Calculate how much

quantity of phosphorus will combine with 10.65g of chlorine =97.26parts.

View Text Solution

10. Air contains 20% oxygen by volume. Calculating the theoretical volume of air which will be required for burning 200 m^3 of acetylene gas completely. All volumes are measured under the same conditions of temperature and pressure.

View Text Solution

11. The density of a gaseous element is 5 times that of oxygen under similar conditions. If the molecule of the element is triatomic, what will be its atomic mass?

View Text Solution

12. One volume of hydrogen combines with sulphur to produce one volume of a gas (A). If the vapour density of (A) be 17. what is its molecular formula? The volumes have been measured under same temperature and pressure.

View Text Solution

13. Analysis of many gaseous compounds of phosphorus shows that 1 litre of any gas at NTP never contains less than 1.384 g of phosphorus Again one litr eof phosphorus regarding approximate atomic mass. Molecular mass and atomicity of phosphorus from the above results?

View Text Solution

14. The relative densit of a mixture of nitrogen and oxygen is 154.4(H=1) and the relative densities of nitrogen and oxygen are 14.0 and 16.0 (H=1) respectively. Calculate the composition of the mixture (i) by volume and (ii) by mass.

View Text Solution

15. 1.020 g of metallic oxide contains 0.540g of the metal . Calculate the equivalent mass of the metal and hence its atomic mass with the help of Dulong and Petit's law. Taking the symbol for the metal s M. find the molecular formula of the oxide. The specific heat of the metal is 0.216 cal $\deg^{-1} g^{-1}$.

View Text Solution

16. Chlorophyll, the green colouring matter of plants, contains 2.68% of magnesium by mass. Calculate the number of magnesium atoms is 3.00g of chlorophyll. [Atomic mass of magnesium=24.3g]

View Text Solution

17. One atom of an element weighs $6.644 \times 10^{-23} g$. Calcualte the number of gram atoms in 40kg of it.

View Text Solution

18. Prove from the following resutls that mercury molecules are monoatomic:

(a) 10g of mercury combine with 0.8g of oxygen to form an oxide.

(b) 1000mL of vapour of Hg at NTP weigh 8.923g

(c) The specific heat of the metal is 0.033.

View Text Solution

19. How many grams of CaO are required to neutralise 852g of P_4O_{10}?

View Text Solution

20. If 1 grain is equal to 64.8mg, how many moes of aspirin (mol. Wt. =169) are present in a 5 grain aspirin tablet?

View Text Solution

21. If the volume occupied in a crystal by a molecule of NaCl is $47 \times 10^{-24} mL$ calculate the volume of the crystal weighing 1g. .

View Text Solution

22. Weighing 3104 carats (1 carat=200mg), the Cullinan diamond was the largest natural diamond ever found. How many carbain atoms were present in the stone?

View Text Solution

23. A cylinder of compressed gas contains nitrogen and oxygen in the ratio 3:1 by mole. If the cylinder is known to contain 2.5×10^4g of oxygen, what is the total mass of the gas mixture?

View Text Solution

24. Amospheric air has 78% N_2: 21% O_2: 0.9% Ar and 0.1% CO_2 by volume. What is the molecular mass air in the atmosphere?

View Text Solution

25. An alloy of iron (54.7%) nickel (45%) and manganese (0.3%) has a density of 8.17 g/cm^3. How many iron atoms are there in a block of alloy measuring $10cm \times 20cm \times 15cm$?

View Text Solution

26. An analysis of pyrex glass showed 12.9% B_2O_3, 2, 2 % Al_2O_3.3.8 % Na_2O, 0.4 % K_2O and remaining is SiO_2. What is the ratio of silicon to boron atoms in the glass?

View Text Solution

27. Calculate the number of millilitres at STP of H_2S gas needed to precipitate cupric sulphide completely from 100mL of a solution containing 0.75 g of $CuCl_2$ in 1L.

A. 21.4

B. 14.2

C. 41.2

D. 124

Answer: D

View Text Solution

28. In the reaction,

$As_2S_5 + xHNO_3 \rightarrow 5H_2SO_4 + yNO_2 + 2H_3AsO_4 + 12H_2O$ the values of x and y are:

A. 40,40

B. 10,10

C. 30,30

D. 20,20

Answer: A

View Text Solution

ILLUSTRATION

1. 116mg of a compound on vaporisation in Victor Meyer's apparatus displaces 44.8mL of air measured at STP. The molecular mass of the compound is.

A. 116

B. 232

C. 58

D. 44.8

Answer: C

View Text Solution

2. A gas has a vapour density 11.2. the volume occupied by 1 g of the gas at NTP is:

A. 1L

B. 11.2L

C. 22.4L

D. 4L

Answer: A

View Text Solution

3. 3g of hydrocarbon on combustion with 11.2 g of oxygen produce 8.8 g of CO_2 and $5.4g$ of H_2O. The data illustrate the law of:

A. conservation of mass

B. multiple proportions

C. constant proportions

D. reciprocal proportions

Answer: A

View Text Solution

4. The maximum number of molecules is present in:

A. 15L of H_2 gas at STP

B. 5L of N_2 gas at STP

C. 0.5 g of H_2 gas

D. 10 g of O_2 gas

Answer: A

View Text Solution

5. Insulin contains 3.4% sulphur. Then, the minimum molecular mass of the insulin in about.

A. 940amu

B. 9400amu

C. 3600amu

D. 970amu

Answer: A

View Text Solution

6. 25 g of MCl_4 contains 0.5 mol chlorine then its molecular mass is:

A. 100g mol^{-1}

B. 200g mol^{-1}

C. $150g\text{mol}^{-1}$

D. $400 g \text{mol}^{-1}$

Answer: B

View Text Solution

7. An unknown element forms an oxide. What will be the equivalent mass of the element if the oxygen content is 20% by mass?

A. 16

B. 32

C. 8

D. 64

Answer: B

View Text Solution

8. A metal M of equivalent mass E forms an oxide of molecular formula M_xO_y. The atomic mass of the metal is given by the correct equation:

A. 2E(x/y)

B. xyE

C. E/y

D. y/E

Answer: A

View Text Solution

9. The percentage of an element M is 53 in its oxide of molecular formula M_2O_3. Its atomic mass is about:

A. 45

B. 9

C. 18

D. 27

Answer: D

View Text Solution

10. The equivalent weight of a metal is double than that of oxygen. How many times is the weight of its oxide greater than the weight of metal?

A. 4

B. 2

C. 3

D. 1.5

Answer: D

View Text Solution

11. A gas mixture contains 50% helium and 50% methane by volume. What is the percentage by mass of methane in the mixture?

A. 0.1997

B. 0.2005

C. 0.5

D. 80.03 %

Answer: D

View Text Solution

12. The atomic composition of the entire universe is approximately given in the table below:

Atom	% of total no. of atoms
H	93
He	7

Hydrogen atoms constitute what percentage of the universe by mass?

A. 0.77

B. 0.23

C. 0.37

D. 0.73

Answer: A

View Text Solution

13. Which pair of species has same percentage of carbon?

A. CH_3COOH and $C_6H_{12}O_6$

B. CH_3COOH and C_2H_5OH

C. $HCOOH_3$ and $C_{12}H_{22}O_{11}$

D. $C_6H_{12}O_6$ and $C_{12}H_{22}O_{11}$

Answer: A

View Text Solution

14. Which one of the following alkaness has 75% of carbon?

A. C_2H_6

B. CH_4

C. C_3H_8

D. C_4H_{10}

Answer: B

View Text Solution

15. Which of the following two oxides of nitrogen have 30.5% nitrogen?

A. NO

B. NO_2

C. N_2O_4

D. N_2O_5

Answer: A::B::C::D

View Text Solution

16. x gram of $CaCO_3$ was completely burnt in air. The mass of the solid residue formed is 28g. What is the value of 'x' in gram?

A. 44

B. 200

C. 150

D. 50

Answer: D

View Text Solution

17. The mass of carbon anode consumed (giving only carbon dioxide) in the production of 270kg of Al metal from bauxite by Hall process is:

A. 270kg

B. 540kg

C. 90kg

D. 180kg

Answer: C

View Text Solution

18. The equivalent mass of an element in 4 . Its chloride has vapour density 59.25. then the valency of th element is:

A. 4

B. 3

C. 2

D. 1

Answer: B

View Text Solution

19. Sulphur trioxide is prepared by the following two reactions:

$S_8(s) + 8O_2(g) \rightarrow 8SO_2(g)$

$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$

How many grams of SO_3 are produced from 1 mole S_8?

A. 1280

B. 640

C. 960

D. 320

Answer: B

View Text Solution

PRACTICE PROB.

1. The density of mercury is 13.6g/mL. Calcualte the diameter of an atom of mercury assuming that each atom of mercury is occupying a cube of edge-length equal to the diamter of mercury atom. (Atomic mass of mercury=200)

View Text Solution

2. A metal M of atomic mass 54.94 has a density of 7.42 g/cc. Calculate the apparent volume occupied by one atom of the metal.

View Text Solution

3. Find the charge of 1 g ion of N^{3-} in coulomb.

View Text Solution

4. Calculate the volume at NTP occupied by 6.25 g of nitrogen.

View Text Solution

5. 10mL of hydrogen contains 2×10^3 molecules of hydrogen at certain pressure and temperature. Calculate the number of molecules of oxygen whose volume is 200mL at the same temperature and pressure.

View Text Solution

6. The masses of equal volumes of a gas and hydrogen are 25.6 g and 0.8g respectively under same conditions of temperature and pressure. Find the molecular mass of the gas.

View Text Solution

7. One litre of a gas at NTP weights 1.97g. Find the molecular mass of gas.

View Text Solution

8. How many moles of water are present in one litre of water?

View Text Solution

9. Calculate the mass of 6.02×10^{21} molecules of nitrogen.

View Text Solution

10. 1.5276g of $CdCl_2$ was found to contain 0.9367g of cadmium. Calculate the atomic mass of cadmium.

View Text Solution

11. Calculate how many methane molecules and how many hydrogen and carbon atoms are there in 25.0 g of methane?

View Text Solution

12. How much sugar $\left(C_{12}H_{22}O_{11}\right)$ will be required if each person on the earth is given 100 molecules of sugar? The population of the earth is 3×10^{10}.

View Text Solution

13. A mixture of hydrogen and oxygen contains 20% by mass of hydrogen. What is the total number of molecules present per gram of the mixture?

View Text Solution

14. How many electrons are present in 18mL of water?

View Text Solution

15. The vapour density of a mixture containing NO_3 and N_2O_4 is 38.3 at $27\ ^\circ C$ Calcualte the moles of NO_2 in 100g of the mixture.

View Text Solution

16. Calcualte the number of oxygen atoms in 88g CO_2. What would be the mass of CO having the same number of oxygen atoms?

View Text Solution

17. Density of water at room tempearture is $1.0 gcm^{-3}$. How many molecules are there in one drop of water if its volume is $0.1 cm^3$?

View Text Solution

18. Naturally occurring boron contain of two isotopes, whose atomic masses are 10.01 and 11.01. the atomic mass of natural boron is 10.81. calculate the percentage of each isotope in natural boron.

View Text Solution

19. How many iron atoms are present in a stainless stell ball bearing having a radius of 0.254 cm? the stainless steel contains 85.6% Fe by weight and has density of 7.75 g/cm^3.

View Text Solution

20. The nucleus of an atom X is supposed to be a sphere with a radius of 5×10^{-13}cm. find the density of the matter in the atomic nucleus if the atomic weight of X is 19.

View Text Solution

21. Calculate the number of atoms of each element present in 122.5g of $KCIO_3$.

View Text Solution

22. In an experiment , 1.0g $CaCO_3$ on heating evolved 224 mL of CO_2 at NTP. What mass of CaO (calcium oxide) is formed?

View Text Solution

23. What mass of potassium chlorate $\left(KClO_3\right)$ on heating gives 1.491 g of potassium chloride (KCl) and 0.672 litres of oxygen at NTP?

View Text Solution

24. A compound AB completely decomposes into A and B on heating. 50g of AB, on strong heating gave 40g of A. how much quantity of AB should be decomposed by heating to obtain 2.5 g of B? How much quantity of A will be produced in the process?

View Text Solution

25. If 12.6 of $NaHCO_3$ is added to 20.0g of HCl solution, the residue solution is found to weigh 24.0g. What is the mass and volume of CO_2 released at NTP in the reaction?

View Text Solution

26. Metal M and chlorine combine in different proportions to form two compound A and B the mass ratio M: Cl is 0.895:1 in A and 1.791:1 in B. what law of chemical combination is illustrated?

View Text Solution

27. By means of the given analytical results show that law of multiple proportions is true:

Mercurous chloride	Mercuric chloride
Mercury = 84.92 %	Mercury = 73.80 %
Chlorine = 15.08 %	Chlorine = 26.20 %

View Text Solution

28. 1 g of metal, having no variable valency, produces 1.67g of its oxide when heated in air. Its carbonate contains 28.57% of the metal. How much oxide will be obtained by heating 1g of the carbonate?

View Text Solution

29. 0.36g of Mg combines with chlorine to produce 1.425 g of mangesium chlorine 9.50g of another sample of anhydrous magnesium chloride gave, on electrolysis 2.24 litre of chlroine at NTP. Show that these data agree with the law of constant proportions.

