CHEMISTRY

BOOKS - BRILLIANT PUBLICATION

ORGANIC CHEMISTRY : SOME BASIC PRINCIPLES - PART II (ISOMERISM AND REACTION MECHANISM)

Level I

1. The stability of a carbonium ion depends upon : the bond angle of the attached group, the substrate with which it reacts, the inductive effect and hyper-conjugative effect of the attached group, None of the above

A. the bond angle of the attached group

B. the substrate with which it reacts

C. the inductive effect and hyper-conjugative effect of the attached group

D. None of the above

Answer: C

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2. Rearrangement reactions are mainly show by:

A. Carbanion

B. Free radical

C. Carbene

D. Carbocation

Answer: D

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3. Which of the following does not show electromeric effect?

A. Alkenes

B. Ethers

C. Aldehyde

D. Ketones

Answer: B

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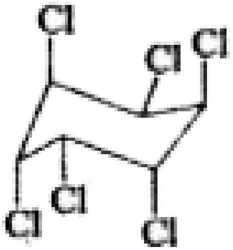
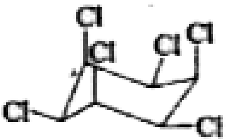
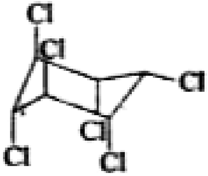
4. Dehydrohalogenation by strong base is slowest in:

A. 

B. 

C. 

D. 

Answer: C

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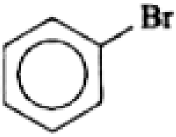
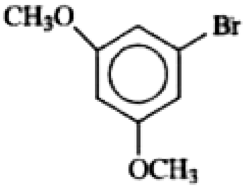
5. Which of the following compounds is the most likely to undergo a biomolecular nucleophilic substituion reaction with aqueous NaOH?

A. 

B. 

C.

D.

Answer: D

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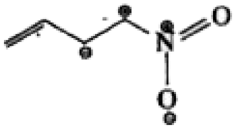
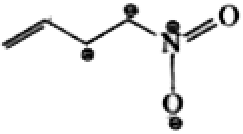
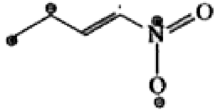
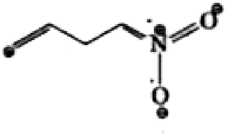
6. Among the following the least stable resonance structure is : , , ,

A. 

B. 

C. 

D. 

Answer: A

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7. Electrophilic addition reactions proceed in two steps. The first step involves the addition of an electrophile. Name the type of intermediate formed in the first step of the following addition reaction.

$H_3C - HC = CH_2 + H^+ \rightarrow$?

A. 2° carbanion

B. 1° carbocation

C. 2° carbocation

D. 1° carbanion

Answer: C

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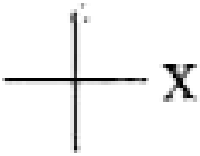
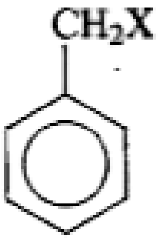
8. Which of the following cannot show S_N1 reaction?



A.



B.

C.

D.

Answer: C

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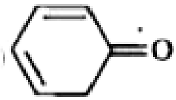
9. Maximum enolisation takes place in

A. CH_3COCH_3

B. CH_3COCH_2CHO

C. $CH_3COCH_2COCH_3$

D. 

Answer: D

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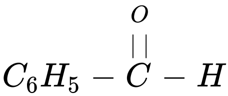
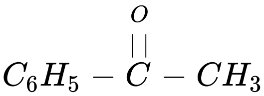
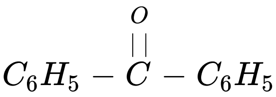
10. Keto-enol tautomerism is observed in

A. 

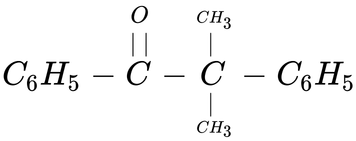
$C_6H_5-\overset{\overset{O}{||}}{C}-H$

B. 

$C_6H_5-\overset{\overset{O}{||}}{C}-CH_3$

C. 

$C_6H_5-\overset{\overset{O}{||}}{C}-C_6H_5$

D. 

$C_6H_5-\overset{\overset{O}{||}}{C}-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-C_6H_5$

Answer: B

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11. $(CH_3)_3CCH_2COOH$ is more acidic than $(CH_3)_3SiCH_2COOH$ because

A. Size of Si is more than that of carbon

B. Electroriegativity of carbon is less than that of silicon

C. Silicon is more electropositive than carbon due to which $(CH_3)_3SiCH_2COO^-$ becomes less stable

D. None of the above

Answer: C

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12. For the following acids

$$\underset{(\mathrm{I})}{(CH_3)_3CCH_2CO_2H} \quad \underset{(\mathrm{II})}{(CH_3)_3\overset{\oplus}{N}CH_2CO_2H} \quad \underset{(III)}{CH_3COOH}$$

pK_a value will be in order

A. $I > II > III$

B. $I < II < III$

C. $I > III > II$

D. $II > III > I$

Answer: C

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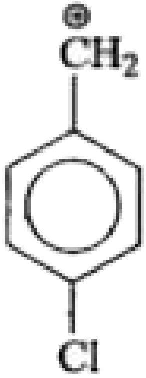
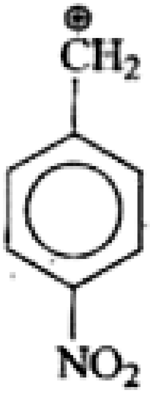
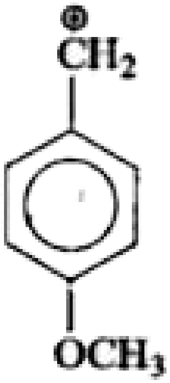
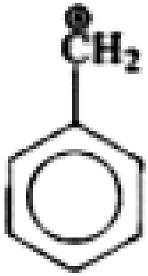
13. Most stable carbocation is:

A. 

B. 

C. 



D.

Answer: C

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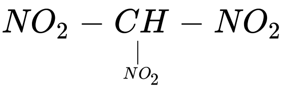
14. Arrange the following in correct order of acidic strength:

I) $CH_3 - NO_2$ II) $NO_2 - CH_2 - NO_2$ III) $CH_3 - CH_2 - NO_2$ IV)



$NO_2 - \underset{NO_2}{\underset{|}{CH}} - NO_2$

A. Iv $>$ II $>$ I $>$ III

B. IV $>$ II $>$ III $>$ I

C. III $>$ I $>$ II $>$ IV

D. III $>$ I $>$ IV $>$ II

Answer: A

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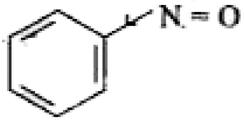
15. In which of the following species, incorrect of inductive effect is shown?

A. 

B. 

C. 

D. $CH_3-CH_2 \longleftarrow MgBr$

Answer: A

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16. Which of the following is not correctly ordered for resonance stability?

