

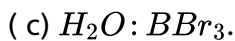
## CHEMISTRY

### BOOKS - CENGAGE CHEMISTRY (HINGLISH)

#### GENERAL ORGANIC CHEMISTRY

#### Illustration

1. Determine the  $F. C$  on each atom in :



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2. (a) Draw Lewis structures for :

(i) Ethanol ( $C_2H_5OH$ )

(ii)  $BrNO$

(iii)  $HOCN$

(iv)  $NH_2OH$  (Hydroxylamine).

(b) Give an isomeric structure for  $NH_2OH$  and explain which structure is more stable.

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3. With the help of *F. C.* Explain which Lewis structure is more stable for the following molecules :

(a)  $N_2O$ : (i)  ${}^{\ominus}\ddot{N} = \overset{2+}{O} = \ddot{N}:{}^{\ominus}$  or (ii)  $N \equiv \overset{\oplus}{N} - \ddot{O}:{}^{\ominus}$

(b)  $H_2SO_4$ : (i)  $H - O - \overset{+2}{S} - O - H$  or (ii)  $H - O - \overset{\ddot{O}:}{\underset{\ddot{O}:}{\parallel}}{S} - O - H$

$HNO_3$ : (i)  $H - O - \overset{\oplus}{N} = \ddot{O}:$  or (ii)  $H - O - \overset{+2}{N} - \ddot{O}:{}^{\ominus}$

(d)  $Cl_2O$ : (i)  $\ddot{Cl} - \ddot{O} - \ddot{Cl}$ : or (ii)  $\ddot{O} - \ddot{Cl} - \ddot{Cl}$ :



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4. Determine  $F. C$  on each atom in

(a) carbocation  $H_3O^{\oplus}$

(b) carbanion  $H_3C^{\ominus}$

(c) free radical  $H_3C^{\cdot}$

(d) carbene  $H_2C:$



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5. Explain whether oxidation, reductio, or neither occurs in the following reactions :

(a)  $H_2C = CH_2 \rightarrow H_3C - CH_3$

(b)  $HC \equiv CH \rightarrow H_3C - CH = O$

(c)  $CH_4 \rightarrow CH_3OH$

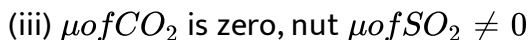
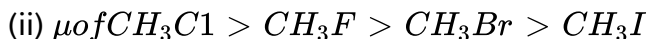
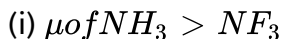
(d)  $H_2CBr_2 \rightarrow H_2C = O$

II. Give the structural formula for the simplest hydrocarbon in which  $C$  has a zero  $O. N$ .

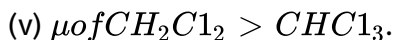


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6. Explain :

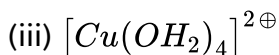
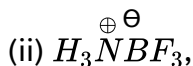
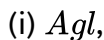


(iv) Why the lone pair of  $e^-$ 's has no effect on the  $\mu$  of  $PH_3$ . The bond angle in  $PH_3$  is  $92^\circ$ .



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7. Describe heterolytic (polar) bond cleavage of :



(b) Name the reverse of heterolytic cleavage.

(c) Describe homolytic bond cleavage of  $CH_3 - Co - Co - CH_3$ .



(d) Compare the relative energies of singlet and triplet carbenes.

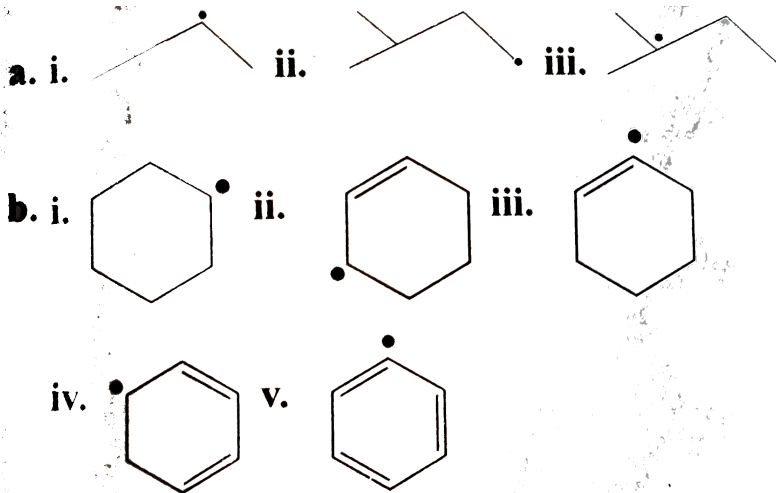
(e) Of  $X_C$  : (singlet) and  $X_2C$  : (triplet), which is stable ?