View Text Solution

30. Cabon dioxide contains 27.27% carbon , carbon disulphide contains 15.97% carbon and sulphur dioxide contains 50% sulphur. Show that these figures illustrate the law of reciprocal proportions

View Text Solution

31. Phosphorus and chlorine form two compounds. The first contains 22.54% by mass of phosphorus and the second 14.88% of phosphorus. Show that these data are consistent with law of multiple proportions.

View Text Solution

32. A and B are two hydrocarbons. A and B are heated separated in excess of oxygen when 0.028 g of A gave 44.8mL CO_2 and 0.44g of B gave 67.2mL CO_2 at NTP. Show that the results are in agreement with law of multiple proportions.

View Text Solution

33. Aluminium oxide contains 52.9% aluminium and carbon dioxide contains 27.27% carbon. Assuming the validity of the law of reciprocal proportions , calculate the percentage of aluminium in aluminium carbide.

View Text Solution

View Text Solution

34. Two volumes of ammonia , on dissociation gave one volume of nitrogen and three volumes of hydrogen. How much hydrogen will be obtained from dissociation of 40mL of NH_3?

View Text Solution

35. The following results were obtained by heating different oxides of lead in a current of hydrogen.

(a) 1.393g of litharge gave 1.293 g of lead.

(b) 2.173g of lead peroxide gave 1.882 g of lead.

(c) 1.721 g of red lead gave 1.552 g of lead.

Show that these resutls are in accordance with the law of multiple proportions.

View Text Solution

36. Calculate the number of g -moles of CaO that could be obtained from 42.54g of $CaCO_3$ and convert the number of g-moles to grams.

View Text Solution

37. 1 g of a metal M which has specific heat of 0.06 combines with oxygen to form 1.08g of oxide. What is the atomic mass of M?

View Text Solution

38. A compound contains 28% of nitrogen and 72% metal by mass 3 atoms of the metal combine with 2 atoms of the nitrogen. Find the atomic mass of the metal.

View Text Solution

39. The chloride of a solid metallic element contains 57.89% by mass of the element. The specific heat of the element is 0.0324 cal $\deg^{-1} g^{-1}$. Calculate the exact atomic mass of the element.

View Text Solution

40. Two oxides of a metal contain 63.2% and 69.62% of the metal the specific heat of the metal is 0.117. what are the formulae of the two oxides?

View Text Solution

41. White vitriol (hydrated zinc sulphate) is isomorphous with $MgSO_4.7H_2O$ white vitriol contains 22.95% zinc and 43.9% of water of crystallisation. Find the atomic mass of zinc.

View Text Solution

42. A solid element burns in oxygen without any change in volume (of gas) under similar conditions of temperature and pressure. If the vapour density of pure gaseous product is 32, what is the equivalent mass of the element?

View Text Solution

43. If the equivalent mass of a metal (M) is x and the formula of its oxide is M_mO_n, then show that the atomic mass of M is $\frac{2xn}{m}$

View Text Solution

44. Two oxides of metals A and B are isomorphous . The metal A whose atomic mass is 52, forms a chloride whose vapour density is 79. the oxide of the metal B contains 47.1% oxygen. Calculate the atomic mass of B.

View Text Solution

45. A mixture of 1.65×10^{21} molecules of X and 1.85×10^{21} molecules of Y weighs 0.688g. If molecular mass of Y is 187. what is the molecular mass of X?

View Text Solution

46. The equivalent mass of a metal is 29.73 and the vapour density of its chloride is 130.4 find out the atomic mass of the metal.

View Text Solution

47. A gaseous hydrocarbon contaisn 85.7% carbon and 14.3% hydrogen 1 litre of the hydrocarbon weights 1.26g at NTP. Determine the molecular formula of the hydrocarbon.

View Text Solution

48. Equal masses of oxygen hydrogen and methane are taken in a container under identical conditions. Find the ratio of their volumes.

View Text Solution

49. How many moles are there in $1m^3$ of any gas at NTP?

View Text Solution

50. A hydrated chloride of metal contains 18.26% metal and 32.42% chloride ion by mass. The specific heat of metal is 0.16 what is hydrated chloride?

View Text Solution

51. An automobile antifreezen consists of 38.7% C,9.7% H and remaining oxygen by weight. When 0.93 g of it are vaporised at $200\,^{\circ}C$ and 1 atm

pressure 582mL of vapour are formed Find the molecular formula of the antifreeze.

View Text Solution

52. Haemoglobin contains 0.25% iron by mass. The molecular mass of haemoglobin is 89600. calculate the number of iron atoms per molecule of haemoglobin.

View Text Solution

53. A sample of potato-starc was ground to give a starch like molecule. The product analysed 0.086% phosphorus, what is the average molecular mass of the material.

View Text Solution

54. Calculate the number of carbon, hydrogen and oxygen atoms in 18g of glucose.

View Text Solution

55. Hydrated sulphate of a divalent metal of atomic weight 65.4 loses 43.85% of its weight on dehydration. Find the number of molecules of water of crystallisation in the formula of hydrated salt.

View Text Solution

56. An ornamental ring contains 275 carats of diamond. How many grams diamond does it have?

View Text Solution

57. 1 volume of a gaseous compound consisting C,H,O on complete combustion in presence of 2.5 volume of O_2 gives 2 vol. of steam and 2 volt. Of CO_2, what is the formula of the compound if all measurements are made at NTP?

View Text Solution

58. For a precious stone, 'carat' is used for specifying its mass. If 1 carat=3.168grains (a unit of mass) and 1 gram=15.4 grains find the total mass in kilogram of the ring that contains 0.5 carat diamond and 7 gram gold.

View Text Solution

OBJECTIVE QUE.

1. The father of modern chemistry is:

A. Priestley

B. Lavoisier

C. Dalton

D. Mendeleev

Answer: B

View Text Solution

2. A pure substance can only be:

A. a compound

B. an element

C. an element or a compound.

D. a heterogeneous mixture.

Answer: C

View Text Solution

3. A pure substance which contains only one type of atoms is called:

A. an element

B. a compound

C. a solid

D. a liquid.

Answer: A::B::C

View Text Solution

4. Which one of the phrases would be incorrect to use?

A. A mole of an element

B. A mole of a compound

C. An atom of an element

D. An atom of a compound

Answer: D

View Text Solution

5. A symbol not only represents the name of the element but also its:

A. atomic mass

B. atomic number

C. atomicity

D. atomic volume

Answer: A::B::C

View Text Solution

6. The most abundant metal in earth's crust is:

A. iron

B. magnesium

C. calcium

D. aluminium

Answer: D

View Text Solution

7. The most abundant element in earth's crust is:

A. hydrogen

B. oxygen

C. nitrogen

D. silicon

Answer: B

View Text Solution

8. Which one of the elements is not found in nature?

A. Radium

B. Technetium

C. Polonium

D. Helium.

Answer: B

View Text Solution

9. Which one of the following is not a compound ?

A. Marble

B. Ozone

C. Carborundum

D. Quicklime

Answer: B

View Text Solution

10. which one of the following is not an element?

A. Diamond

B. Ozone

C. Silica

D. Graphite.

Answer: C

View Text Solution

11. The direct change from solid to gaseous state is referred to as:

A. disociation

B. decompositon

C. subslimation

D. deliquescence

Answer: C

View Text Solution

12. Sulphur burns in oxygen to form sulphur dioxide . The properties of sulphur dioxide are:

A. totally different from sulphur and oxygen

B. similar to sulphur

C. similar to oxygen

D. more similar to sulphur than oxygen.

Answer: A::B::C

View Text Solution

13. One sample of air is found to have 0.03% carbon dioxide and another sample 0.02%. This illustrate that:

A. air is a compound

B. air is an element

C. air does not follow the law of constant proportions

D. air is a mixture.

Answer: D

View Text Solution

14. Which one of the following is not a mixture?

A. Distilled water

B. Sugar dissolved in water.

C. Liquefied Petroleum Gas (LPG).

D. Gasoline

Answer: A::B::C

View Text Solution

15. Which of the following is a characteristic property of both mixtures and compounds?

A. Their proporties are same as those of their components .

B. Energy is released when they are formed.

C. Their masses are equal to the sum of the masses of their components.

D. They contain the components in fixed proportions.

Answer: C

View Text Solution

16. Which of the following processes results in the formation of a new compound?

A. Dissolving common salt in water

B. Heating water

C. Heating platinum rod

D. Heating iron rod

Answer: D

View Text Solution

17. Which one of the following is not a chemical change?

A. Sublimation

B. Combustion

C. Electrolysis

D. Rusting

Answer: A::B::C

View Text Solution

18. The law of multiple proportions is illustrated by the pair of compounds.

A. sodium chloride and sodium bromide

B. water and heavy water

C. sulphur dioxide and sulphur trioxide

D. magnesium hydroxide and magnesium oxide.

Answer: C

View Text Solution

19. In compound A,1,.0g nitrogen combines with 0.57g oxygen. In compound B,2.0g nitrogen unite with 2.24 g oxygen and in compound Cdd, 3.0g nitrogen combine with 5.11g oxygen. These results obey the law of:

A. multiple proportions

B. constant proportions.

C. reciprocal proportions

D. none of these.

Answer: A

View Text Solution

20. Which one is the best example of law of conservation of mass?

A. 6g of carbon is heated in vacuum, there is no change in mass.

B. 6g of carbon combines with 16g of oxygen to form 22g of CO_2.

C. 6g water is completely converted into steam.

D. A sample of air is heated at constant pressure when its volume increases but there is not change in mass.

Answer: B

View Text Solution

21. A chemical equation is balanced according to the law of:

A. multiple proportions

B. constant proportions

C. reciprocal proportions

D. conservation of mass.

Answer: D

View Text Solution

22. SO_2 gas was prepared by (i) burning sulphur in oxygen, (ii) reacting sodium sulphite with dilute H_2SO_4 and (iii) case sulphur and oxygen combined in the ratio of 1:1. the data illustrates the law of:

A. conservation of mass

B. multiple proportions

C. constant proportions

D. reciprocal proportions

Answer: C

View Text Solution

23. A sample of $CaCO_3$ has $Ca = 40\,\%$, $C = 12\,\%$ and O=48% . If the law of constant proportions is true, then the mass of Ca in 5g of $CaCO_3$ from another source will be:

A. 2.0g

B. 0.2g

C. 0.02g

D. 20.0g

Answer: A

View Text Solution

24. Potassium combines with two isotopes of chlorine $\left(.^{35}Cl \text{and}.^{37}Cl\right)$ respectivel to form two samples of KCl. Their formation follows the law of:

A. constant proportions

B. multiple proportions

C. reciprocal proportions

D. none of these.

Answer: D

View Text Solution

25. Different proportions of oxygen in the various oxides of nitrogen, prove the law of

A. reciprocal proportions

B. multiple proportions

C. constant proportions

D. conservation of mass.

Answer: B

View Text Solution

26. One part of an element A combines with two parts of B (another element). Six parts of element C combine with four parts of elementB. If A and C combine together, the ratio of their masses will be governed by

A. law of definite proportions

B. law of multiple proportions

C. law of reciprocal proportions

D. law of conservation of mass

Answer: C

View Text Solution

27. H_2S contains 5.88% hydrogen, H_2O contains 11.11% hydrogen while SO_2 contains 50% sulphur. These figures illustrate the law of :

A. conservation of mass

B. constant proportions

C. multiple proportions

D. reciprocal proportions

Answer: D

View Text Solution

28. Number of atoms in 4.25 g of NH_3 is:

A. 6.023×10^{23}

B. $4 \times 60.23 \times 10^{23}$

C. 1.7×10^{24}

D. $4.5 \times 6.023 \times 10^{23}$

Answer: A

View Text Solution

29. Hydrogen combines with chlroine to form HCl. It also combines with sodium to form NaH. If sodium and chlorine also combine with each other, they will do so in the ratio of their masses as:

A. 23 : 35.5

B. 35.5 : 23

C. $1:1$

D. $23:1$

Answer: A

View Text Solution

30. Zinc sulphate contains 22.65% n and 43.9% H_2O . If the law of constant proportions is true, then the mass of zinc required to give 40 g crystals will be:

A. 90.6g

B. 9.06g

C. 0.906g

D. 906g

Answer: B

View Text Solution

31. 3 g of a hydrocarbon on combustion in excess of oxygen produces 8.8g of CO_2 and 5.4 g of H_2O. The data illustrates the law of:

A. conservation of mass

B. multiple proportions

C. constant proportions

D. reciprocal proportions

Answer: A

View Text Solution

32. In the reaction $N_2 + 3H_2 \rightarrow 2NH_3$. The ratio of volumes of nitrogen, hydrogen and ammonia is 1:3:2. these figures illustrate the law of:

A. constant proportions

B. Gay-Lussac

C. multiple proportions

D. reciprocal proportions

Answer: B

View Text Solution

33. Two volumes of ammonia, on dissociation gave one volume of nitrogen and three volumes of hydrogen. How much hydrogen will be obtained from the dissociation of 10 litre of NH_3?