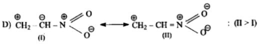
A.

$$\overset{\ominus}{C}H_2 - \underset{(\text{I})}{CH} = \overset{\oplus}{N} = O \leftrightarrow CH_2 = \underset{(\text{II})}{CH} - \ddot{N} = O \leftrightarrow \overset{\oplus}{C}H_2 - \underset{(\text{III})}{CH} =$$

B.

$$\overset{\oplus}{N}\underset{(\text{I})}{H_2} = C = O \leftrightarrow \ddot{N}H_2 - \underset{(\text{II})}{\overset{\oplus}{C}} = O \leftrightarrow \underset{(\text{III})}{NH_2} - C \equiv \overset{\oplus}{O} : (I > III >$$

C. $H_3C - \underset{(\text{I})}{\overset{\oplus}{C}} = O \leftrightarrow \underset{(\text{II})}{H_3C} - C \equiv \overset{\oplus}{O} : (I > II)$

D. 

Answer: C

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17. An organic molecule has 5 C = C bonds (heat of hydrogenation for C = C bond is 28.8 kJ mol^{-1}) and experimental value for heat of hydrogenation is 99 kJ mol^{-1}. The resonance energy in kJ mol^{-1} is

A. 45

B. 90

C. 70

D. 140

Answer: A

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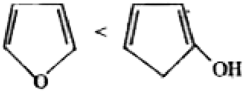
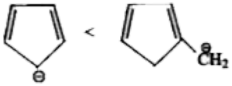
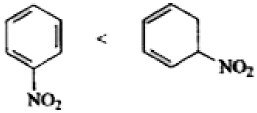
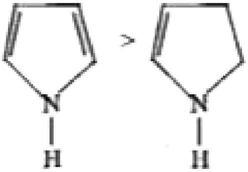
18. Which order is true for resonance energy?

A. 

B. 

C. 

D. 

Answer: D

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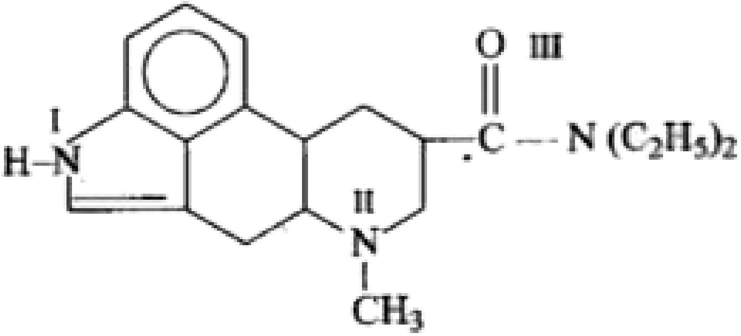
19. Which nitrogen in LSD (Lysergic acid diethylamide) is more basic?



A. I

B. II

C. III

D. All are equally basic

Answer: B

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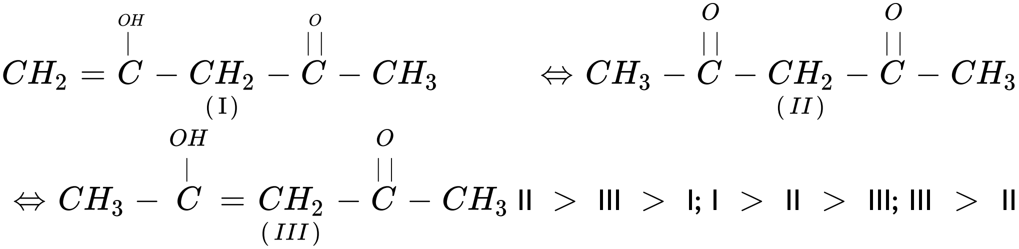
20. The order of stability of the following tautomeric compounds is:



$$CH_2 = \overset{OH}{\overset{|}{C}} - \underset{(I)}{CH_2} - \overset{O}{\overset{||}{C}} - CH_3 \Leftrightarrow CH_3 - \overset{O}{\overset{||}{C}} - \underset{(II)}{CH_2} - \overset{O}{\overset{||}{C}} - CH_3$$

$$\Leftrightarrow CH_3 - \overset{OH}{\overset{|}{C}} = \underset{(III)}{CH_2} - \overset{O}{\overset{||}{C}} - CH_3$$

II $>$ III $>$ I; I $>$ II $>$ III; III $>$ II $>$ I; II $>$ I $>$ III

A. I $>$ II $>$ III $>$ IV

B. III $>$ I $>$ II $>$ IV

C. IV $>$ II $>$ III $>$ I

D. IV $>$ III $>$ II $>$ I

Answer: C

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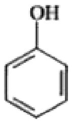
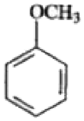
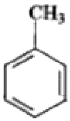
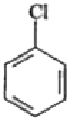
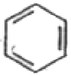
21. Arrange the following compounds in the order of decreasing reactivity towards electrophilic substitution


(I)


(II)


(III)


(IV)


(V)

A. V $>$ IV $>$ III $>$ II $>$ I

B. I $>$ II $>$ III $>$ V $>$ IV

C. I $>$ II $>$ IV $>$ III $>$ V

D. I $>$ III $>$ IV $>$ II $>$ V

Answer: B

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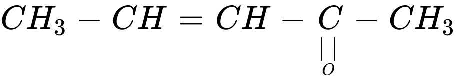
22. Which of the following molecules has all the effects inductive mesomeric and Baker Nathan effect?

A. C_2H_5Cl

B. $CH_3 - CH = CH_2$

C. $CH_2 = CH - CH = CH_2$

D. 

$CH_3 - CH = CH - \underset{\underset{O}{||}}{C} - CH_3$

Answer: D

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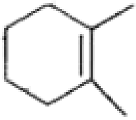
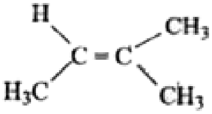
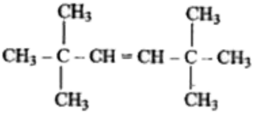
23. Which of the following alkenes will show maximum number of hyperconjugation forms?



A.

B. $CH_3 - CH = CH - CH_3$

C. 

D. 

$CH_3-\overset{CH_3}{\underset{CH_3}{C}}-CH=CH-\overset{CH_3}{\underset{CH_3}{C}}-CH_3$

Answer: A

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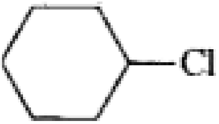
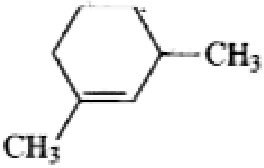
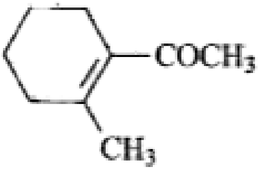
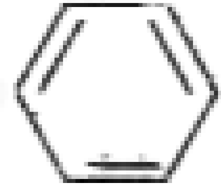
24. In which of the following molecules all the effects namely inductive, mesomeric and hyperconjugation operate?

A. 

B. 

C. 

D. 