(f) Of  $F_2C$  : ,  $C1_2C$  : ,  $Br_2C$  : ,  $I_2C$  : (singlet), which is more stable ?

(g) Compare and explain the difference in the  $IE$  and  $EA$  of  $\cdot CH_3$ .

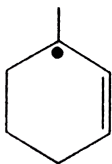
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8. Give the decreasing order of the stabilities of the following :

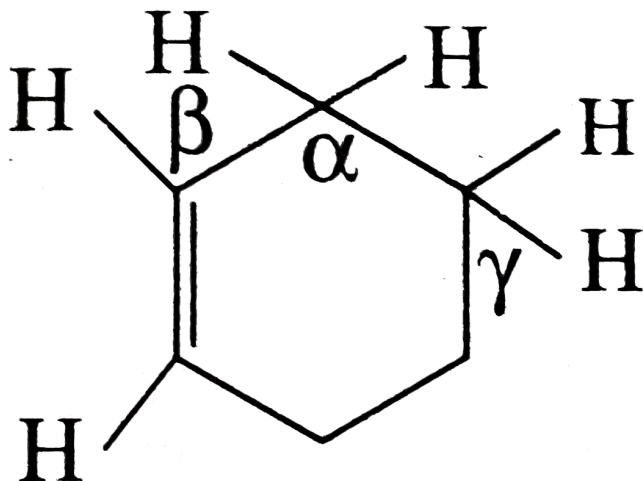
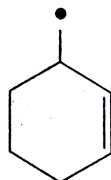




iii.



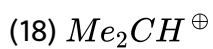
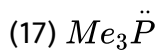
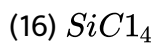
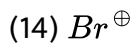
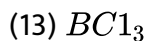
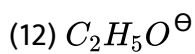
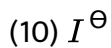
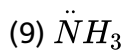
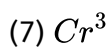
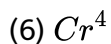
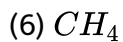
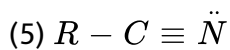
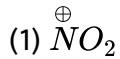
iv.

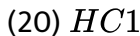
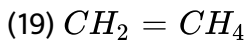


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9. Classify the following species as

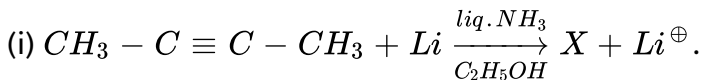
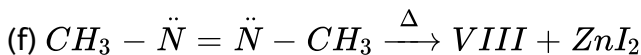
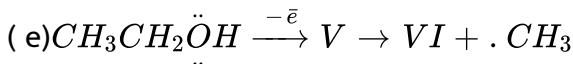
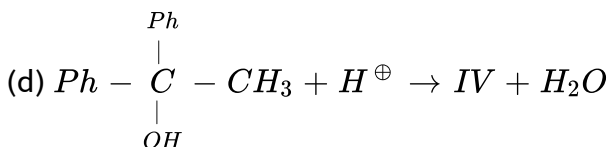
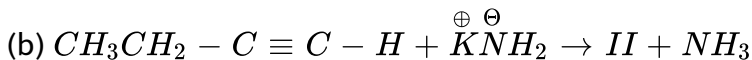
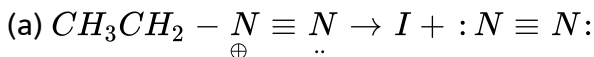
- (a) nucleophile,
- (b) electrophile,
- (c) both, or
- (d) neither.