A. 30 litre

B. 10 litre

C. 15 litre

D. 20 litre.

Answer: C

View Text Solution

34. If 6 litre of H_2 of Cl_2 are mixed and exploded in an eudiometer, the volume of HCl formed is:

A. 6.0 litre

B. 5.6litre

C. 11.2 litre

D. 11.6 litre

Answer: C

View Text Solution

35. The law of constant proportions was enunciated by:

A. Dalton

B. Berthelot

C. Avodadro

D. Proust.

Answer: D

View Text Solution

36. An important postulate of Dalton's atomic theory is

A. an atom contains electrons, protons and neutrons

B. atom can neither be created nor destroyed nor divisible

C. all the atoms of an element are not identical

D. all the elements are available in nature in the form of atoms.

Answer: B

View Text Solution

37. Which one of the following relationship is correct?

A. At. Mass $= 6.4 \times$ Sp.heat

B. At.mass $\times$ Sp.heat $= 6.4$

C. At. Mass $\times 6.4 =$ Sp.heat

D. AT. Mass $\times$ Sp. Heat $\times 6.4 = 1$

Answer: B

View Text Solution

38. $A_1 g$ of an element gives $A_2 g$ of its oxide. The equivalent mass of the element is:

A. $\frac{A^2 - A_1}{A_1} \times 8$

B. $\frac{A_2 - A_1}{A_2} \times 8$

C. $\frac{A_1}{A_2 - A_1} \times 8$

D. $\left(A_2 - A_1\right) \times 8$

Answer: C

View Text Solution

39. $A_1 g$ of an element gives $A_2 g$ of its chloride, the equivalent mass of the element is:

A. $\frac{A_1}{A_2 - A_1} \times 35.5$

B. $\frac{A_2}{A_2 - A_1} \times 35.5$

C. $\frac{A_2 - A_1}{A_1} \times 35.5$

D. $\frac{A_2 - A_1}{A_2} \times 35.5$

Answer: A

View Text Solution

40. Which one of the relationship is wrong?

A. 2V.D.=Mol. Mass

B. At. Mass=Eq. mass $\times$ Valency

C. all the atoms of an element are not identical

D. Valency $= \frac{\text{Mass.mass}}{\text{Eq.mass}}$

Answer: D

View Text Solution

41. In $m_1 g$ of a metal A displaces $m_2 G$ of another metal B from its salt solution and if their equivalent masses are E_1 and E_2 respectively, then the equivalent mass of A can be expressed as:

A. $E_1 = \frac{m_2 \times E_2}{m_1}$

B. $E_1 = \frac{m_1}{m_2} \times E_2$

C. $E_1 = \frac{m_1 \times m_2}{E_2}$

D. $E_1 = \sqrt{\frac{m_1}{m_2} \times E_2}$

Answer: B

View Text Solution

42. When the specific heat of a metallic element is 0.214 cal g^{-1} the atomic mass will be closed to which one of the following?

A. 1

B. 12

C. 30

D. 66

Answer: C

View Text Solution

43. Approximate atomic mass of an element is 26.89. if its equivalent mass is 8.9. th exact mass of the element is:

A. 29.89

B. 8.9

C. 17.8

D. 26.7

Answer: D

View Text Solution

44. When an element forms an oxide in which oxygen is 20% of the oxide by mass, the equivalent mass of the element will be:

A. 32

B. 40

C. 60

D. 128

Answer: A

View Text Solution

45. 0.32g of a metal gave on treatment with an acid 112mL. Of hydrogen at NTP. Calculate equivalent mass of the metal:

A. 58

B. 32

C. 11.2

D. 24

Answer: B

View Text Solution

46. 74.5g of a metallic chloride contains 35.5 g of chlorine . The equivalent mass of the metal is:

A. 19.5

B. 35.5

C. 39

D. 78

Answer: C

View Text Solution

47. The procut of atomic mass and specific heat of any element is a constant, approximately 6.4. this is known as:

A. Dalton's law

B. Avogadro's law

C. Gay-Lussac's law

D. Dulong Pett's law.

Answer: D

View Text Solution

48. The molecular mass of chloride MCl, is 74.5 . The equivalent mass of the metal M will be

A. 39

B. 74.5

C. 110

D. 35.5

Answer: A

View Text Solution

49. 1 g of hydrogen is found to combine with 80g of bromine 1 g of calcium combines with 4 g of bromine. The equivalent. Mass of calcium is:

A. 10

B. 20

C. 40

D. 80

Answer: B

View Text Solution

50. 28g of iron displace 3.2 g of copper from a solution of copper sulphate. If the equivalent mass of iron is 28, the equivalent mass of copper will be:

A. 16

B. 32

C. 48

D. 64

Answer: B

View Text Solution

51. The specific heat of a metal of atomic mass 32 is likely has a vapour density 59.25. the valency of the element will be:

A. 0.25

B. 0.24

C. 0.2

D. 0.15

Answer: C

View Text Solution

52. The equivalent mass of an element is 4. its chloride has a vapour density 59.25. the valency of the element will be

A. 4

B. 3

C. 2

D. 1

Answer: B

View Text Solution

53. the equivalent mass of iron in the reaction.

$3Fe + 4H_2O \rightarrow Fe_2O_4 + 4H_2$ would be:

A. 21

B. 56

C. 42

D. 10

Answer: A

View Text Solution

54. The specific heat of a bivalent metal is 0.16. the approximate equivalent mass of the metal will be:

A. 40

B. 20

C. 80

D. 10

Answer: B

View Text Solution

55. A sample of pure calcium weighing 1.35g was quantitatively converted to 1.88g of pure calcium oxide. Atomic mass of calcium would be:

A. 20

B. 40

C. 16

D. 35.5

Answer: B

View Text Solution

56. A metal oxide is reduced by heating it in a stream of hydrogen it is found that after complete reduction, 3.15 g of the oxide have yielded 1.05 g of the metal. We may conclude that:

A. atomic mass of the metal is 4

B. atomic mass of the metal is 8

C. equivalent mass of the metal is 4

D. equivalent mass of the metal is 8

Answer: C

View Text Solution

57. Compound with identical crystal structure and analogous chemical formula are called:

A. isomers

B. isotones

C. allotropes

D. isomorphous

Answer: D

View Text Solution

58. Which pair of the following substances is said to be isomorphous?

A. White vitriol and blue vitriol

B. Epsom salt and Glauber salt

C. Blue vitriol and Glauber salt

D. White vitriol and epsom salt.

Answer: D

View Text Solution

59. Atomic mass of chlorine is 35.5. it has two isotopes of atomic mass 35 and 37. the percentage of heavier isotope is:

A. 10

B. 15

C. 20

D. 25

Answer: D

View Text Solution

60. Atomic mass of boron is 10.81. it has two isotopes with 80% and 20% abundance respectively. The atomic mass of the isotope having 80%

abundance is 11.01. the atomic mass of the other isotope is:

A. 1081

B. 11.01

C. 10.01

D. 21.82

Answer: C

View Text Solution

61. 71 g of chlorine combines with a metal giving 111g of its chloride. The chloride is isomorphous with $MgCl_2 : 6H_2O$. The atomic mass of the metal is:

A. 20

B. 30

C. 40

D. 69

Answer: C

View Text Solution

62. The vapour density of a volatile chloride of a metal is 59.5 and the equivalent mass of the metal is 24. the atomic mass of the element will be:

A. 96

B. 48

C. 24

D. 12

Answer: B

View Text Solution

63. The oxide of an element possesses the molecular formula, M_2O_3. If the equivalent mass of the metal is 9, the atomic mas sof the metal will be:

A. 27

B. 18

C. 9

D. 4.5

Answer: A

View Text Solution

64. The density of air is 0.001293 gmL^{-1}. Its vapour density is:

A. 143

B. 14.3

C. 1.43

D. 0.143

Answer: B

View Text Solution

65. M g of a substance when vaporised occupy a volume of 5.6 litre at NTP. The molecular mass of the substance will be

A. M

B. 2M

C. 3M

D. 4M

Answer: D

View Text Solution

66. The vapour densities of two gases are in the ratio of 1:3. Their molecular masses are in the ratio of:

A. $1:3$

B. $1:2$

C. $2:3$

D. $3:1$

Answer: A

View Text Solution

67. An organic compound of two gases are in the ratio of 1:3 Their molecular masses are in the ratio is:

A. 200

B. 2000

C. 20000

D. 200000

Answer: D

View Text Solution

68. The atomic mass of an element is 27. if valency is 3, the vapour density of the volatile chloride will be:

A. 66.75

B. 6.675

C. 667.5

D. 81

Answer: A

View Text Solution

69. The density of a gas 'A' is three timess that of a gas 'B' if the molecular mass of A is M, the molecular mass of B is:

A. 3M

B. M/3

C. $\sqrt{3}M$

D. $(M)\sqrt{3}$

Answer: B

View Text Solution

70. Vapour density of a volatile of a volatile substance is 4 in comparison to methane $\left(CH_4 = 1\right)$. Its molecular mass will be:

A. 8

B. 2

C. 64

D. 128

Answer: C

View Text Solution

71. Which of the following has the smallest number of molecules?

A. $22.4 \times 10^3 mL of CO_2$ gas

B. 22g of CO_2 gas

C. 11.2 litre of CO_2 gas

D. 0.1 mole of CO_2 gas

Answer: D

View Text Solution

72. The number of grams of H_2SO_4 present in 0.25 mole of H_2SO_4 is:

A. 0.245

B. 2.45

C. 24.5

D. 49.0

Answer: C

View Text Solution

73. Number of molecules in 1 litre of oxygen at NTP is:

A. $\frac{6.02 \times 10^{23}}{32}$

B. $\frac{6.02 \times 10^{23}}{22.4}$

C. 32×22.4

D. $\frac{32}{22.4}$

Answer: B

View Text Solution

74. What amount of dioxygen (in gram) contains 1.8×10^{22} molecules?

A. 9.6

B. 0.096

C. 96.0

D. 0.960

Answer: D

View Text Solution

75. The number of molecules in 89.6 litre of a gas at NTP are:

A. 6.02×10^{23}

B. $2 \times 6.02 \times 10^{23}$

C. $3 \times 6.02 \times 10^{23}$

D. $4 \times 6.02 \times 10^{23}$

Answer: D

View Text Solution

76. The toal number of protons in 10g of calcium carbonate is

A. 3.015×10^{24}

B. 1.5057×10^{24}

C. 2.0479×10^{24}

D. 4.0956×10^{24}

Answer: A

View Text Solution

77. 19.7kg of gold was recovered from a smulggler. The atoms of gold recovered are: (Au=197)

A. 100

B. 6.02×10^{23}

C. 6.02×10^{24}

D. 6.02×10^{25}

Answer: D

View Text Solution

78. The molecular mass of CO_2 is 44 amu and Avogadro's number is 6.02×10^{23}. Therefore, the mass of one molecule of CO_2 is:

A. 7.31×10^{-23}

B. 3.65×10^{-23}

C. 1.01×10^{-23}

D. 2.01×10^{-23}

Answer: A

View Text Solution

79. Equal volumes of different gases at any definite tempearture and pressure have:

A. equal weights

B. equal masses

C. equal densities

D. equal number of moles

Answer: D

View Text Solution

80. A gaseous mixture contains oxygen and nitrogen in the ratio of 1:4 by mass. Therefore , the ratio of their number of molecules is:

A. $1:4$

B. $1:8$

C. $7:32$

D. $3:16$

Answer: C

View Text Solution

81. 23 g of sodium will react with ethyl alcohol to give:

A. one mole of hydrogen

B. one mole of oxygen

C. one mole of NaOH

D. 1/2 mole of hydrogen.

Answer: D

View Text Solution

82. The mass of an atom of carbon is:

A. 1g

B. $1.99 \times 10^{-23} g$

C. $1/12 g$

D. $1.99 \times 10^{23} g$

Answer: B

View Text Solution

83. If a mole was to contain 1.0×10^{24} particles, the mass of one mole of oxygen is:

A. 53.2g

B. 5.32g

C. 32.0g

D. 16.0g

Answer: A

View Text Solution

84. Four flasks of 1 litre capacity each are separately filled with gases H_2, He, O_2 and O_3. At the same tempearture and present the ratio of the number of atoms of these gases present is different flasks would be:

A. $1:1:1:1$

B. $2:1:2:3$

C. $1:2:1:3$

D. $3:2:2:1$

Answer: B

View Text Solution

85. At room tempearture and pressure, two flasks of equal volumes are filled with H_2 and SO_2 separately. Particles which are equal in number, in the two flasks are:

A. atoms

B. electrons

C. molecules

D. neutrons

Answer: C

View Text Solution

86. Volume of a mixture of 6.02×10^{23} oxygen atoms and 3.01×10^{23} hydrogen molecules at NTP is:

A. 28.0litre

B. 33.6litre

C. 11.2 litre

D. 22.4 litre

Answer: D

View Text Solution

87. The number of molecular present in a drop of water, if its volume is 0.05mL, are:

A. 1.66×10^{21}

B. 1.66×10^{22}

C. 1.66×10^{23}

D. 1.66×10^{23}

Answer: A

View Text Solution

88. A compound was found to contain nitrogen and oxygen in the ratio nitrogen 28g and oxygen 80 g. the formula of the compound is:

A. NO

B. N_2O_3

C. N_2O_5

D. N_2O_4

Answer: C

View Text Solution

89. The simplext formula of a compound containng 50% of element X (At. Mass=75) and Y(At. Mass=16) combine to give a compound having 75.8% of X. the formula of the compound is:

A. XY

B. X_2Y

C. X_2Y_2

D. X_2Y_3

Answer: B

View Text Solution

90. Two element X (At.mass=75)and Y (At. Mass=16) combine to give a compound having 75.8% of X. the formula of the compound is:

A. XY

B. X_2Y

C. X_2Y_2

D. X_2Y_3

Answer: D

View Text Solution

91. One analysis a certain compound was found to contain iodine and oxygen in the ratio of 254:80. the formula of the compound is: (At. Mass of 1=127,O=16)

A. IO

B. I_2O

C. I_5O_2

D. I_2O_5

Answer: D

View Text Solution

92. A compound of aluminium and chlorine is composed of 9.0g Al for every 35.5 g of chlorine. The empirical formula of the compound is:

A. AlCl

B. $AICl_3$

C. $AICl_2$

D. $AICl_4$

Answer: B

View Text Solution

93. The haemoglobin from red corpuscles of most mammels contain approximately 0.33% of iron by mass. The molecular mass of haemoglobin is 67200. the number of iron atoms in each molecule of haemoglobin is:

A. 4

B. 3

C. 2

D. 1

Answer: A

View Text Solution

94. The percentage of P_2O_5 in diammonium hydrogen phosphate $\left[\left(NH_4\right)_2HPO_2\right]$ is

A. 23.48

B. 46.96

C. 53.78

D. 71

Answer: C

View Text Solution

95. The percentage of nitrogen in urea $\left(NH_2CONH_2\right)$, is:

A. 38.4

B. 46.6

C. 59.1

D. 61.3

Answer: B

View Text Solution

96. The chloride of a metal has the formula MCl_3. The formula its phosphate is:

A. M_2PO_4

B. MPO_4

C. M_3PO_4

D. $M\left(PO_4\right)_2$

Answer: B

View Text Solution

97. 10g of hydrofluoric acid gas occupies 5.6 litre of volume at NTP. If the empirical of the gas is HF, then its molecular formula will be: (At. Mass of F=19)

A. HF

B. H_3F_3

C. H_2F_2

D. H_4F_4

Answer: C

View Text Solution

98. Calcium pyrophosphate is represented by the formula $Ca_2P_2O_7$. The molecular formula of ferric pyrophosphate is:

A. $Fe_2P_2O_7$

B. FeP_2O_7

C. $Fe\left(P_2O_7\right)_3$

D. $Fe_4\left(P_2O_7\right)_3$

Answer: D

View Text Solution

99. The percentage of available chlorine in a sample of bleaching powder, $CaOCl_2, 2H_2O$, is:

A. 30

B. 50

C. 43.5

D. 59.9

Answer: C

View Text Solution

100. SI unit of energy is:

A. kgm^2s^{-2}

B. $kgm^{-1}s^2$

C. kgm^2s^{-1}

D. kgm^2s^2

Answer: A

View Text Solution

101. Significant figures in 0.00051 are:

A. 5

B. 3

C. 2

D. 4

Answer: C

View Text Solution

102. The number of significant figures in 6.02×10^{23} is

A. 23

B. 3

C. 4

D. 26

Answer: B

View Text Solution

103. Express 0.006006 into scientific notation in three significant digits:

A. 6.01×10^{-3}

B. 6.006×10^{-3}

C. 6.00×10^{-3}

D. 6.0×10^{-3}

Answer: A

View Text Solution

104. The proper value of significant figures in 38.0+0.0035 +0.00003 is:

A. 38

B. 38.0035

C. 38.00353

D. 38

Answer: D

View Text Solution

105. Which of the following is the correct unit for measuring nuclear radii?

A. Micron

B. Millimetre

C. Angstrom

D. Ferni

Answer: D

View Text Solution

106. In order to prepare 1 litre normal solution of $KMnO_4$, how many grams of $KMnO_4$ are required if the solution is to be used in acid medium for oxidation?

A. 158g

B. 31.6g

C. 62g

D. 790g

Answer: B

View Text Solution

107. 3g of an oxide of a metal is converted to chloride completely and it yields 5g chloride. The equivalent weight of metal is:

A. 33.25

B. 3.325

C. 12

D. 20

Answer: A

View Text Solution

108. Number of atoms 558.5g Fe (At. Wt. of Fe=55.85g mol^{-1}) is:

A. twice that in 60 g carbon

B. 6.023×10^{23}

C. half that of 8 g He

D. $55.5 \times 6.023 \times 10^{23}$

Answer: A

View Text Solution

109. The prefix 10^{18} is:

A. giga

B. exa

C. kilo

D. nano

Answer: B

View Text Solution

110. Difference in density is the basis of:

A. ultra filtration

B. molecular sieving

C. gravity separation

D. molecular attraction.

Answer: C

View Text Solution

111. Irrespective of the source, pure sample of water always yeilds 88.89% mass of oxygen and 11.11% mass of hyrdogen . This is explained by the law of:

A. conservation of mass

B. constant composition

C. multiple proportions

D. constant volume.

Answer: B

View Text Solution

112. How many moles of electron weigh one kilogram?

A. 6.023×10^{23}

B. $\frac{1}{9.108} \times 10^{31}$

C. $\frac{6.023 \times 10^{54}}{9.108}$

D. $\frac{1}{9.108 \times 6.023} \times 10^{8}$

Answer: D

View Text Solution

113. Give the numbers: 161 cm,0.161 cm:0161 cm . The number of significant figure for three numbers is:

A. 3,4,5

B. 3,3,3

C. 3,3,4

D. 3,4,4

Answer: B

View Text Solution

114. Which one of the following laws directly explains the law of conservation of mass?

A. Hund's rule

B. Dalton's law

C. Avogadro's law

D. Berzelius hypothesis

Answer: C

View Text Solution

115. Which has maximu number of atoms?

A. 24g C(12)

B. 56g Fe(56)

C. 27g Al(27)

D. 108g Ag(108)

Answer: A

View Text Solution

116. How much of sulphur is present in an organic compound, if 0.53g compound gave 1.158g of $BaSO_4$ analysis?

A. 0.1

B. 0.15

C. 0.2

D. 0.25

Answer: C

View Text Solution

117. If 30mL of H_2 and 20mL of O_2 react to form form water, what is left at the end of the reaction?

A. 10mL of H_2

B. 5 mL of H_2

C. 10mL of O_2

D. 5 mL of O_2

Answer: A

View Text Solution

118. How many water molecules are there in a drop of volume 0.05mL? (Density of water is 1g/mL)

A. 1.67×10^{21}

B. 1.67×10^{22}

C. 1.67×10^{23}

D. 1.67×10^{24}

Answer: C

View Text Solution

119. A sample of PCl_3 contains 1.4 mole of the substance. How many atoms are there in the sample?

A. 4

B. 5.6

C. 8.431×10^{23}

D. 3.372×10^{24}

Answer: D

View Text Solution

120. The equivalent weight of phosphoric acid H_3PO_4 in the reaction, $NaOH + H_3PO_4 \rightarrow NaH_2PO_4 + H_2O$ is:

A. 59

B. 49

C. 25

D. 98

Answer: D

View Text Solution

121. 5.6 g of an organic compound on burning with excess of oxygen gave 17.6g of CO_2 and 7.2 gH_2O. The organic compound is:

A. C_6H_6

B. C_4H_8

C. C_3H_8

D. CH_3COOH

Answer: B

View Text Solution

122. The decomposition of a certain mass of $CaCO_3$ gave 11.2 dm^3 of CO_2 gas at STP. The mass of KOH required to completely neutralise the gas is:

A. 56g

B. 28g

C. 42g

D. 20g

Answer: B

View Text Solution

123. How many moles of magnesium phosphate, $Mg_3\left(PO_4\right)_2$, will contains 0.25 mole ofoxygen atoms?

A. 0.02

B. 3.125×10^{-2}

C. 1.25×10^{-2}

D. 2.5×10^{-2}

Answer: B

View Text Solution

124. An element X has the following isotopic composition,

.^{200}X : 90 %

.^{199}X : 8 %

.^{2002}X : 2 %

the weighted average atomic mass of the naturally-occurring element 'X' is closed to:

A. 201amu

B. 202amu

C. 199amu

D. 200amu

Answer: D

View Text Solution

125. The incorrect statement for 14 g CO is:

A. It occupies 2.24L at NTP

B. It corresponds to $\frac{1}{2}$ mole of CO

C. It corresponds to same mole of CO and N_2.

D. It corresponds to 3.01×10^{23} molecules of CO

Answer: A

View Text Solution

126. The number of hydrogen atoms present in 25.6 g of sucrose $\left(C_{12}H_{22}O_{11}\right)$ which has a molar mass of 342.3 g is:

A. 22×10^{23}

B. 9.91×10^{23}

C. 11×10^{23}

D. 44×10^{23}

Answer: B

View Text Solution

127. Volume occupied by one molecule of water (density $=1g/cm^3$) is:

A. $3 \times 10^{-23} cm^3$

B. $5.5 \times 10^{-23} cm^3$

C. $9 \times 10^{-23} cm^3$

D. $6.023 \times 10^{-23} cm^3$

Answer: A

View Text Solution

128. 80g of oxygen contians as many atoms as in:

A. 10 g of hydrogen

B. 5g of hydrogen

C. 80g of hydrogen

D. 1g of hydrogen

Answer: B

View Text Solution

129. A plant virus consists of uniform cylindrical particles of 150 $\overset{\circ}{A}$ in diamter and $5000\overset{\circ}{A}$ long. The specific volume of virus is 0.75 cm^3/g. if the virus is considered to be a single particle, its molecular mass is:

A. $7.09 \times 10^7 g\text{mol}^{-1}$

B. $7.90 \times 10^7 g\text{mol}^{-12}$

C. $9.07 \times 10^7 g\text{mol}^{-1}$

D. $9.70 \times 10^7 g\text{mol}^{-1}$

Answer: A

View Text Solution

130. Common salt obtained from sea-water contains 95% NaCl by mass. The approximate number of molecules present in 10g salt is:

A. 10^{21}

B. 10^{22}

C. 10^{23}

D. 10^{24}

Answer: C

View Text Solution

131. 10g hydrogen and 64 g oxygen were filled in a steel vessel and exploded, Amoung of water produced in this reaction will be

A. 3 mol

B. 4 mol

C. 1 mol

D. 2 mol

Answer: B

View Text Solution

132. An organic compound made of C , H and N contains 20% nitrogen. What will be its molecular mass if it contains only one nitrogen atom in it?

A. 70

B. 140

C. 100

D. 65

Answer: A

View Text Solution

133. Given that the abundances of isotopes $.^{54}Fe, .^{56}Fe$ and $.^{57}Fe$ are 5%,90% and 5% respectively, the atomic mass of Fe is:

A. 55.85u

B. 55.95u

C. 55.75u

D. 56.05u

Answer: B

View Text Solution

134. The number of atoms in 0.1 mol triatomic gas is: $\left(N_A = 6.02 \times 10^{23} \text{mol}^{-1}\right)$

A. 6.026×10^{22}

B. 1.806×10^{23}

C. 3.6×10^{23}

D. 1.8×10^{22}

Answer: B

View Text Solution

135. Which of the following quantities has the least number of significant digits?

A. 0.8076

B. 0.08765

C. 5.7423×10^2

D. 80.760

Answer: B

View Text Solution

136. Prefix giga means:

A. 10^{-9}

B. 10^9

C. 10^66

D. 10^{-6}

Answer: B

View Text Solution

137. Calculate the massof oxygen obtained by complete decomposition of 10kg of pure potassium chlorate (Atomic mass K=39,O=16 and Cl=35.5).

A. 39.2kg

B. 392kg

C. 3.92kg

D. 3kg

Answer: C

View Text Solution

138. In the DNA of E coli, the mole ratio of adenine to cytosine is 0.7. if the number of moles of adenine in the DNA is 350000, the number of moles of guanine is equal to:

A. 35000

B. 500000

C. 225000

D. 700000

Answer: B

View Text Solution

139. A gaseous hydrocarbon given upon combustion, 0.72g water and 3.08g of CO_2. The empirical formula of the hydrocarbon is:

A. C_6H_5

B. C_7H_8

C. C_2H_4

D. C_3H_4

Answer: B

View Text Solution

140. The ratio of masses of oxygen and nitrogen in a particular gaseous mixture is 1:4. the ratio of number of their molecules is:

A. $1:8$

B. $3:16$

C. $1:4$

D. $7:32$

Answer: D

View Text Solution

141. 3.011×10^{22} atoms of an element weighs 1:15gm. The atomic mass of the element is:

A. 23

B. 10

C. 16

D. 35.5

Answer: A

View Text Solution

142. A carbon compound contains 12.8% of carbon, 2.1% of hydrogen and 85.1% bromine . The molecule mass of compound is 187.9. calculate the molecular formula of the compound (Atomic mass H=1.008,C=12,Br=79.9)

A. CH_3Br

B. CH_2Br_2

C. $C_2H_4Br_2$

D. $C_2H_3Br_3$

Answer: C

View Text Solution

143. At 300 K and 1 atm, 15mL of a gaseous hydrocarbon requires 375mL air containing 20% O_2 by volume for complete combustion. After combination the gases occupy 330 mL. Assuming that the water formed isin liquid form and the volumes were measured at the same temperature and pressure. the formula of the hydrocarbon is:

A. C_3H_6

B. C_3H_8

C. C_4H_8

D. C_4H_{10}

Answer: B

View Text Solution

144. The most abundant elements by mass in the body of a healthy human adult are:

Oxygen (61.4%), carbon (22.9%), hydrogen (10.0%) and Nitrogen (2.6%)

the weight which a 75 kg person would gain if all $.^{1}H$ atoms are replaced by $.^{2}H$ atoms is

A. 15kg

B. 37.5kg

C. 7.5kg

D. 10kg

Answer: C

View Text Solution

145. If 3.01×10^{20} molecules of H_2SO_4 are removed from 98mg of H_2SO_4. Then number of moles of H_2SO_4 left are:

A. 0.1×10^{-3} mol

B. 0.5×10^{-3} mol

C. 1.66×10^{-3} mol

D. 9.95×10^{-2} mol

Answer: B

View Text Solution

146. 1g of Mg is burnt with 0.28g of O_2 in a closed vessel. Which reactant is left in excess and how much?