Answer: C

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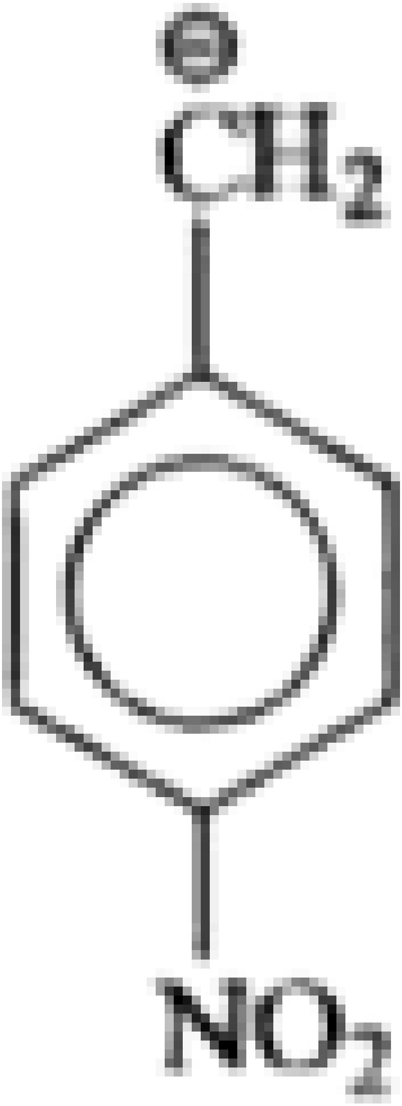
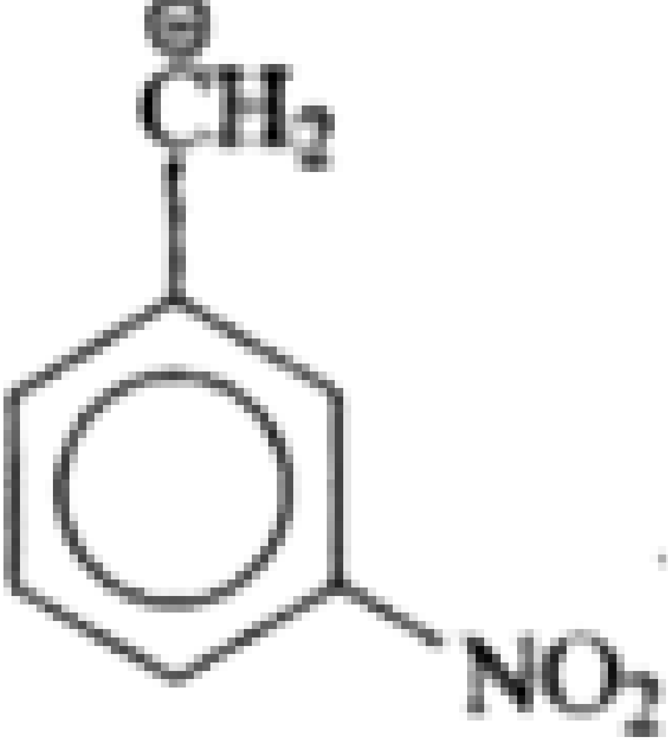


(II)

25. is more



stable than

because

A. 180° location of NO_2 and $\overset{\Theta}{C}H_2$ in (I)

B. $-NO_2$ operate both $-I$ and $-M$ in (I)

C. $-I$ in (II) is weaker than (I)

D. Due to steric repulsion

Answer: B

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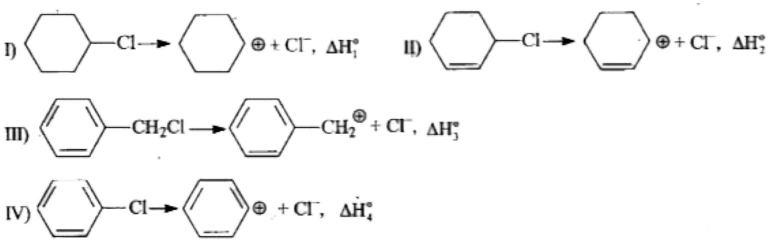
26. The decreasing order of enthalpies of reaction for producing carbocation is:



A. $\Delta H_1^\circ > \Delta H_2^\circ > \Delta H_3^\circ > \Delta H_4^\circ$

B. $\Delta H_4^\circ > \Delta H_1^\circ > \Delta H_2^\circ > \Delta H_3^\circ$

C. $\Delta H_3^\circ > \Delta H_2^\circ > \Delta H_1^\circ > \Delta H_4^\circ$

D. $\Delta H_2^\circ > \Delta H_1^\circ > \Delta H_4^\circ > \Delta H_3^\circ$

Answer: B

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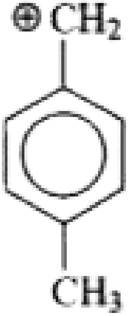
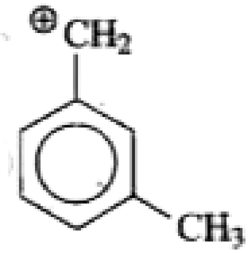
27. Which of the following is most stable carbocation?

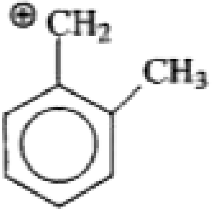
A.



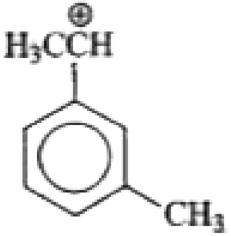
B.



C.



D.



Answer: D

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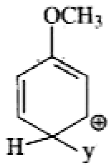
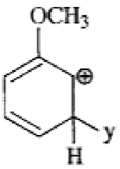
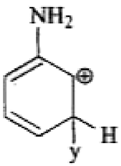
28. Give the stability order of the following compounds.



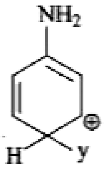
(I)



(II)



(III)



(IV)

A. I $>$ II $>$ III $>$ IV

B. IV $>$ I $>$ II $>$ III

C. IV $>$ I $>$ III $>$ II

D. IV $>$ II $>$ I $>$ III

Answer: C

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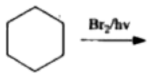
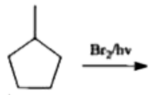
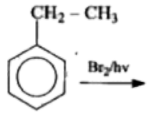
29. Among the following free radical bromination reactions, select those in which 2° halide is the major product.



(P)

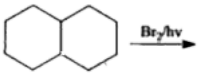


(Q)



(R)

(S)



(T)

(U)

A. P,Q,R,S

B. P,R,U

C. P,R,S,T

D. P,Q,R,S,T

Answer: B

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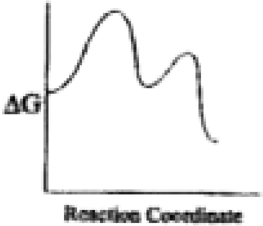
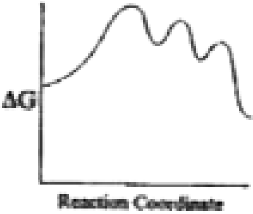
30. Which is the correct reaction coordinate diagram for the following solvolysis reaction?