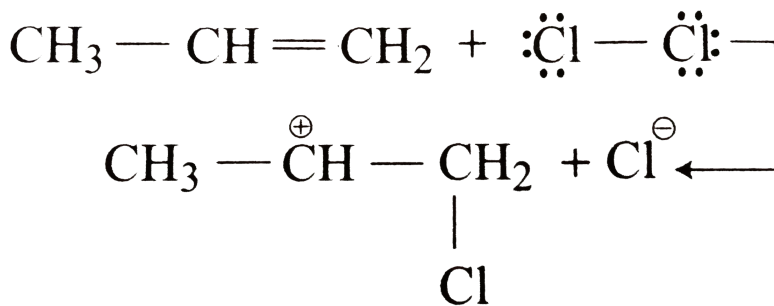
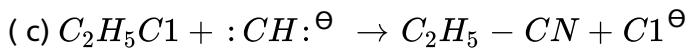
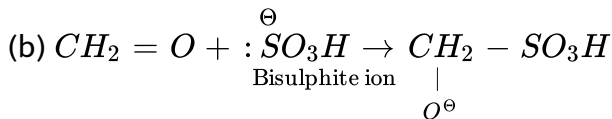
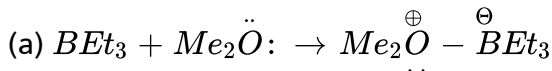
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10. Name the intermediate species formed in the following reactions :

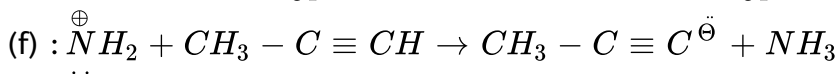
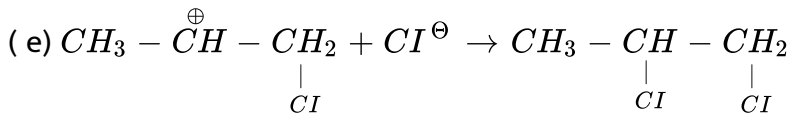


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11. Designate the species (A) and (B) as electrophile ( E ) or nucleophile (Nu) in the following reactions :

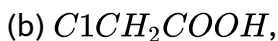
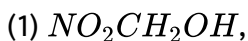


(d)



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12. Give the decreasing order of acidic character.



(c)  $HCOOH$ ,

(d)  $CH_3COOH$ ,

(e)  $CH_3OH$

(2) (a)  $RCOOH$

(b)  $ROH$

(c)  $H_2O$

(d)  $NH_3$

(e)  $CH \equiv CH$

(f)  $RH$

(3) (a)  $HCOOH$

(b)  $PhOH$

(c)  $CH_3OH$

(d)  $C_2H_5OH$

(e)  $CH_3C \equiv CH$

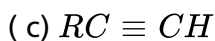
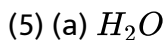
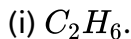
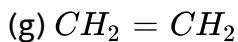
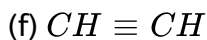
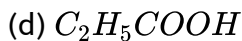
(f)  $CH \equiv CH$ ,

(g)  $NH_3$

(4) (a)  $CH_3COOH$

(b)  $H_3O^{\oplus}$

(c)  $H_2O$



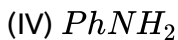
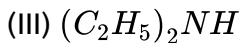
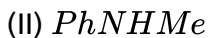
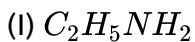
(6) Basic character of conjugate base of Problem 5.



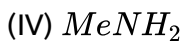
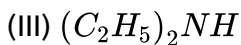
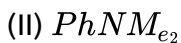
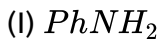
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**13.** Arrange the following :

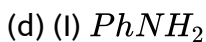
(a) In decreasing order of  $pK_b$  values



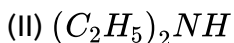
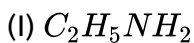
(b) In increasing order of basic strength



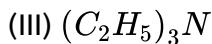
(c) Increasing order of basic strength (I)  $PhNH_2$



(e) In decreasing order of basic strength in gas phase.

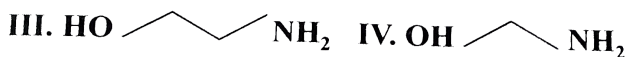






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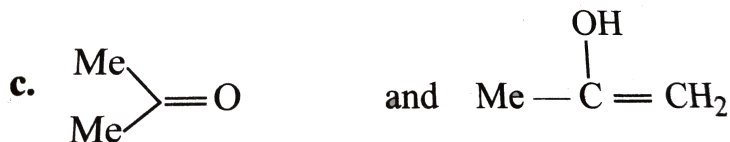
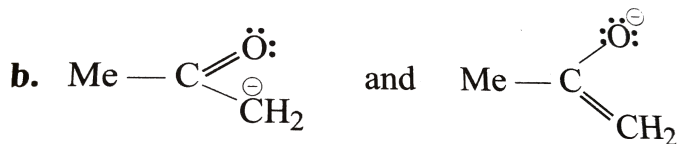
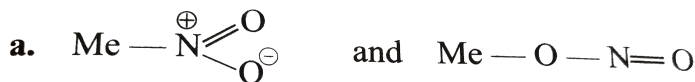
14. Arrange the following in decreasing order of basicities :