A. Mg,5.8g

B. Mg,0.58g

C. O_2, $0.24g$

D. $O_2, 2.4g$

Answer: B

View Text Solution

SET-2

1. Which of the following relationships are wrong?

A. 1atm=0.1bar

B. 1litre=1 dm^3

C. 1J=0.239cal

D. 1eV=9.11×10^{-4}J

Answer: A::D

View Text Solution

2. Which of the following numbers have same significant figures?

A. 0.06

B. 0.6

C. 6

D. 60

Answer: A::B::C::D

View Text Solution

3. Which of the following have the same mass?

A. 0.1 mole of O_2 gas

B. 0.1 mole of SO_2 gas

C. 6.023×10^{22} molecules of SO_2 gas

D. 1.204×10^{23} molecules of O_2 gas

Answer: B::C

View Text Solution

4. Select the numbers with same significant figures:

A. 6.02×10^{23}

B. 0.25

C. 6.60×10^{-34}

D. 1.50

Answer: A::C::D

View Text Solution

5. Which are isomorphic to each other?

A. $CuSO_4 : 5H_2O$

B. $ZnSO_4 : 7H_2O$

C. $FeSO_4.7H_2O$

D. $FeSO_4.8H_2O$

Answer: B::C

View Text Solution

6. 11.2L of a gas at STP weighs 14g. The gas could be

A. N_2

B. CO

C. NO_2

D. N_2O

Answer: A::B::C::D

View Text Solution

7. $8gO_2$ has same number of molecules as that in:

A. 14g CO

B. 7g CO

C. 11g CO_2

D. 22g CO_2

Answer: B::C

View Text Solution

LEVEL B set1

1. Study the following table:

Compound	Mass of the compound
$CO_2(44)$	4.4
$NO_2(46)$	2.3
$H_2O_2(34)$	6.8
$SO_2(64)$	1.6

Which two compounds have least mass of oxygen? (Molercular masses of compounds are given in brackets.

A. II nd II

B. I and III

C. I and II

D. III and IV

Answer: A

View Text Solution

2. The phosphate of a certain metal M is $M_3\left(PO_4\right)_2$. The correct formula of metal sulphate would be:

A. $M_2\left(SO_4\right)_3$

B. MSO_4

C. $M_3\left(SO_4\right)_2$

D. M_2SO_4

Answer: B

View Text Solution

3. The percentage of Se in peroxidase enzyme is 0.5% by mass (atomic mass of Se=78.4 amu). Then, the minimum molecular mass of enzyme which contains not more than one Se atom is:

A. 1.568×10^4 amu

B. 1.568×10^7 amu

C. 1.568×10^3 amu

D. 1.568×10^6 amu

Answer: A

View Text Solution

4. The number of moles of a gas 1 m^3 of volume at NTP is:

A. 4.46

B. 0.446

C. 1.464

D. 44.6

Answer: D

View Text Solution

5. The total number of electrons present in 18mL. Water(density 1g/mL) is:

A. 6.023×10^{23}

B. 6.023×10^{24}

C. 6.023×10^{25}

D. 6.023×10^{21}

Answer: B

View Text Solution

6. What is the empirical formula of vanadium oxide if 2.74 g of metal oxide contains 1.53g of metal?

A. V_2O_3

B. VO

C. V_2O_5

D. V_2O_7

Answer: C

View Text Solution

7. Number of moles of electrons in 4.2g of N^{3-} ion (nitride ion) is:

A. 3

B. 2

C. 1.5

D. 4.2

Answer: A

View Text Solution

8. The ratio of volumes occupied by 1 mole O_2 and 1 mole CO_2 under identical conditions of temperature and pressure is:

A. $1:1$

B. $1:2$

C. $1:3$

D. $2:1$

Answer: A

View Text Solution

9. The maximum amount of $BaSO_4$ that can be obtained on mixing 0.5 mole $BaCl_2$ with 1 mole H_2SO_4 is:

A. 0.5mol

B. 0.1mol

C. 0.15mol

D. 0.2mol

Answer: A

View Text Solution

10. If 10^{21} molecules are removed from 100mg CO_2. Then number of moles of CO_2 left are:

A. 6.10×10^{-4}

B. 2.8×10^{-3}

C. 2.28×10^{-3}

D. 1.36×10^{-2}

Answer: A

View Text Solution

11. The charge on one gram ion of Al^{3+} ion is:

A. $\frac{1}{27} N_A \times e$ coulomb

B. $\frac{1}{3} \times N_A \times e$ coulomb

C. $\frac{1}{9} N_A \times e$ coulomb

D. $3 \times N_A \times e$ coulomb

Answer: D

View Text Solution

12. The molar mass of N_2O as well as CO_2 is 44 g mol^{-1}. At $25\,^{\circ}C$ and 1 atm pressure. 1L N_2O contains n molecules of gas. The number of CO_2 molecules in 2L under same conditions will be:

A. n

B. 2n

C. $\frac{n}{2}$

D. $\frac{n}{4}$

Answer: B

View Text Solution

13. 5.85 g NaCl is dissovled in 1L water. The number of ions of Na^+ and Cl^- in 1 mL of this solution will be:

A. 6.02×10^{19}

B. 1.2×10^{22}

C. 1.2×10^{20}

D. 6.02×10^{20}

Answer: C

View Text Solution

14. A metal oxide has the formula X_2O_3. It can be reduced by hydrogen to give free metal and water. 0.1596g of metal oxide requires 6 mg of hydrogen for complete reduction . The atomic mass of metal in amu is:

A. 15.58

B. 155.8

C. 5.58

D. 55.8

Answer: D

View Text Solution

15. Phosphine $\left(PH_3\right)$ decomposes to produce vapours of phosphorus and H_2 gas. What will be the change in volume when 100mL of phosphine is decomposed?

A. $+50mL$

B. $500mL$

C. $+75mL$

D. $-500mL$

Answer: C

View Text Solution

16. If mass of neutron is assumed to half of its original value. Whereas that of proton is assumed to be twice of its original value, then the atomic mass of ${}_{6}^{14}C$ will be:

A. same

B. 14.28% more

C. 14.28% less

D. 28.56% less

Answer: B

View Text Solution

17. The mass and charge of 1 mole electrons will be:

A. 1kg,96500C

B. 0.55mg: 96500C

C. 1.55mg:96500C

D. 5.5mg 96500C

Answer: B

View Text Solution

18. The Simplest formula of the compound containing 50% X (Atomic mass 10 amu) and 50% Y(Atomic mass 20amu) is:

A. XY_2

B. X_2Y

C. X_2Y_3

D. XY_3

Answer: B

View Text Solution

19. Rest mass of 1 mole neutrons $\left(m_n = 1.675 \times 10^{-27} kg\right)$ is:

A. $1.8 \times 10^{-3} kg$

B. $1.008 \times 10^{-4} kg$

C. $1.08 \times 10^{-3} kg$

D. $1.008 \times 10^{-3} kg$

Answer: D

View Text Solution

20. Loschmidt number is the number of:

A. molecules present in 1 mL of a gas at STP

B. molecules present in 1 gram mole of a gas at STP

C. atoms present in 1mL of a gas at STP

D. atoms present in 1 gram mole of a gas at STP

Answer: A

View Text Solution

21. Which of the following statements is incorrect?

A. one gram mole of silver equals $\frac{108}{6.023} \times 10^{-23} g$

B. one mole of CH_4 and 17g of NH_3 at NTP occupy same volume

C. One mole AG weighs more than that of two moles of Ca

D. One gram mole of CO_2 is 6.023×10^{23} times heavier than one molecular of CO_2

Answer: A

View Text Solution

22. One atom of an element X weighs 6.664×10^{-23} gm. The number of gram atoms in 40kg of it is:

A. 10

B. 100

C. 10000

D. 1000

Answer: D

View Text Solution

23. The density of a liquid is 1.2g/mL. there are 35 drops in 2 mL The number of molecules in 1 drip is (molecular weight of liquid=70:

A. $\frac{1.2}{34}N_A$

B. $\left(\frac{1}{35}\right)^2 N_A$

C. $\frac{1.2}{(35)^2}N_A$

D. $1.2N_A$

Answer: C

View Text Solution

24. What volume of a liquid will contain 4 mole? Molar mass of liquid is 280 and its density is 1.4g/mL:

A. 0.4L

B. 1.6L

C. 0.8L

D. $4.8 \times 10^{23} L$

Answer: C

View Text Solution

25. The molar ratio of Fe^{2+} to Fe^{3+} in a mixture of $FeSO_4$ and $Fe_2\left(SO_4\right)_3$ having equal number of sulphate ions in both ferrous and ferric sulphates is:

A. 1 : 2

B. 3 : 2

C. 2 : 3

D. none of these.

Answer: B

View Text Solution

26. Number of electrons in 3.6mg of NH_4^+ are:

A. 1.2×10^{21}

B. 1.2×10^{20}

C. 1.2×10^{32}

D. 2×10^{-3}

Answer: A

View Text Solution

27. In the reaction $4A + 2B + 3C \rightarrow A_4B_2C_3$. What will be the number of moles of product formed, starting from one of

A. 0.25

B. 0.3

C. 0.24

D. 2.32

Answer: C

View Text Solution

28. 26.8gm of $Na_2SO_4nH_2O$ contains 12.6gm of water. The value of 'n' is:

A. 1

B. 10

C. 6

D. 7

Answer: D

View Text Solution

29. Consider the following data:

Element	Atomic weight
A	12.01
B	35.5

A and B combine to form a new substance X. if 4 moles of B combine with 1 mole of A to give 1 mole of X, then the weight of 1 mole of X is:

A. 154g

B. 74g

C. 47.5g

D. 160g

Answer: A

View Text Solution

30. How many moles of Na^+ ions are in 20mL of $0.4MNa_3PO_4$?

A. 0.008

B. 0.024

C. 0.05

D. 0.2

Answer: B

View Text Solution

31. The element whose one atom has mass of $10.86 \times 10^{-26} kg$ is:

A. boron

B. calcium

C. silver

D. zinc

Answer: D

View Text Solution

32. An electric discharge is passed through a containing 50cc of O_2 and 50cc of H_2. The volume of the gases formed

(i) at room temperature, (ii) at $110\ ^\circ C$ will be:

A. i 25 cc ii 50cc

B. i50cc ii 75cc

C. i 25cc ii 75cc

D. i 75cc ii 75cc

Answer: C

View Text Solution

33. The mass of carbon present in 0.5 mole of $k_4\left[Fe(CN)_6\right]$ is:

A. 1.8g

B. 18g

C. 3.6g

D. 36g

Answer: D

View Text Solution

34. Caffeine has a molecular weight of 194. if it contains 28.9% by mass of nitrogen. Number of atoms of nitrogen in one molecular of caffeine is:

A. 4

B. 6

C. 2

D. 3

Answer: A

View Text Solution

35. Chlorine can be prepared by reacting HCL with MnO_2. The reaction is represented by the equation.

$MnO_2(s) + 4HCl(aq) \rightarrow Cl_2(g) + MnCl_2(aq) + 2H_2O(l)$

Assuming that the reaction goes to completion, what mass of conc. HCl solution (36%HCl by mass) is needed to produce 2.5g Cl_2?

A. 5.15g

B. 14.3g

C. 19.4g

D. 26.4g

Answer: B

View Text Solution

36. What is the mass per cent of oxygen in $Al_2\left(SO_4\right)_3.18H_2O$? The molar mass of this substance is 666.43 g/mol:

A. 9.60

B. 28.8

C. 43.2

D. 72

Answer: D

View Text Solution

37. 0.25 g of an element 'M' reacts with excess fluorine to produce 0.547g of the hexafluoride MF_6. What is the element?gt

A. Cr

B. Mo

C. S

D. Te

Answer: B

View Text Solution

38. How many electron are present in 2×10^{-3} moles of ${}_{8}^{18}O^{2-}$?

A. 1.2×10^{21}

B. 9.6×10^{21}

C. 1.2×10^{22}

D. 1.9×10^{22}

Answer: C

View Text Solution

39. Fluorine reacts with uranium to form UF_6.

$U(s) + 3F_2(g) \rightarrow UF_6(g)$

How many fluorine molecules are required to produce 2 mg of UF_6 from an excess of uranium? The molar mass of UF_6 is 352 g mol^{-1}.