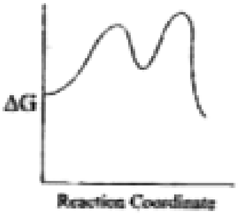

CH₃
Br
H₂O
CH₃
OH
+
OH
CH₃


ΔG
Reaction Coordinate

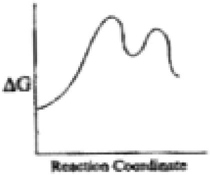
,


ΔG
Reaction Coordinate

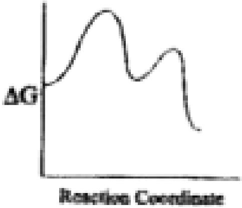
,


ΔG
Reaction Coordinate

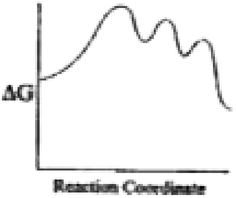
,


ΔG
Reaction Coordinate

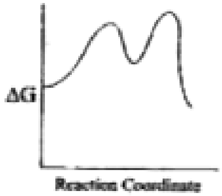
A.

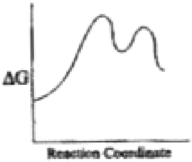

ΔG
Reaction Coordinate

B.


ΔG
Reaction Coordinate

C.


ΔG
Reaction Coordinate

D. 

Answer: B

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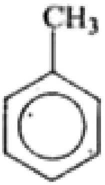
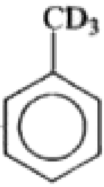
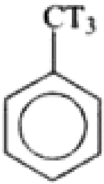
31. Arrange the following in decreasing order of reactivity towards EAS (electrophilic aromatic substitution).


(a)


(b)


(c)

A. $a > b > c$

B. $c > b > a$

C. $a > c > b$

D. $c > a > b$

Answer: A

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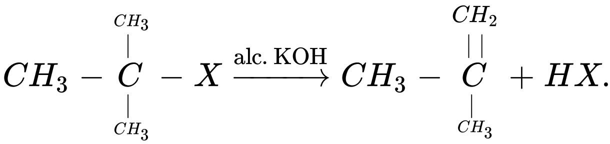
32. 

$CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-X\xrightarrow{\text{alc. KOH}}CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_2}{||}}{C}}+HX$. The reaction is

A. S_N1 reaction

B. S_N2 reaction

C. E_1 reaction

D. E_2 reaction

Answer: C

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33. The conversion of 2,3-dibromobutane to 2-butene with Zn is:

A. Redox reaction

B. α-Elimination

C. dehalogenation

D. Both-α-elimination and redox reaction

Answer: C

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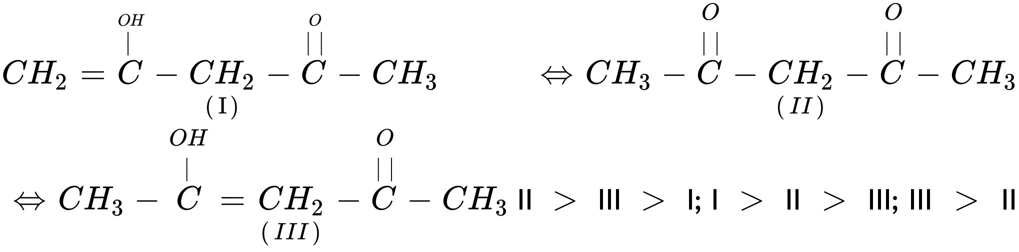
34. The order of stability of the following tautomeric compounds is:



$$CH_2=\overset{OH}{\overset{|}{C}}-\underset{(\mathrm{I})}{CH_2}-\overset{O}{\overset{||}{C}}-CH_3 \Leftrightarrow CH_3-\overset{O}{\overset{||}{C}}-\underset{(II)}{CH_2}-\overset{O}{\overset{||}{C}}-CH_3$$

$$\Leftrightarrow CH_3-\overset{OH}{\overset{|}{C}}=\underset{(III)}{CH_2}-\overset{O}{\overset{||}{C}}-CH_3$$

II $>$ III $>$ I; I $>$ II $>$ III; III $>$ II $>$ I; II $>$ I $>$ III

A. II $>$ III $>$ I

B. I $>$ II $>$ III

C. III $>$ II $>$ I

D. II $>$ I $>$ III

Answer: C

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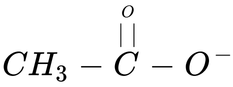
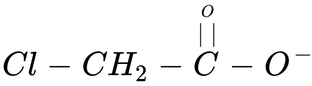
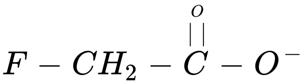
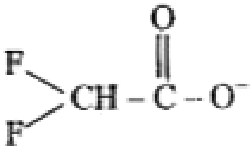
35. Ionic species are stabilised by the dispersal of charge. Which of the following carboxylate ion is the most stable?

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

B. 
$Cl - CH_2 - \overset{O}{\overset{||}{C}} - O^-$

C. 
$F - CH_2 - \overset{O}{\overset{||}{C}} - O^-$


D.

Answer: D

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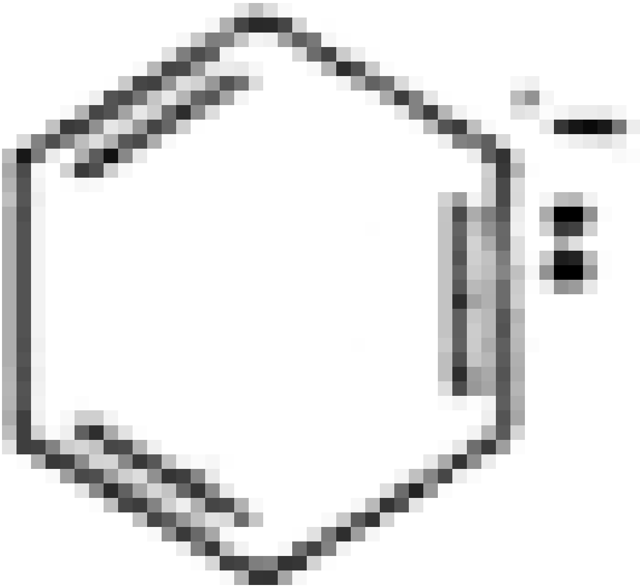
36. The stability of carbanions in the following:

(i) $RC \equiv C^{\Theta}$ (ii)



(iii)

$R_2C = \overset{\Theta}{C}H$ (iv) $R_3C - \overset{\Theta}{C}H_2$ in the order of: (iv) $>$ (ii) $>$ (iii) $>$ (i); (i) $>$ (iii) $>$ (ii) $>$ (iv); (i) $>$ (ii) $>$ (iii) $>$ (iv); (ii) $>$ (iii) $>$ (iv) $>$ (i)

A. (iv) $>$ (ii) $>$ (iii) $>$ (i)

B. (i) $>$ (iii) $>$ (ii) $>$ (iv)

C. (i) $>$ (ii) $>$ (iii) $>$ (iv)

D. (ii) $>$ (iii) $>$ (iv) $>$ (i)

Answer: C

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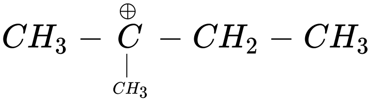
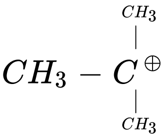
37. Which of the following carbocation is more stable?