(f) Write the conjugate base and conjugate acid of (I)  $HOCH_2CH_2NH_2$ .

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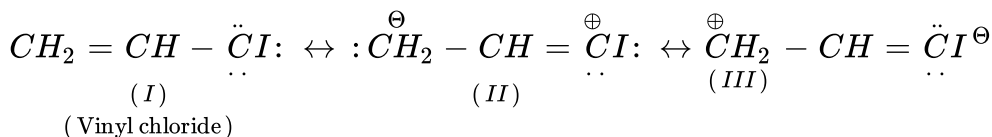
15. Which of the following pairs do not constitute resonance structures ?



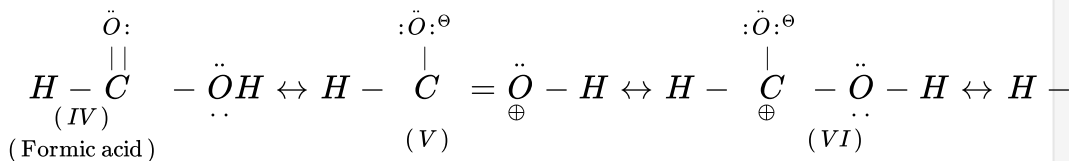
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16. Arrange the following resonating structures in the order of decreasing stability :

(a)



b.



( c ) Write the resonating structure of phenol in order of decreasing stability.

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17. (a) Write the resonance structures of  $NO_2^\ominus$  (nitrite) and  $NO_3^\ominus$  (nitrate ion) in terms of :

(i) outer shell  $\bar{e}$ 's with formal charges

(ii) overlapping atomic orbitals.

( c ) Compare the resonance (delocalisation) energy and stabilities of  $NO_2^\ominus$  and  $NO_3^\ominus$ .

(b) (i) Write the resonance contributing and hybrid structures of (I)  $N_2O$

(II)  $H_2C - N_2$  (diazomethane).

(ii) Give the hybridised state of each atom in each structure.

(iii) Discuss their bond length in each resonance contributing structure and compare with those in hybrid structures.

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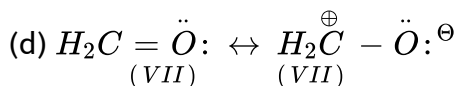
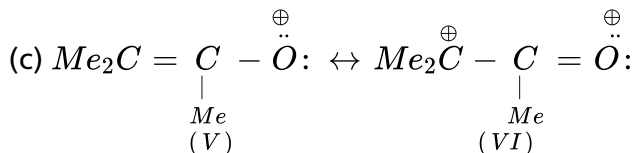
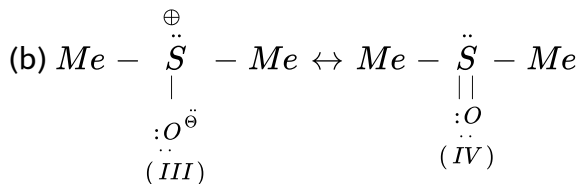
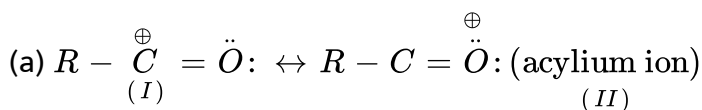
18. (a) Which  $N$  of guanidine ( $I$ ) is more basic and is more likely to be protonated ?