A. 3.4×10^{18}

B. 1×10^{19}

C. 2×10^{19}

D. 3.4×10^{21}

Answer: B

View Text Solution

40. What is the formula of a substance with mass percentage of 35.79% for S, 62.92% for O and 1.13% for H?

A. H_2SO_3

B. H_2SO_4

C. $H_2S_2O_7$

D. $H_2S_2O_8$

Answer: C

View Text Solution

41. In 1811, Avogadro calculated the formula of camphor by means of elemental chemical analysis and by measuring the density of its vapour. Avogadro found the density to be 3.84 g/L when he made the measurement at $210\,^{\circ}C$ at 1 atm pressure. Which of the following is the correct formula of camphor?

A. $C_{10}H_{14}O$

B. $C_{10}H_{16}O$

C. $C_{10}H_{16}O_2$

D. $C_{10}H_{18}O$

Answer: B

View Text Solution

42. A quantity of aluminium has a mass of 54g . What is the mass of same number of magnesium atoms?

A. 12.1g

B. 24.3g

C. 48.6g

D. 97.2g

Answer: C

View Text Solution

43. When 1 L of CO_2 is heated with graphite, the volume of the gases collected is 1.5L . Calculate the number of moles of CO produced at STP:

A. $\frac{1}{11.2}$

B. $\frac{28}{22.4}$

C. $\frac{1}{22.4}$

D. $\frac{14}{22.4}$

Answer: C

View Text Solution

44. Which of the following has greatest number of atoms?

A. 1g of butane $\left(C_4H_{10}\right)$

B. 1g of nitorgen $\left(N_2\right)$

C. 1 g of silver (Ag)

D. 1g of water $\left(H_2O\right)$

Answer: A

View Text Solution

45. A metal oxide has the formula M_2O_3. It can be reduced by H_2 to free metal and water. 0.1596g of M_2O_3 required 6 mg of H_2 for complete reduction. The atomic mass of the metal is:

A. 27.9

B. 79.8

C. 55.8

D. 159.8

Answer: C

View Text Solution

46. In a compound of molecular formula A_mB_n:

A. number of equivalents of A,B and A_mB_n are same

B. number of moles of A,B and A_mB_n are same

C. $m \times$ moles of $A = n \times$ moles of $B = (m + n) \times$ moles of A_mB_n

D. $n \times$ moles of $A = m \times$ moles of $B = (m + n) \times$ moles of A_mB_n

Answer: A

View Text Solution

47. 4.4 g of CO_2 and 2.24 litre of H_2 at STP are mixed in a container. The total number of molecules present in the container will be:

A. 6.022×10^{23}

B. 1.2044×10^{23}

C. 6.023×10^{26}

D. 6.023×10^{24}.

Answer: B

View Text Solution

48. A partially dried clay mineral contaisn 8% water. The original the partially contained 12% water and 45% silica. The % of silica in the partially dried sample is nearly:

A. 0.5

B. 0.49

C. 0.55

D. 0.47

Answer: D

View Text Solution

49. Which of the following is isomorphous with $MgSO_4.7H_2O$?

A. Green vitriol

B. Blue vitriol

C. Red vitriol

D. Vitriol of mass

Answer: A

View Text Solution

50. 10 mL of mixture containing carbon monoxide and nitrogen required 7mL, oxygen to form CO_2 and NO, on combustion The volume of N_2 in the mixture will be:

A. 7/2mL

B. 17/2mL

C. 4mL

D. 7mL

Answer: C

View Text Solution

51. 1.44 g of titanium (Ti) reacte with excess of O_2 and produced x gm of a nonstoichiometric compound $Ti_{1.44}O_1$. The value of x is:

A. 1.44

B. 1.77

C. 2

D. none of these.

Answer: B

View Text Solution

52. What volume of 75% alcohol by mass (d=0.8 g/cm^3) must be used to prepare 150cc. Of 30% alcohol by mass $\left(d = 0.9g/cm^3\right)$?

A. 44.44mL

B. 56.25mL

C. 67.5mL

D. 33.56mL

Answer: C

View Text Solution

SET-II

1. 11.2L of a gas at STP weighs 14g. The gas could be:

A. N_2O

B. NO_2

C. N_2

D. CO

Answer: C::D

View Text Solution

2. In which of the following pairs do 1 g of each have an equal number of molecules?

A. N_2O and CO

B. N_2 and C_3O_2

C. N_2 and CO

D. N_2O and CO_2

Answer: C::D

View Text Solution

3. 8g of oxygen has the same number of molecules as in:

A. 11g CO_2

B. 22g CO_2

C. 7g CO

D. 14g CO

Answer: A::C::D

View Text Solution

4. Which of the following has three significant figures?

A. 6.02×10^{23}

B. 0.25

C. 6.60×10^{-34}

D. 1.5

Answer: A::C::D

View Text Solution

5. 1 mole of ${}_{7}^{14}N^{3-}$ ions contains:

A. $7 \times 6.023 \times 10^{23}$ electrons

B. $7 \times 6.023 \times 10^{23}$ protons

C. $7 \times 6.023 \times 10^{23}$ neutrons

D. $14 \times 60.23 \times 10^{23}$ protons

Answer: B::C

View Text Solution

6. 1 g atom of nitrogen represents:

A. 14 g nitrogen

B. 11.2 litre of N_2 at NTP

C. 22.4 litre of N_2 at NTP

D. 6.023×10^{23} molecules of N_2

Answer: A

View Text Solution

Assertion

1. (A) 1g O_2 and 1 g O_3 have equal number of atoms

(R) Mass of 1 mole atom is equal to its gram-atomic mass.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is wrong.

D. If (A) is wrong but (R) is correct.

Answer: B

View Text Solution

2. (A) Vapour density of sulphur vapour relative in oxygen is 2 because sulphur atom is twice as heavy as that of oxygen atom.

(R) Vapour density depends upon the molecular state of the substance in vapour state.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is wrong.

D. If (A) is wrong but (R) is correct.

Answer: D

View Text Solution

3. (A) 1 Avogram is equal to 1 amu.

(R) Avogram is reciprocal of Avogadro's number.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is wrong.

D. If (A) is wrong but (R) is correct.

Answer: C

View Text Solution

4. (A) 1 mole H_2SO_4 contains same mass of oxygen and sulphur.

(R) 1 mole of H_2SO_4 represents 98g mass.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is wrong.

D. If (A) is wrong but (R) is correct.

Answer: D

View Text Solution

5. (A) 1 mole oxygen and N_2 have same volume at same temperature pressure.

(R) 1 mole gas at NTP occupies 22.4 litre volume at STP.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is wrong.

D. If (A) is wrong but (R) is correct.

Answer: B

View Text Solution

6. (A) Empricial formula of glucose is HCHO.

(R) Molecular formula of glucose will also be equal to HCHO

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is wrong.

D. If (A) is wrong but (R) is correct.

Answer: C

View Text Solution

7. (A) The volume of 1 mole of an ideal gas at 1 bar pressure at $25^{\circ}C$ is 24.78 litre.

(R) 1 bar=0987atm.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is wrong.

D. If (A) is wrong but (R) is correct.

Answer: B

View Text Solution

8. (A) Atomic weight=Specific heat (cal/mol) $\times$ 64.

(R) The formula is valid for metals only.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is wrong.

D. If (A) is wrong but (R) is correct.

Answer: B

View Text Solution

9. (A) Number of moles of H_2 in 0.224 L of H_2 is 0.001 mol.

(R) 22.4 litres of H_2 at STP contains 6.023×10^{23} mol.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is wrong.

D. If (A) is wrong but (R) is correct.

Answer: C

View Text Solution

10. (A) The equivalent weight of an element is variable.

(R) The valency of an element is variable.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is wrong.

D. If (A) is wrong but (R) is correct.

Answer: A

View Text Solution

11. (A) The number of significant figures in 507000 is three.

(R) In 507000, all the zeros are significant.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is wrong.

D. If (A) is wrong but (R) is correct.

Answer: A

View Text Solution

12. (A) Law of conservation of mass is invalid for nuclear fission fusion and disintegration.

(R) The law proposes that mass if neither created nor destroyed in a reaction.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is wrong.

D. If (A) is wrong but (R) is correct.

Answer: B

View Text Solution

13. (A) Mass spectrometer is used for determination of atomic mass of isotopes.

(R) Isotopes are the atoms of same element having same atomic number but different mass numbers.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is wrong.

D. If (A) is wrong but (R) is correct.

Answer: A

View Text Solution

Integer

1. A gaseous alkane $\left(C_nH_{2n+2}\right)$ is exploded with oxygen. The volume of O_2 and CO_2 formed are in the ratio of 7:4, Deduce the value of n.

View Text Solution

2. How many atoms do a mercury vapour molecule consist of, if the vapour density of mercury vapour relative to air is 6.92? (Atomic mass of mercury is 200). The average molar mass of air is 29g/mol.

View Text Solution

3. One mole of an element contains 4.2×10^{24} electrons. What is the atomic number of the element?

View Text Solution

4. A macromolecule of iron has molar mass 2800amu, it contains 8% iron by mass. The number of iron atom in one formula unit of the

macromolecule is:

View Text Solution

5. 6 moles of 'A' and 10 moles of 'B' are mixed and allowed to react according to the equation.

$A + 3B \rightarrow 2C$

How many moels of C are present when there are 4 moles of A in the container?

View Text Solution

6. How many water molecules will be there in 3×10^{-23} g sample of water?

View Text Solution

7. 5g H_2 is allowed to react with 14 g N_2 for the following reaction.

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

What mass of H_2 will be left unreached at the end of reaction?

View Text Solution

8. In Avogadro's number be 3.01×10^{23} then the atomic mass of carbon will be:

View Text Solution

9. How many moles of R will be produced when 8 mol of P and S mol of Q are allowed to react according to the equation?

$2P + Q \rightarrow R$

View Text Solution

10. The mass of 1×10^{22} molecules of blue vitriol $\left(CuSO_4.xH_2O\right)$ is 4.144g. The values of 'x' will be:

View Text Solution

11. What will be the mass (in kg) of 7.298×10^6 mol electrons?

View Text Solution

12. Silver (Atomic weight =108g mol^{-1} has a density of 10.5g cm^{-3}. The number of silver atoms on a surface area of 10^{-12} can be expressed in scientific notation as $y \times 10^x$. The value of x is:

View Text Solution

13. A student performs a titration with different burettes and finds titre values of 25.2 mL, 25.25mL and 25.0mL . The number of significant figures

in average litre value is:

View Text Solution

14. If the value of Avogadro's number is $6.023 \times 10^{23} \text{mol}^{-1}$ and the value of Boltzman constant is $1.380 \times 10^{-23} JK^{-1}$. The number of significant digits in the calculated value of the universal gas constant is:

View Text Solution

15. Three moles of B_2H_6 are completely reacted with methanol. The number of moles of boron containing product formed is. . . . .

View Text Solution

16. In neutral or faintly alkaline solution, 8 moles of permagnate anion quantitatively oxidize thiosulphate anions to produce X moles of a sulphur containing product. The magnitude of X is:

View Text Solution

LINKED COMPREHENSION TYPE QUESTION

1. In chemistry, 'mole' is an essential tool for the chemical calculations. It is a basic SI unit adopted by the 14th general conference on weights and measurements in 1971. A mole contains as many elementary particles as the number of atoms present in 12g of $.^{12}C$. 1 mole of a gas at STP occupies 22.4 litre volume. molar volume of solids and liquids is not definite Molar mass of a substance is also called gram-atomic mass or gram molar mass. the virtual meaning of mole is plenty. heap of the collection of large numbers. 1 mole of a substance contains 6.023×10^{23} elementary particles like atom or molecule. Atomic mass unit (amu) is the unit of atomic mass, e.g., atomic mass of single carbon is 12 amu.

The mass of one amu is approximately.

A. 1g of butane $\left(C_4H_{10}\right)$

B. 0.5g

C. $1.66 \times 10^{-24} g$

D. $3.2 \times 10^{-24} g$

Answer: C

View Text Solution

2. In chemistry, 'mole' is an essential tool for the chemical calculations. It is a basic SI unit adopted by the 14th general conference on weights and measurements in 1971. A mole contains as many elementary particles as the number of atoms present in 12g of $.^{12}C$. 1 mole of a gas at STP occupies 22.4 litre volume. molar volume of solids and liquids is not definite Molar mass of a substance is also called gram-atomic mass or gram molar mass. the virtual meaning of mole is plenty. heap of the collection of large numbers. 1 mole of a substance contains 6.023×10^{23} elementary particles like atom or molecule. Atomic mass unit (amu) is the unit of atomic mass, e.g., atomic mass of single carbon is 12 amu.