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

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

C. 
$CH_3 - \underset{CH_3}{\overset{\oplus}{C}} - CH_2 - CH_3$

D. 
$CH_3 - \underset{CH_3}{\overset{CH_3}{C}}{}^{\oplus}$

Answer: D

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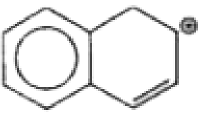
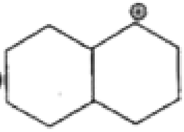
38. Compare relative stability of following carbocation:

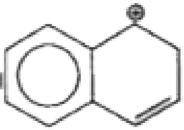
(i)



ii)



iii)



A. $i > ii > iii$

B. $iii > i > ii$

C. $i > iii > ii$

D. $iii > ii > i$

Answer: C

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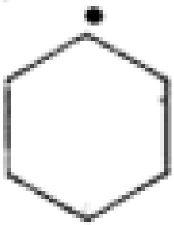
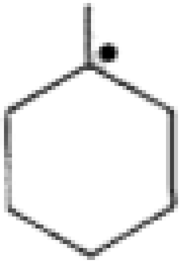
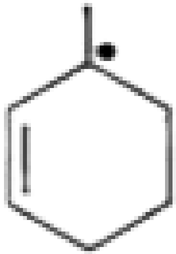
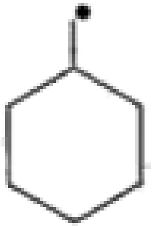
39. Most stable radical among the following is:

A.



B. 

C. 

D. 

Answer: C

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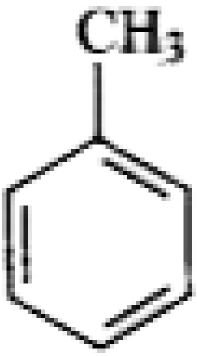
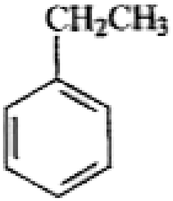
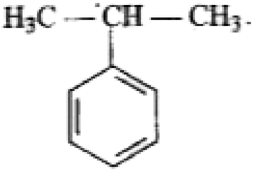
40. Which of the following alkyl benzene cannot be oxidised to benzoic acid?



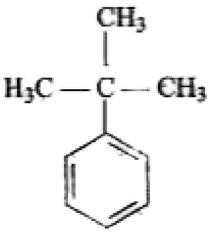
A.



B.



C.



D.

Answer: D

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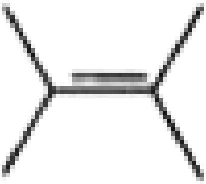
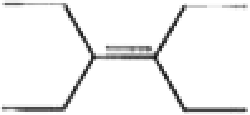
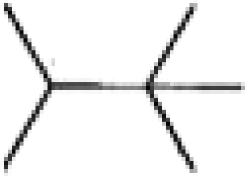
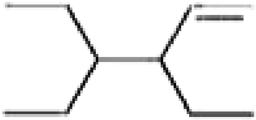
41. Which of the following has maximum number of α-hydrogen?

A. 

B. 

C. 

D. 

Answer: A

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42. The order of decreasing reactivity towards an electrophilic reagent, for the following:

I. Benzene II. Toluene III. Chlorobenzene IV. Phenol

A. I $>$ II $>$ III $>$ IV

B. II $>$ IV $>$ I $>$ III

C. IV $>$ III $>$ II $>$ I

D. IV $>$ II $>$ I $>$ III

Answer: D

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Level Ii

1. In the following compounds, nucleophile and the leaving groups are in the same molecule:

I)


II)


III)


IV)


These dual nature species can undergo intramolecular and intermolecular nucleophilic substitution. Intramolecular substitution reaction is possible in: I, II; II, III; III, IV; IV

A. I, II

B. II, III

C. III, IV

D. IV

Answer: C

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2. The decreasing order of reactivity towards electrophilic substitution of the following is:

I) Nitrobenzene II) Chlorobenzene III) Toluene IV) Benzene

A. (I) $>$ (II) $>$ (III) $>$ (IV)

B. (IV) $>$ (III) $>$ (II) $>$ (I)

C. (III) $>$ (IV) $>$ (II) $>$ (I)

D. (I) $>$ (II) $>$ (IV) $>$ (III)

Answer: C

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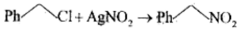
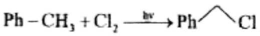
3. Which of the following is a free radical substitution reaction?

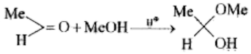
A. Benzene $+ Me - Cl \xrightarrow[AlCl_3]{\text{Anhyd.}} Ph - CH_3$

B.



C.



D. 

Answer: C

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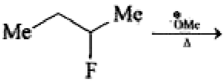
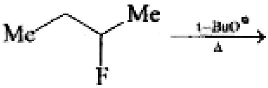
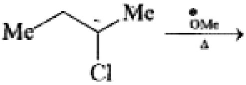
4. Which of the following reactions will not give Hofmann alkene?

A. 

B. 

C. 

D. All

Answer: C

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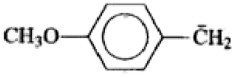
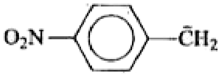
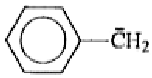
5. Consider the following carbanions?

I)


II)


III)


Correct order of stability is

A. I $>$ II $>$ III

B. III $>$ II $>$ I

C. II $>$ III $>$ I

D. I $>$ III $>$ II

Answer: C

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6. Which of the following explain why propene undergo electrophilic addition with HBr, but not with HCN?

A. Br^- is better nucleophile than CN^-

B. HBr being better source of proton as it is stronger acid than HCN

C. HCN attacks preferentially via lone pair of nitrogen

D. The C-Br bond being stronger is formed easily as compared to C-CN bond

Answer: B

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7. Examine the following statements regarding S_N2 reaction

1. The rate of reaction is independent of concentration of nucleophile

2. The nucleophile attacks the carbon atom on the side of molecule opposite to the group being displaced

3. The reaction proceeds with simultaneous bond formation and rupture

Which of the above written statements are correct?

A. 1, 2

B. 1, 3

C. 1, 2, 3

D. 2, 3

Answer: D

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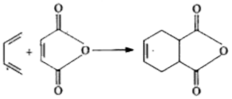
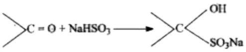
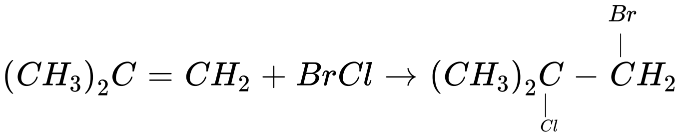
8. The substitution reaction among the following is

A. 

B. 

C. 