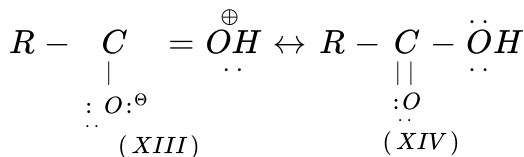
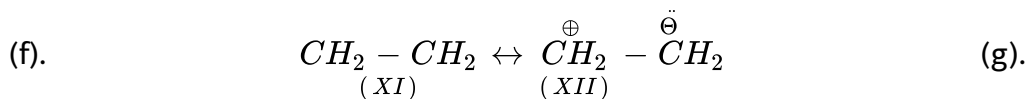
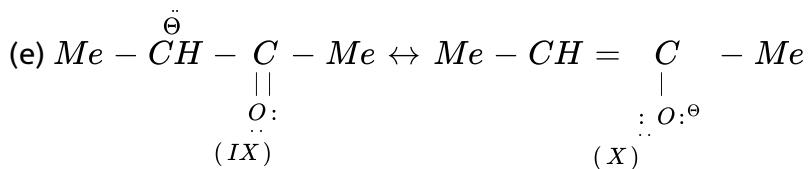
(b) Why guanidine is the strongest organic  $N$  – base ( $K_b \cong 1$ ) ?

(c) Why amides ( $III$ ) are weakly basic (amphoteric), whereas phthalimide ( $IV$ ) is an acid ?

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19. Compare the stabilities of the following pairs of resonance contributing structures and explain how the hybrid structure is related to the structures.





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20. (a) Give the decreasing order of stabilities of the following alkenes :

(i) Ethene,

(ii) Propene,

(iii) *cis* - 2 - butene

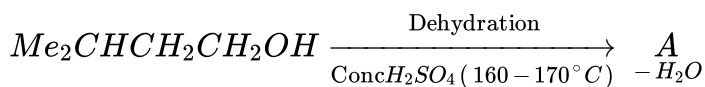
(iv) *trans*-2-Butene

(v) 2 - Methyl-2-butene,

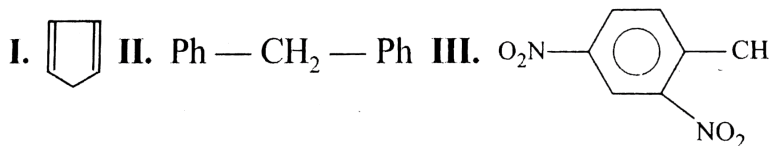
(vi) 2, 3 - Dimethyl-2-butene

(b) Give the decreasing order of reactivity of the above alkenes.

(c) Give the product of the following reaction :

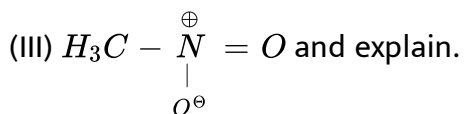
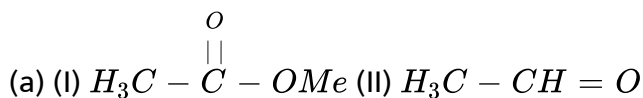


21. (a) Give the resonance structure of the conjugate bases of the following :



(b) Compare the stabilities of their bases and the acidities of the parent compounds.

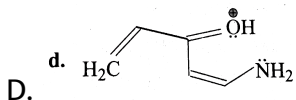
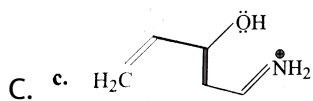
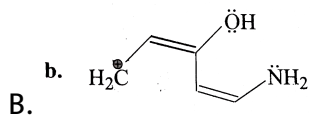
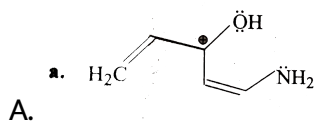
22. Give the decreasing order of acidities of :



(b) Give the factors that affect relative basicities.

## Solved Example

1. Which of the following is the most stable resonance structure ?

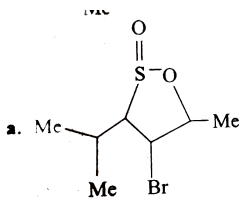
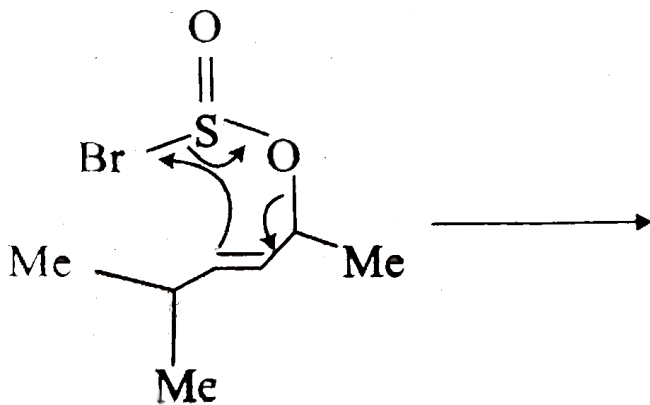