5.6 litre of a gas at STP are found to have a mass of 22g. the molecvular mass of the gas is:

A. 22

B. 44

C. 88

D. 33

Answer: C

View Text Solution

3. In chemistry, 'mole' is an essential tool for the chemical calculations. It is a basic SI unit adopted by the 14th general conference on weights and measurements in 1971. A mole contains as many elementary particles as the number of atoms present in 12g of $.^{12}C$. 1 mole of a gas at STP occupies 22.4 litre volume. molar volume of solids and liquids is not definite Molar mass of a substance is also called gram-atomic mass or gram molar mass. the virtual meaning of mole is plenty. heap of the collection of large numbers. 1 mole of a substance contains 6.023×10^{23} elementary particles like atom or molecule. Atomic mass unit (amu) is the

unit of atomic mass, e.g., atomic mass of single carbon is 12 amu.

The mass of one molecule of water is approximately.

A. 1g of butane $\left(C_4H_{10}\right)$

B. 0.5g

C. $1.66 \times 10^{-24}g$

D. $3.2 \times 10^{-23}g$

Answer: D

View Text Solution

4. In chemistry, 'mole' is an essential tool for the chemical calculations. It is a basic SI unit adopted by the 14th general conference on weights and measurements in 1971. A mole contains as many elementary particles as the number of atoms present in 12g of $.^{12}C$. 1 mole of a gas at STP occupies 22.4 litre volume. molar volume of solids and liquids is not definite Molar mass of a substance is also called gram-atomic mass or gram molar mass. the virtual meaning of mole is plenty. heap of the

collection of large numbers. 1 mole of a substance contains 6.023×10^{23} elementary particles like atom or molecule. Atomic mass unit (amu) is the unit of atomic mass, e.g., atomic mass of single carbon is 12 amu.

How many atoms are present in 49g of H_2SO_4?

A. $7 \times 6.023 \times 10^{23}$

B. $4 \times 6.023 \times 10^{23}$

C. $6 \times 6.023 \times 10^{23}$

D. $7. \times 3.02 \times 10^{23}$

Answer: D

View Text Solution

5. In chemistry, 'mole' is an essential tool for the chemical calculations. It is a basic SI unit adopted by the 14th general conference on weights and measurements in 1971. A mole contains as many elementary particles as the number of atoms present in 12g of $.^{12}C$. 1 mole of a gas at STP occupies 22.4 litre volume. molar volume of solids and liquids is not

definite Molar mass of a substance is also called gram-atomic mass or gram molar mass. the virtual meaning of mole is plenty. heap of the collection of large numbers. 1 mole of a substance contains 6.023×10^{23} elementary particles like atom or molecule. Atomic mass unit (amu) is the unit of atomic mass, e.g., atomic mass of single carbon is 12 amu.

xL N_2 gas at STP contains 3×10^{22} molecules. the number of molecules. in x L ozone at STP will be:

A. 3×10^{22}

B. 6.02×10^{23}

C. 3×10^{24}

D. none of these.

Answer: A

View Text Solution

6. In chemistry, 'mole' is an essential tool for the chemical calculations. It is a basic SI unit adopted by the 14th general conference on weights and

measurements in 1971. A mole contains as many elementary particles as the number of atoms present in 12g of $.^{12}C$. 1 mole of a gas at STP occupies 22.4 litre volume. molar volume of solids and liquids is not definite Molar mass of a substance is also called gram-atomic mass or gram molar mass. the virtual meaning of mole is plenty. heap of the collection of large numbers. 1 mole of a substance contains 6.023×10^{23} elementary particles like atom or molecule. Atomic mass unit (amu) is the unit of atomic mass, e.g., atomic mass of single carbon is 12 amu.

If Avogadro's number is $1 \times 10^{23} mol^{-1}$ then the mass of one atom of oxygen would be:

A. $\frac{16}{6.02}$amu

B. 16×6.02 amu

C. 16 amu

D. 16×10^{-23} amu

Answer: C

View Text Solution

7. In chemistry, 'mole' is an essential tool for the chemical calculations. It is a basic SI unit adopted by the 14th general conference on weights and measurements in 1971. A mole contains as many elementary particles as the number of atoms present in 12g of $.^{12}C$. 1 mole of a gas at STP occupies 22.4 litre volume. molar volume of solids and liquids is not definite Molar mass of a substance is also called gram-atomic mass or gram molar mass. the virtual meaning of mole is plenty. heap of the collection of large numbers. 1 mole of a substance contains 6.023×10^{23} elementary particles like atom or molecule. Atomic mass unit (amu) is the unit of atomic mass, e.g., atomic mass of single carbon is 12 amu.

If N_A is the Avogadro's number then number of valence electrons in 4.8g of O^{2-} is:

A. $2.4N_A$

B. $4.2N_A$

C. $1.6N_A$

D. $3.2N_A$

Answer: A

View Text Solution

8. Isotopes are the atoms of same element, they have same atomic number but different mass numbers. Isotopes have different number of neutrons in their nucleus . If an element exists in two isotopes having atomic masses 'a' and 'b' in the ratio m:n, then average atomic mass will be $\frac{m \times a + n \times b}{m + n}$

Different isotopes of same element have same position in the periodic table. the elemens which have single isotope are called monoisotropic elements. Greater is the percentage composition of an isotope, more will be its abundance in nature.

The isotopes of chlorine with mass number 35 and 37 exist in the ratio of. . . .. Its average atomic mass is 35.5.

A. $1:1$

B. $2:1$

C. $3:1$

D. $3:2$

Answer: C

View Text Solution

9. Isotopes are the atoms of same element, they have same atomic number but different mass numbers. Isotopes have different number of neutrons in their nucleus . If an element exists in two isotopes having atomic masses 'a' and 'b' in the ratio m:n, then average atomic mass will be $\frac{m \times a + n \times b}{m + n}$

Different isotopes of same element have same position in the periodic table. the elemens which have single isotope are called monoisotropic elements. Greater is the percentage composition of an isotope, more will be its abundance in nature.

Which of the following isotopes is/are used to decide the scale of atomic mass?

A. $._{6}^{12}C$

B. $._{6}^{14}C$

C. $\_\ (8)^{16}O$

D. $._{7}^{14}N$

Answer: A::C::D

View Text Solution

10. At 300 K and 1 atm, 15mL of a gaseous hydrocarbon requires 375mL air containing 20% O_2 by volume for complete combustion. After combination the gases occupy 330 mL. Assuming that the water formed isin liquid form and the volumes were measured at the

Atomic mass of boron is 10.81. it has two isotopes namely $._{5}^{11}B$ and $._{5}^{x}B$ with their relative abundance of 80% and 20% respectively. the value of x is:

A. 10.05

B. 10

C. 10.01

D. 10.02

Answer: B

View Text Solution

11. Isotopes are the atoms of same element, they have same atomic number but different mass numbers. Isotopes have different number of neutrons in their nucleus . If an element exists in two isotopes having atomic masses 'a' and 'b' in the ratio m:n, then average atomic mass will be $\frac{m \times a + n \times b}{m + n}$

Different isotopes of same element have same position in the periodic table. the elemens which have single isotope are called monoisotropic elements. Greater is the percentage composition of an isotope, more will be its abundance in nature.

The ratio of mass of $.^{12}C$ atom to that of an atom of element X(whose atomicity is four) is 1:9. the molecular mass of element X is:

A. 480 g mol^{-1}

B. $432 g mol^{-1}$

C. $36 g mol^{-1}$

D. $84 g mol^{-1}$

Answer: B

View Text Solution

12. Isotopes are the atoms of same element, they have same atomic number but different mass numbers. Isotopes have different number of neutrons in their nucleus . If an element exists in two isotopes having atomic masses 'a' and 'b' in the ratio m:n, then average atomic mass will be $\frac{m \times a + n \times b}{m + n}$

Different isotopes of same element have same position in the periodic table. the elemens which have single isotope are called monoisotropic

elements. Greater is the percentage composition of an isotope, more will be its abundance in nature.

$.^{12}C$ and $.^{14}C$ isotopes are found at 98% and 2% respectively in any sample. then, the number of $.^{14}C$ atoms in 12g of the sample will be:

A. 1.5 mole atoms

B. 1.032×10^{22} atoms

C. 2.06×10^{21} atoms

D. 2g atoms

Answer: B

View Text Solution

13. Empirical formula is the simplest formula of the compound which gives the atomic ratio of various elements present in one molecule of the compound. However, the molecular formula of the compound gives the number of atoms of various elements present in one molecule of the compound.

Molecular formula=(Empirical formula) $\times n$

$$n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}}$$

A compound may have same empirical and molecular formulae Both these formulae are calculated by using percentage composition of constituent elements.

Two metallic oxides contain 27.6% and 30% oxygen respectively. if the formulae of first oxide is M_3O_4, that of second will be:

A. MO

B. MO_2

C. M_2O_5

D. M_2O_3

Answer: D

View Text Solution

14. Empirical formula is the simplest formula of the compound which gives the atomic ratio of various elements present in one molecule of the

compound. However, the molecular formula of the compound gives the number of atoms of various elements present in one molecule of the compound.

Molecular formula=(Empirical formula) $\times n$

$$n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}}$$

A compound may have same empirical and molecular formulae Both these formulae are calculated by using percentage composition of constituent elements.

Which of the following compounds have same empirical formula?

A. Formaldehyde

B. Glucose

C. Sucrose

D. Acetic acid

Answer: A::B::C::D

View Text Solution

15. Empirical formula is the simplest formula of the compound which gives the atomic ratio of various elements present in one molecule of the compound. However, the molecular formula of the compound gives the number of atoms of various elements present in one molecule of the compound.

Molecular formula=(Empirical formula) $\times n$

$$n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}}$$

A compound may have same empirical and molecular formulae Both these formulae are calculated by using percentage composition of constituent elements.

Which of the following represents the formula of a substance which contains 50% oxygen?

A. N_2O

B. CO_2

C. NO_2

D. CH_3OH

Answer: D

View Text Solution

16. Empirical formula is the simplest formula of the compound which gives the atomic ratio of various elements present in one molecule of the compound. However, the molecular formula of the compound gives the number of atoms of various elements present in one molecule of the compound.

Molecular formula=(Empirical formula) $\times n$

$$n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}}$$

A compound may have same empirical and molecular formulae Both these formulae are calculated by using percentage composition of constituent elements.

An oxide of iodine (I=127) contains 25.4 g of iodine and 8 g of oxygen. its formula could be:

A. I_2O_3

B. I_2O

C. I_2O_5

D. I_2O_7

Answer: C

View Text Solution

17. Empirical formula is the simplest formula of the compound which gives the atomic ratio of various elements present in one molecule of the compound. However, the molecular formula of the compound gives the number of atoms of various elements present in one molecule of the compound.

Molecular formula=(Empirical formula) $\times n$

$$n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}}$$

A compound may have same empirical and molecular formulae Both these formulae are calculated by using percentage composition of constituent elements.

10 g of hydrofluoric acid gas occupies 5.6 litres of volume at STP. if the

empiriccal formula of the gas is HF, then its molecular formula in the gaseous state will be:

A. HF

B. H_2F_2

C. H_3F_3

D. H_4F_4

Answer: B

View Text Solution

18. Empirical formula is the simplest formula of the compound which gives the atomic ratio of various elements present in one molecule of the compound. However, the molecular formula of the compound gives the number of atoms of various elements present in one molecule of the compound.

Molecular formula=(Empirical formula) $\times n$

$$n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}}$$

A compound may have same empirical and molecular formulae Both these formulae are calculated by using percentage composition of constituent elements.

The pair of species having different percentage composition of carbon are:

A. CH_3COOH and $C_6H_{12}O_6$

B. CH_3COOH and C_2H_5OH

C. $HCOOCH_3$ and $HCOOH$

D. C_2H_5OH and CH_3OCH_3

Answer: B::C

View Text Solution

19. Empirical formula is the simplest formula of the compound which gives the atomic ratio of various elements present in one molecule of the compound. However, the molecular formula of the compound gives the number of atoms of various elements present in one molecule of the

compound.

Molecular formula=(Empirical formula) $\times n$

$$n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}}$$

A compound may have same empirical and molecular formulae Both these formulae are calculated by using percentage composition of constituent elements.

A compound of Na, C and O contains 0.0887 mol Na, 0.132 mol O and 2.65×10^{22} atoms of carbon . the empirical formula of the compound is:

A. $NaCO$

B. $Na_3C_5O_2$

C. Na_2CO_3

D. $Na_{0.0887}C_{2.65\times10^{22}}O_{0.132}$

Answer: A

View Text Solution

20. Several alkaloids are extracted from the extracts of the plants called marijuana. Marijuana owes its activity to tetrahydro cannabinol, which contains 70% as many as carbon atoms as hydrogen atoms and 15 times as many hydrogen atoms as oxygen atoms. One gram of tetrahydro cannabinol is 0.00318.

Molecular mass of the compound is:

A. 413amu

B. 314amu

C. 143amu

D. 341amu

Answer: B

View Text Solution

21. Several alkaloids are extracted from the extracts of the plants called marijuana. Marijuana owes its activity to tetrahydro cannabinol, which

contains 70% as many as carbon atoms as hydrogen atoms and 15 times as many hydrogen atoms as oxygen atoms. One gram of tetrahydro cannabinol is 0.00318.