D. 

$$(CH_3)_2C = CH_2 + BrCl \to (CH_3)_2\underset{\displaystyle | \atop Cl}{C} - \overset{Br \atop |}{C}H_2$$

Answer: C

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

I. Inductive effect operates through π-bond. II. Resonance effect operates through σ-bond

III. Inductive effect operates through σ-bond IV. Resonance effect operates through π-bond

V. Resonance and inductive effects operate through σ-bond

A. III and IV

B. I and II

C. II and IV

D. I and III

Answer: A

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10. The arrangement of $(CH_3)_3C-$, $(CH_3)_2CH-$, CH_3CH_2- when attached to benzene or unsaturated group in increasing order of inductive effect is:

A. $(CH_3)_3C- < (CH_3)_2CH- < CH_3CH_2-$

B. $CH_3CH_2- < (CH_3)_2CH- < (CH_3)_3C-$

C. $(CH_3)_2CH- < (CH_3)_3C- < CH_3CH_2-$

D. $(CH_3)_3C- < CH_3CH_2- < (CH_3)_2CH-$

Answer: A

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11. 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 effect of the Me group

C. hyperconjugative effect of the Me group

D. resonance as well as inductive effect of the group

Answer: C

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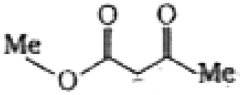
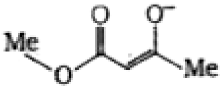
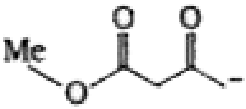
12. Among the following structure the one which is not a resonating structure of other is:

A. 

B. 

C. 

D. 

Answer: D

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13. The stability of carbanions in the order:

I. $RC \equiv C$ II.

III. $R_2C = CH$ IV. $R_3C - CH_2$

A. I $>$ II $>$ III $>$ IV

B. II $>$ III $>$ IV $>$ I

C. IV $>$ II $>$ III $>$ I

D. I $>$ III $>$ II $>$ IV

Answer: A

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14. The effective electrophile in aromatic sulphonation is:

A. HSO_4^-

B. SO_2

C. $^+SO_2$

D. SO_3

Answer: D

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15. Among the given compounds, the most susceptible to nucleophilic attack at the carbonyl group is

A. CH_3COCl

B. CH_3COOCH_3

C. CH_3CONH_2

D. $CH_3COOCOCH_3$

Answer: A

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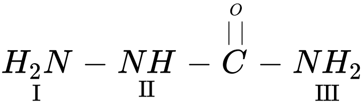
16. Which one of the nitrogen atoms in  $\underset{\text{I}}{H_2N} - \underset{\text{II}}{NH} - \overset{O}{\overset{||}{C}} - \underset{\text{III}}{NH_2}$ is the most nucleophilic?

A. III

B. I

C. II

D. All three nitrogen atoms

Answer: B

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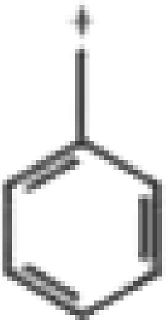
17. Which one of the following is an intermediate in the reaction of benzene with CH_3Cl in the presence of anhydrous $AlCl_3$?

A. Cl^+

B. Cl^-

C. CH_3^+



D.

Answer: C

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18. The hydrolysis of 2-bromo-3-methylbutane by S_N1 mechanism gives mainly:

A. 3-methyl-2-butanol

B. 2-methyl-2-butanol

C. 2,2-dimethyl-1-propanol

D. 2-methyl-1-butanol

Answer: B

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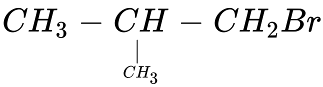
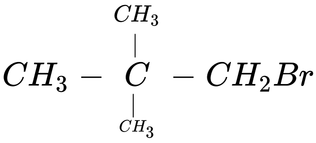
19. In an S_N2 substitution reaction of the type $R-Br+Cl^- \xrightarrow{\text{DMF}} R-Cl+Br^-$. Which one of the following has the highest relative rate?

A. $CH_3 - CH_2 - CH_2Br$

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

C. 
$CH_3 - \overset{\displaystyle CH_3}{\overset{|}{\underset{\displaystyle CH_3}{\underset{|}{C}}}} - CH_2Br$

D. CH_3CH_2Br

Answer: D

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20. The product of which of the following reactions has the highest ease to undergo electrophilic substitution? $C_6H_5COCl \xrightarrow{Pd / BaSO_4}$, $C_6H_6 \xrightarrow{Cl_2 / FeCl_3}$, $C_6H_6 \xrightarrow{CH_3Cl / \text{Anhy}. AlCl_3}$, $C_2H_5OH \xrightarrow{\text{conc.} H_2SO_4}$

A. $C_6H_5COCl \xrightarrow{Pd / BaSO_4}$

B. $C_6H_6 \xrightarrow{Cl_2 / FeCl_3}$

C. $C_6H_6 \xrightarrow{CH_3Cl / \text{Anhy}. AlCl_3}$

D. $C_2H_5OH \xrightarrow{\text{conc.}H_2SO_4}$

Answer: C

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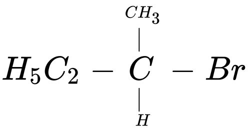
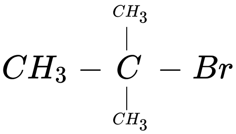
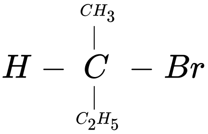
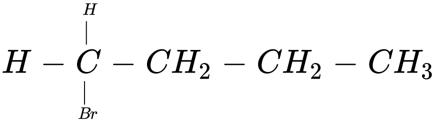
21. Which will undergo fastest S_N2 substitution reaction when treated with NaOH?

A. 
$H_5C_2-\underset{H}{\overset{CH_3}{C}}-Br$

B. 
$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-Br$

C. 
$H-\underset{C_2H_5}{\overset{CH_3}{C}}-Br$

D. 
$H-\underset{Br}{\overset{H}{C}}-CH_2-CH_2-CH_3$

Answer: D

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22. Under identical conditions, S_N1 reaction will occur most efficient with:

A. tert-butyl chloride

B. 1-chlorobutane

C. 2-methyl-1-chloropropane

D. 2-chlorobutane

Answer: A

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23. Consider the reaction, $RCHO + NH_2NH_2 \rightarrow RCH = N - NH_2$.

What type of reactions is it?

A. Electrophilic addition elimination reaction

B. Free radical addition elimination reaction

C. Electrophilic substitution elimination reaction

D. Nucleophilic addition elimination reaction

Answer: D

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24. An incorrect statement with respect to S_N1 and S_N2 mechanism for alkyl halide is:

A. A strong nucleophile in an aprotic solvent increases the rate or favours S_N2 reaction

B. Competing reaction for an S_N2 reaction is rearrangement

C. S_N1 reaction can be catalysed by some Lewis acids

D. A weak nucleophile and a protic solvent increases the rate or favours S_N1 reaction

Answer: B

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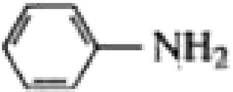
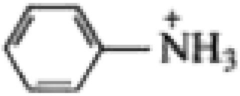
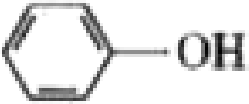
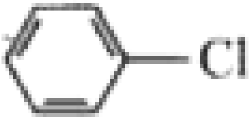
25. In which of the following molecules, the resonance effect is not present?