**Answer:**

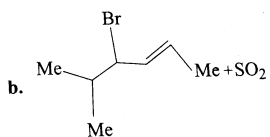


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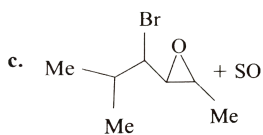
2. Which of the following is a most likely product from the reaction as shown below ?



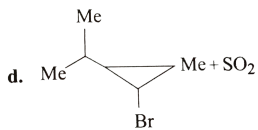
A.



B.



C.



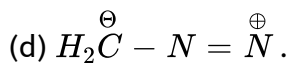
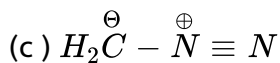
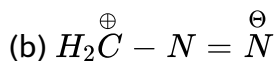
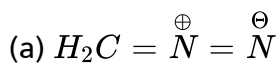
D.

Answer:

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3. Give the stability of the following resonance structures



A.  $a > c > b > d$

B.  $a > b > c > d$

C.  $a > b > d > c$

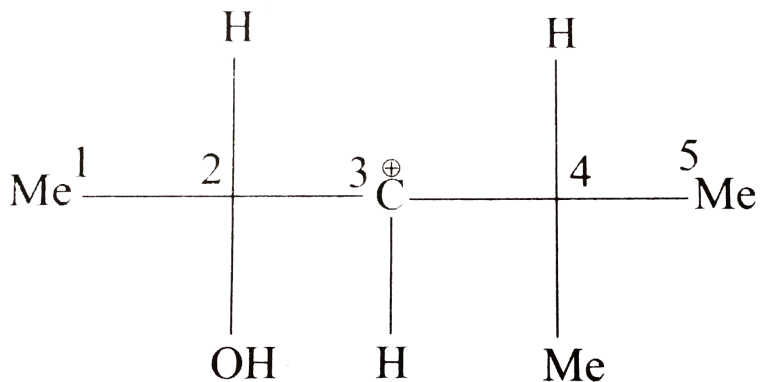
D.  $c > b > d > a$

**Answer: A**



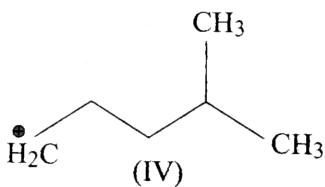
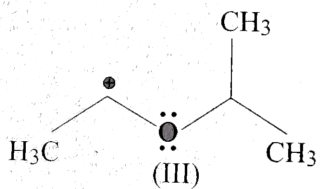
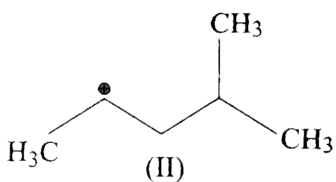
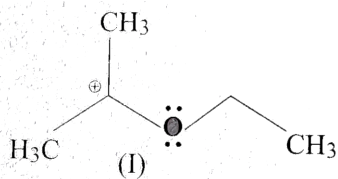
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4. Write the correct resonance structure of the given compound.



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5. Give the correct stability order of the following species :

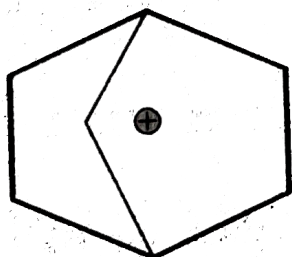


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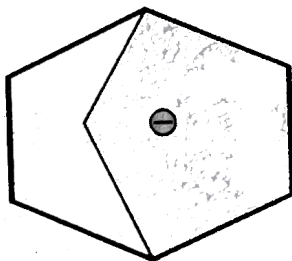
6. Explain the following :

(a) Why  $MeNH\overset{\oplus}{C}H_2$  (I) is more stable more than  $MeCH_2\overset{\oplus}{C}H_2$  (II) when both are  $1^\circ$  carbocations ?