Molecular formula of the compound is:

A. $C_{21}H_{30}O_2$

B. $C_{21}H_{14}O_3$

C. $C_{21}H_{46}O$

D. none of these.

Answer: A

View Text Solution

22. Several alkaloids are extracted from the extracts of the plants called marijuana. Marijuana owes its activity to tetrahydro cannabinol, which contains 70% as many as carbon atoms as hydrogen atoms and 15 times as many hydrogen atoms as oxygen atoms. One gram of tetrahydro

cannabinol is 0.00318.

Number of oxygen atoms in 1 mol of the tetrahydro cannabinol is:

A. $2N_A$

B. N_A

C. $3N_A$

D. $4N_A$

Answer: A

View Text Solution

23. Several alkaloids are extracted from the extracts of the plants called marijuana. Marijuana owes its activity to tetrahydro cannabinol, which contains 70% as many as carbon atoms as hydrogen atoms and 15 times as many hydrogen atoms as oxygen atoms. One gram of tetrahydro cannabinol is 0.00318.

Percentage composition of carbon in the compound is:

A. 0.6046

B. 0.7085

C. 0.8025

D. 0.5964

Answer: C

View Text Solution

24. Vapour density of a compound is defined as the ratio of mass of a certain volume of gas to the mass of the same volume of hydrogen gas under conditions of temperature and pressure.

$$\text{Vapour density} = \frac{\text{Mass of certain of gas}(22.4L)\text{at STP}}{\text{Mass of same volume of}H_2\text{gas}(22.4L)\text{at STP}}$$

$$= \frac{Mw}{2}$$

i.e., Molecular mass of gas=Vapour density $\times 2$

Vapour density is a unitless quantity it is unaffected by variation of temperature and pressure.

Vapour density of a metal chloride is 66. its oxide contains 53% metal. the atomic mass of the metal is:

A. 21

B. 54

C. 27.06

D. 2.086

Answer: C

View Text Solution

25. Vapour density of a compound is defined as the ratio of mass of a certain volume of gas to the mass of the same volume of hydrogen gas under conditions of temperature and pressure.

$$\text{Vapour density} = \frac{\text{Mass of certain of gas}(22.4L)\text{at STP}}{\text{Mass of same volume of}H_2\text{gas}(22.4L)\text{at STP}}$$

$$= \frac{Mw}{2}$$

i.e., Molecular mass of gas=Vapour density $\times 2$

Vapour density is a unitless quantity it is unaffected by variation of temperature and pressure.

The vapour density of a mixture containing NO_2 and N_2O_4 is 38.3 at $27^\circ C$. the moles of NO_2 in 100 moles of mixture are:

A. 33.48

B. 53.52

C. 38.3

D. 76.6

Answer: C

View Text Solution

26. Vapour density of a compound is defined as the ratio of mass of a certain volume of gas to the mass of the same volume of hydrogen gas under conditions of temperature and pressure.

$$\text{Vapour density} = \frac{\text{Mass of certain of gas}(22.4L)\text{at STP}}{\text{Mass of same volume of}H_2\text{gas}(22.4L)\text{at STP}}$$

$= \frac{Mw}{2}$

i.e., Molecular mass of gas=Vapour density $\times 2$

Vapour density is a unitless quantity it is unaffected by variation of temperature and pressure.

At STP, 5.6 litre of a gas weighs 60g. the vapour density of gas is:

A. 60

B. 120

C. 30

D. 240

Answer: B

View Text Solution

27. Vapour density of a compound is defined as the ratio of mass of a certain volume of gas to the mass of the same volume of hydrogen gas under conditions of temperature and pressure.

Vapour density $= \frac{\text{Mass of certain of gas}(22.4L)\text{at STP}}{\text{Mass of same volume of}H_2\text{gas}(22.4L)\text{at STP}}$

$= \frac{Mw}{2}$

i.e., Molecular mass of gas=Vapour density $\times 2$

Vapour density is a unitless quantity it is unaffected by variation of temperature and pressure.

Which of the following two substances have same vapour density?

A. Glucose

B. Fructose

C. Sucrose

D. Starch.

Answer: A::B::C::D

View Text Solution

28. Vapour density of a compound is defined as the ratio of mass of a certain volume of gas to the mass of the same volume of hydrogen gas

under conditions of temperature and pressure.

$$\text{Vapour density} = \frac{\text{Mass of certain of gas}(22.4L)\text{at STP}}{\text{Mass of same volume of}H_2\text{gas}(22.4L)\text{at STP}}$$

$$= \frac{Mw}{2}$$

i.e., Molecular mass of gas=Vapour density $\times 2$

Vapour density is a unitless quantity it is unaffected by variation of temperature and pressure.

Let $NH_4HS(s) \Leftrightarrow NH_3(g) + H_2S(g)$

The vapour density of the mixture will be:

A. equal to that of NH_4HS

B. lesser than that of NH_4HS

C. greater than that of NH_4HS

D. cannot be predicted.

Answer: B

View Text Solution

29. Precision refers to the closeness of a set of values obtained for identical measurement of a quantity. Precision depends on the limitations of measuring devices and the skills with which it is used. However, accuracy refers to the closeness of a single measurement to its true value.

The digits in a properly measurement are known as significant figures. these are meaningful digits in a measured or calculated quantity. The greater the number of significant figures in a reported result, smaller is the uncertainly and greater is the precision. the zeros at the beginning are not counted. the zeros to the right of a decimal point are counted. in the numbers that do not contain a decimal point. "trailing" zeros may or may not be significant . the purpose of zeros at the end of a number is to convey the correct range of uncertainly.

If repeated measurements give values close to one another, the number is:

A. surely precise

B. surely accurate

C. surely precise and accurate

D. all of these are correct.

Answer: A

View Text Solution

30. Precision refers to the closeness of a set of values obtained for identical measurement of a quantity. Precision depends on the limitations of measuring devices and the skills with which it is used. However, accuracy refers to the closeness of a single measurement to its true value.

The digits in a properly measurement are known as significant figures. these are meaningful digits in a measured or calculated quantity. The greater the number of significant figures in a reported result, smaller is the uncertainly and greater is the precision. the zeros at the beginning are not counted. the zeros to the right of a decimal point are counted. in the numbers that do not contain a decimal point. "trailing" zeros may or may not be significant . the purpose of zeros at the end of a number is to

convey the correct range of uncertainly.

The number of significant figures in a measured number contained how many uncertain number of digits?

A. Zero

B. 1

C. 2

D. cannot be predicted.

Answer: B

View Text Solution

31. Precision refers to the closeness of a set of values obtained for identical measurement of a quantity. Precision depends on the limitations of measuring devices and the skills with which it is used. However, accuracy refers to the closeness of a single measurement to its true value.

The digits in a properly measurement are known as significant figures.

these are meaningful digits in a measured or calculated quantity. The greater the number of significant figures in a reported result, smaller is the uncertainly and greater is the precision. the zeros at the beginning are not counted. the zeros to the right of a decimal point are counted. in the numbers that do not contain a decimal point. "trailing" zeros may or may not be significant . the purpose of zeros at the end of a number is to convey the correct range of uncertainly.

In the number 2.4560, there are 5 significant digits. which one is the least significant digit?

A. 2

B. 4

C. 0

D. 6

Answer: C

View Text Solution

32. Precision refers to the closeness of a set of values obtained for identical measurement of a quantity. Precision depends on the limitations of measuring devices and the skills with which it is used. However, accuracy refers to the closeness of a single measurement to its true value.

The digits in a properly measurement are known as significant figures. these are meaningful digits in a measured or calculated quantity. The greater the number of significant figures in a reported result, smaller is the uncertainly and greater is the precision. the zeros at the beginning are not counted. the zeros to the right of a decimal point are counted. in the numbers that do not contain a decimal point. "trailing" zeros may or may not be significant . the purpose of zeros at the end of a number is to convey the correct range of uncertainly.

If we add 296.2 and 2.256, we get the answer as 298.456g. The number of significant figures in the result are:

A. 6

B. 5

C. 4

D. 3

Answer: C

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convey the correct range of uncertainly.

In which of the following numbers, all the zeros are not significant?

A. 0.001

B. 0.001

C. 0.001

D. 0.001

Answer: D

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SELF ASSESSMENT

1. Cartisone is a molecular substance containing 21 atoms of carbon per molecule. The mass percentage of carbon in cartisone is 69.98%. What is the molecular mass of cartisone?

A. 360.4

B. 176.5

C. 287.6

D. 312.8

Answer: A

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2. Total number of atoms present in 25mg of camphor. $C_{10}H_{18}O$ is:

A. 2.57×10^{21}

B. 9.89×10^{19}

C. 2.67×10^{21}

D. 6.02×10^{20}

Answer: C

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3. The oxide of a metal contains 60% of the metal. What will be percentage of bromine in the bromide of the metal. If the valency of the metal is the same in both, the oxide and the bromide?

A. 0.93

B. 0.87

C. 0.7

D. 0.77

Answer: B

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4. The radius of water molecule having density 1g mL^{-1} is:

A. 1.925 $\overset{\circ}{A}$

B. 73.46 $\overset{\circ}{A}$

C. 19.25 $\overset{\circ}{A}$

D. 7.346 $\overset{\circ}{A}$

Answer: A

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5. 3g of an oxide of a metal is converted completely to 5 g chloride. Equivalent mass of metal is:

A. 33.25

B. 3.325

C. 12

D. 20

Answer: A

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6. Quantitative analysis of a compound shows that it contains 0.110 mole of 'C'. 0.055 mole of 'N' and 0.165 mole of 'O' its molecular mass is about 270. how many atoms of carbon are there in empirical and molecular formulae of the compound respectively?

A. Empirical formula 1 Molecular formula 3

B. Empirical formula 2 Molecular formula 2

C. Empirical formula 2 Molecular formula 6

D. Empirical formula 3 Molecular formula 2

Answer: C

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7. Total number of electrons present in 11.2L of NH_3 at STP is:

A. 6.02×10^{23}

B. 3.01×10^{23}

C. 3.01×10^{24}

D. 5.1×10^{24}

Answer: C

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8. Which one of the following is not a unit of length?

A. Angstrom

B. Light-year

C. Micron

D. Radian.

Answer: D

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9. Unit of J pa^{-1} is equivalent to:

A. m^3

B. cm^3

C. dm^3

D. none of these.

Answer: A

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10. The relative abundance of two isotopes of atomic masses 85 and 87 are 75% and 25% respectively. The average atomic mass of element is:

A. 86

B. 40

C. 85.5

D. 75.5

Answer: C

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SECTION II MULTIPLE ANSWERS TYPE OBJECTIVE QUESTION.

1. Mass of one atom of oxygen is/are:

A. 16amu

B. 32amu

C. 16gm

D. 2.656×10^{-23}gm

Answer: A::D

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2. Which of the following compounds have same percentage composition of carbon?

A. $C_6H_{12}O_6$

B. CH_3COOH

C. $HCOOCH_3$ and $HCOOH$

D. $C_{12}H_{12}O_{11}$

Answer: A::B::C::D

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3. Which of the following is/are correct about 1 mole electrons?

A. 6.023×10^{21} electrons

B. $5.48 \times 10^{-7} kg$

C. 96500 coulomb charge

D. none of these.

Answer: A::C::D

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4. In which of the following numbers , all zeros are significant?

A. 5.0005

B. 0.0030

C. 30.000

D. 0.5200

Answer: B::C::D

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5. Which of the following are correct SI units?

A. Amount of substance in mol L^{-1}

B. Pressure of gas in pascal

C. Density of a solid in kg m^{-1}

D. Force in newton.

Answer: A

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SECTION III ASSWERTION-REASON TYPE QUESTION.

1. Statement-1: Avogadro's number is a dimensionless quantity.

because

Statement-2: It is a number of atoms or molecules in one gram mole.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanantion for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1.

C. Statement-1 is true, statement-2 is false.

D. Statement-1 is false, statement-2 is true.

Answer: B

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2. Statement-1:An element has variable equivalent mass.

Because

Statement-2: The valency of element is variable.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanantion for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1.

C. Statement-1 is true, statement-2 is false.

D. Statement-1 is false, statement-2 is true.

Answer: C

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3. Statement-1: Vapour density of CH_4 is half of O_2.

Because

Statement-2: 1.6 g of CH_4 contains same number of electrons as 3.2 g of O_2.

Statement-2: Specific gravity is dimensionless quantity.

Because

Statement-2: Specific gravity. is relative density of a substance, measured with respect to density of water at $4^\circ C$?

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanantion for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1.

C. Statement-1 is true, statement-2 is false.

D. Statement-1 is false, statement-2 is true.

Answer: A

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SECTION IV MATRIX-MATCHING TYPE QUESTION

1. Statement-1: Specific gravity is dimensionless quantity.

Because

Statement-2: Specific gravity is relative density of a substance, measured with respect to density of water at $4^{\circ} C$.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanantion for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1.

C. Statement-1 is true, statement-2 is false.

D. Statement-1 is false, statement-2 is true.

Answer: A::B::C::D

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SECTION V INTEGER ANSWER TYPE QUESTION

1. In the Avogadro's number 6.023×10^{23} the number of significant figures will be:

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2. How many moles of electrons will together contribute to the charge of 289500 coulomb?

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3. In Siemen's ozoniser, 60% O_2 is covered to ozone. How many moles of ozone will be obtained from 10 mole of O_2?

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