A. 

B. 

C. 

D. 

Answer: B

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26. For 1-methoxy-1, 3-butadiene, which of the following resonating structures is the least stable?

A. $H_2C = CH - \overset{\oplus}{C}H - \overset{\Theta}{C}H - O - CH_3$

B. $H_2C = CH - \overset{\Theta}{C}H - CH = \overset{\oplus}{O} - CH_3$

C. $H_2\overset{\Theta}{C} - \overset{\oplus}{C}H - CH = CH - O - CH_3$

D. $H_2\overset{\Theta}{C} - CH = CH - CH = \overset{\oplus}{O} - CH_3$

Answer: A

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27. Which of the following statements regarding resonance is not correct?

A. The different resonating structures of a molecule have fixed arrangement of atoms

B. The different resonating structures differ in the arrangement of atoms

C. All resonating structures are equally probable

D. The characteristics of a molecule exhibiting resonance cannot be explained on the basis of one resonating structure.

Answer: C

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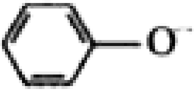
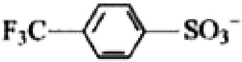
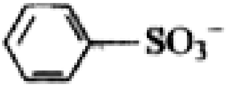
28. Amongst the given species, the best leaving group in a nucleophilic substitution reaction is:

A. OH^-

B. 

C. 

D. 

Answer: C

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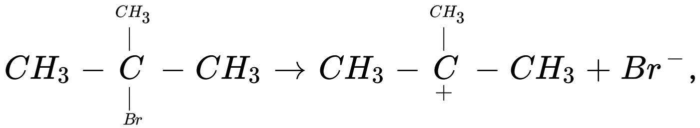
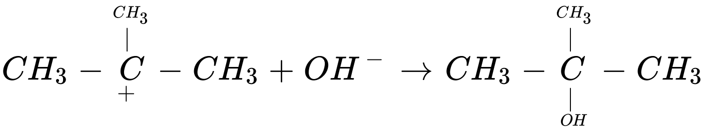
29. The mechanism of the reaction between tert-butyl alcohol and hydroxide ion involves the following steps.

Step 1

$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{Br}{|}}{C}}-CH_3 \rightarrow CH_3-\overset{\overset{CH_3}{|}}{\underset{+}{C}}-CH_3+Br^-$,

Step 2

$CH_3-\overset{\overset{CH_3}{|}}{\underset{+}{C}}-CH_3+OH^- \rightarrow CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{OH}{|}}{C}}-CH_3$

Which of the following statements hold good for this mechanism?

A. step 1 is fast and step 2 is slow

B. step 1 is slow and step 2 is fast

C. both steps 1 and 2 are slow

D. both steps 1 and 2 are fast

Answer: B

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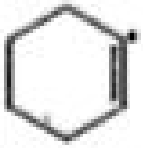
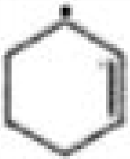
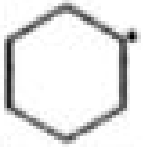
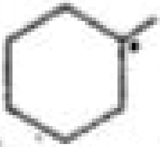
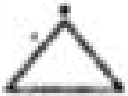
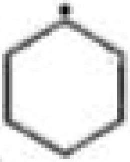
30. In which of the following pairs A is more stable than B?

	A	**B**
A)		
B)		
C)		
D)	$Ph_3C^{\bullet}$	$(CH_3)_3C^{\bullet}$

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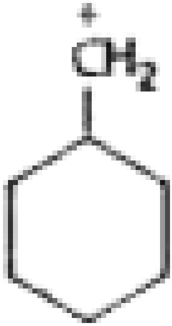
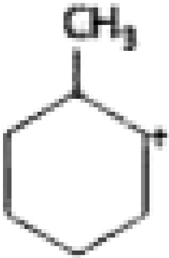
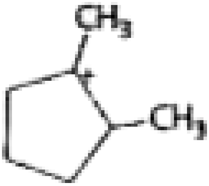
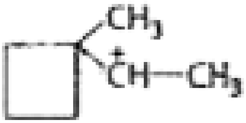
31. Which of the following carbocations will not rearrange?

A. 

B. 

C. 

D. 

Answer: C

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32. Which one of the following substitutents at para-position is most effective in stabilizing the phenoxide

ion?

A. $-CH_3$

B. $-OCH_3$

C. $-COCH_3$

D. $-CH_2OH$

Answer: C

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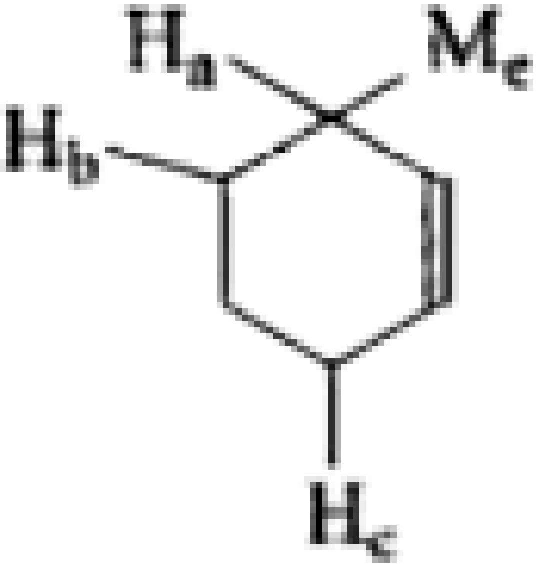
33. The order of decreasing ease of abstraction of hydrogen atoms in the following molecule is



A. $H_a > H_b > H_c$

B. $H_a > H_c > H_b$

C. $H_b > H_a > H_c$

D. $H_c > H_b > H_a$

Answer: B

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34. Which of the following reactions involves a nucleophile?