(b) Which of the following intermediate is unstable ?



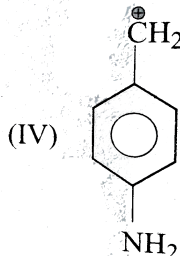
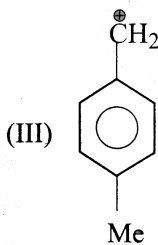
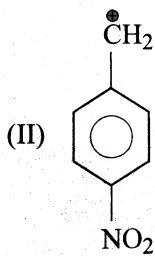
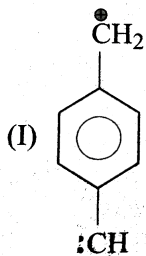
(I)



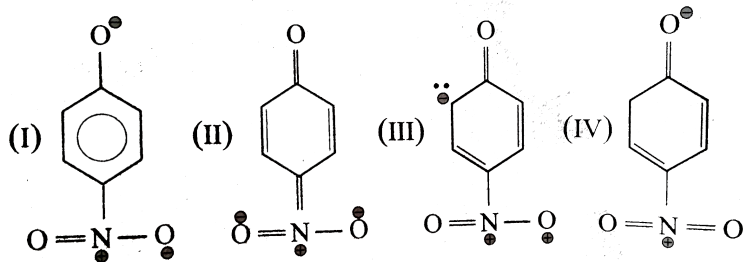
(II)

(c) Why allylic free radical  $(CH_2 - \dot{C}H = CH_2)$  (I) is more stable than propyl free radical  $(\dot{C}H_2 - CH_2 - CH_3)$  (II), when both are  $1^\circ$  free radicals ?

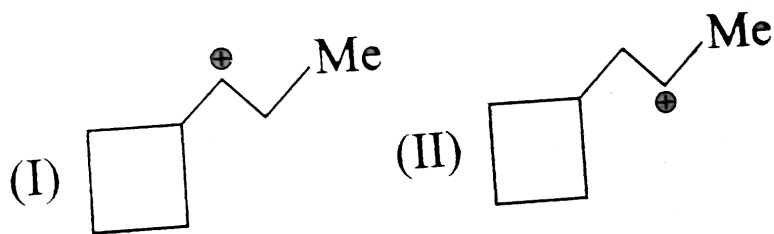
(d) Arrange the following in the decreasing order of their stabilities :



(e) Which of the following resonance structures of *p*-nitro phenoxide is not feasible ?

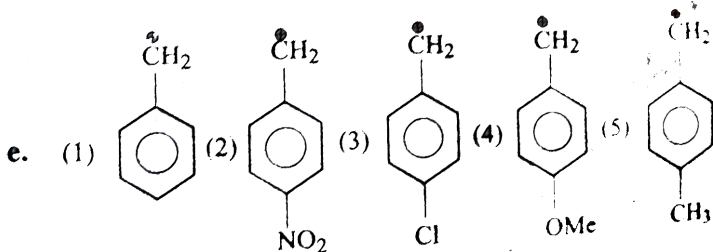
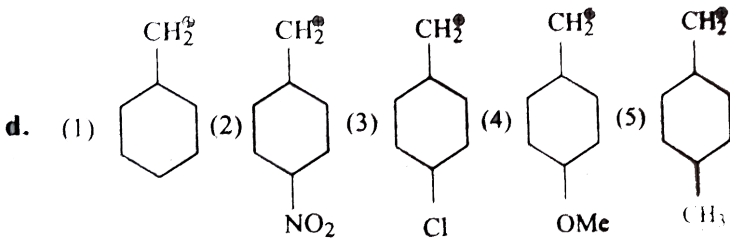
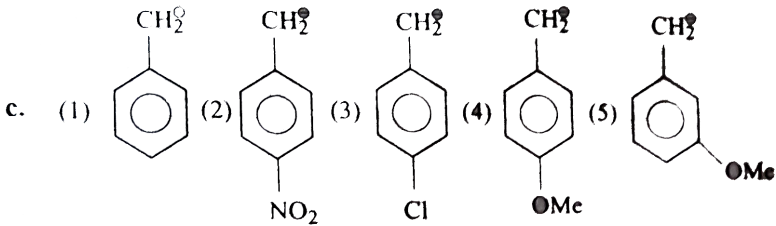
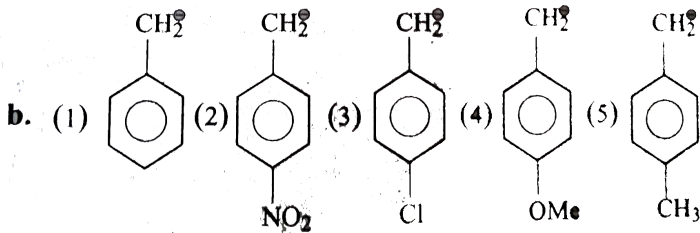
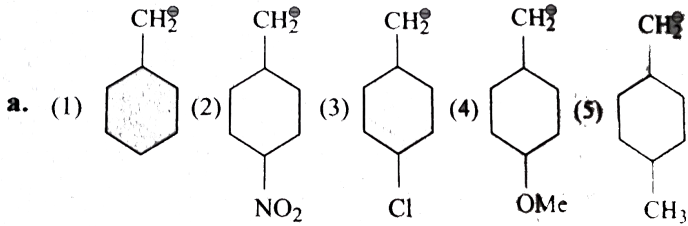