(I) $CH_3COOH + OH^- \rightarrow CH_3COO^- + H_2O$ (II) $CH_3COCH_3 + CN^- \rightarrow (CH_3)_2C(CN) + (OH)$

(III) $C_6H_5 + CH_3\overset{+}{C}O \rightarrow C_6H_5COCH_3$

A. I and II

B. I and III

C. III only

D. II and III

Answer: A

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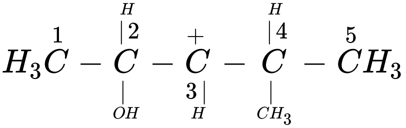
35. In the following carbocation, H / CH_3 that is most likely to migrate to the positively charged carbon is



$$H_3\overset{1}{C}-\underset{\overset{|}{OH}}{\overset{\overset{H}{|2}}{C}}-\underset{\overset{3|}{H}}{\overset{+}{C}}-\underset{\overset{|}{CH_3}}{\overset{\overset{H}{|4}}{C}}-\overset{5}{C}H_3$$

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

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

B. $\sigma \rightarrow \sigma^{*}$ and $\sigma \rightarrow \pi$ electron delocalizations

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

D. π (filled) $\rightarrow \sigma^{*}$ and $\sigma \rightarrow \pi^{*}$ electron delocalizations.

Answer: A

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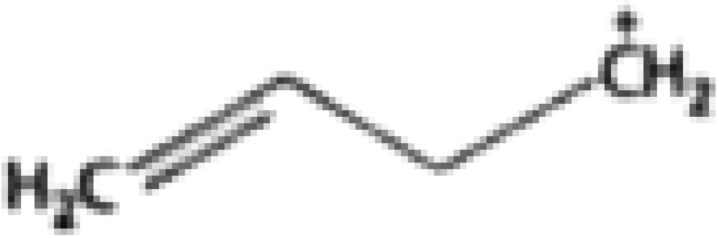
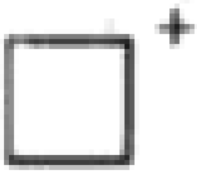
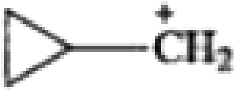
37. If the carbocation



rearranges to gain stability, it will rearrange to

A. 

B. 

C. 

D. 

Answer: C

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38. p-chlorophenol is a stronger acid than phenol because

A. Cl is less electronegative than oxygen atom

B. of the $-I$ effect of a halogen, which is greater than its $+R$ effect

C. of $+R$ effect of Cl, which is stronger than its $-I$ effect

D. of $+R$ effect of Cl

Answer: B

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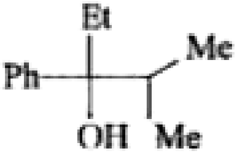
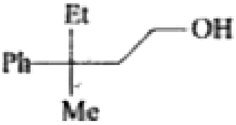
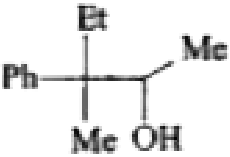
39. The major product in the reaction is:

A. 

B. 

C. 

D. Both (B) and (C)

Answer: A

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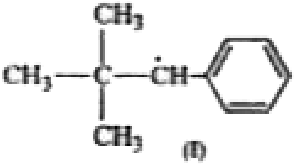
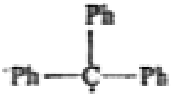
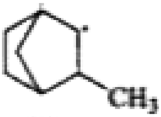
40. Consider the following compounds:


(I)


(II)


(III)

Hyperconjugation occurs in

A. III only

B. I and II

C. I only

D. II only

Answer: A

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Level Ii Assertion Reason Type

1. Assertion : Simple carbanions are usually pyramidal but allyl carbanion is a planar species.

Reason : All the carbon atoms in allyl carbanion are sp^2-hybridized.

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 both (A) and (R) are incorrect

Answer: B

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2. Assertion : All the carbon atoms of but-2-ene lie in one plane.

Reason : All the carbon atoms in but-2-ene are sp^2-hybridized.

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 both (A) and (R) are incorrect

Answer: C

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3. Assertion : A free radical is paramagnetic species.

Reason : A free radical is formed in homolytic fission of covalent 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 both (A) and (R) are incorrect

Answer: B

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4. Assertion : Tertiary carbocations are generally formed more easily than primary carbocation.

Reason : Hyperconjugation as well as inductive effect due to additional alkyl groups stabilize tertiary carbocations.

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 both (A) and (R) are incorrect

Answer: A

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5. Assertion : tert-Butyl carbanion is more stable than methyl carbanion.

Reason : The $+I$ effect of the three methyl groups in tert-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 both (A) and (R) are incorrect

Answer: D

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6. Assertion : The order of stability of carbocations are $R_3C^+ > R_2\overset{+}{C}H > R\overset{+}{C}H_2 > \overset{+}{C}H_3$.

Reason : The stability of the above carbocations is influenced by both resonance and inductive effects.

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 both (A) and (R) are incorrect

Answer: C

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7. Assertion : 1° allylic halides are more reactive than 1° RX in S_N1 reaction.

Reason : Allylic carbocation intermediate is stabilised 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 both (A) and (R) are incorrect

Answer: A

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8. Assertion : Crown ether acts as phase transfer catalysis and increases S_N2 reactivity.

Reason : They strongly complex cation and leave anion (nucleophile) with increased reactivity.

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 both (A) and (R) are incorrect

Answer: A

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9. Assertion : RS^{Θ} is a stronger nucleophile and a better leaving group than RO^{Θ}.

Reason : RS^{Θ} is a weaker base than RO^{Θ}.

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 both (A) and (R) are incorrect

Answer: A

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10. Assertion : E_1cB reaction is favoured by stabilisation of carbanion and poor leaving group.

Reason : The reaction is kinetically of the second order and unimolecular.

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 both (A) and (R) are incorrect

Answer: B

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11. Assertion : Inductive effect is responsible for the dipole moment in the molecules.

Reason : All inductive effects are permanent polarisations in the ground 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 incorrect

D. If both (A) and (R) are incorrect

Answer: A

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12. Assertion : A carbanion is pyramidal in shape like NH_3 and amines.

Resaon : A carbanion has sp^3 hybridised carbon having lone pair of electron on negatively charged carbon.

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 both (A) and (R) are incorrect

Answer: A

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13. Assertion : Hybridisation influences the bond length and bond enthalpy in organic compounds.

Reason : More the 's' character of hybrid orbital, shorter and stronger will be the 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 both (A) and (R) are incorrect

Answer: A

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14. Assertion : Rotation about C = C is restricted.

Reason : Electron charge cloud of the π bond is located above and below the plane of bonding atoms.

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 both (A) and (R) are incorrect

Answer: B

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15. Assertion : Heterolytic fission involves breaking of bond in such a way that the shared pair of electrons go.

Reason : Heterolytic fission involves breaking of bond in such a way that the shared pair of electrons go with one atom.

.

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 both (A) and (R) are incorrect

Answer: B

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16. Assertion : The order of reactivity of carbocations is $3^\circ > 2^\circ 1^\circ$.

Reason : Carbon atom in carbocation is in sp^3 state of hybridisation.

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 both (A) and (R) are incorrect

Answer: D

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17. Assertion : When inductive and electromeric effects operate in opposite directions, the inductive effect. Predominates.

Reason : Inductive effect is the complete transfer of shared pair of π electrons to one of the atoms.

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 both (A) and (R) are incorrect

Answer: D

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18. Assertion : 1° allylic halides are more reactive than 1° RX in S_N1 reaction.

Reason : Allylic carbocation intermediate is stabilised 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 both (A) and (R) are incorrect

Answer: A

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19. Assertion : Rate of ethanolysis of 1° halide

by S_N1 mechanism is fast.

Reason : Carbocation is stabilised 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 both (A) and (R) are incorrect

Answer: A

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20. Assertion : Allyl and benzyl carbonium ions are more stable than propyl carbonium ions.

Reason : Electron releasing group stabilises carbonium ion.

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 both (A) and (R) are incorrect

Answer: B

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