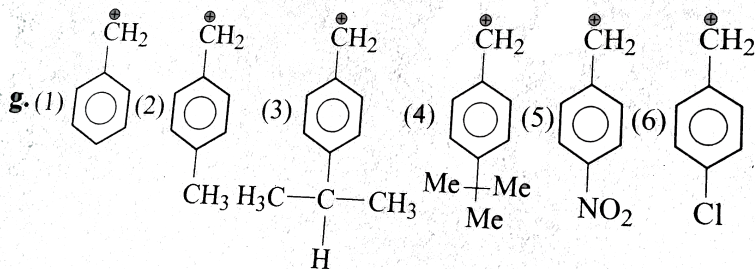
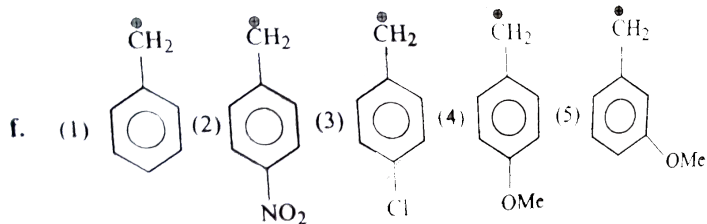
(f) Which of the more stable carbocation ?



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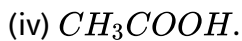
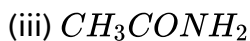
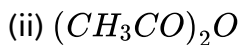
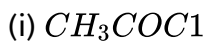
7. Give decreasing order of the stabilities of the following :





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8. Arrange the following compounds in the order of increasing boiling points :



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9. Arrange the compounds of each of the following sub-questions :

(a) In decreasing order of boiling points.

(b) In the decreasing order of solubility in water.

(i) (1) Ethanol

(2) Propane

(3) Pentanol

(ii) (1) Butane

(2) 1,2,3-Pentanetriol

(3) Butyl alcohol (iii) (1) Pentane

(2) Pentanol

(3) 1 - *Hexanol*.



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10. Arrange the following in the decreasing order of boiling points :

(i) (1)  $C_3H_8$

(2)  $C_2H_5OH$

(3)  $(CH_3)_2O$

(4)  $CH_2OHCH_2OH$

(ii) (1) 3 – *Pen tan ol*

(2) *n*-pentane



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**11.** Arrange the following alcohols :

(a) In the decreasing order of their boiling points.

(b) In the decreasing order of their solubility in water.

(1) *n* – *Butylalcohol*

(2) *sec* – *Butylalcohol*

(3) *tert* – *Butylalcohol*.



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**12.** Arrange the following alcohols in the decreasing order of reactivity towards

(a) Lucas reagent

Sodium metal



(1) 1-Butanol

(2) sodium metal

(3) 2-Methyl-2-propanol.



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13. Arrange the following alcohols in the decreasing order of their reactivity with  $HCrO_3$  :

(1)  $C_6H_5CH_2OH$

(2)  $(C_6H_5)_2CHOH$

(3)  $(C_6H_5)_3COH$

(4)  $p - O_2NC_6H_4CH_2OH$

(5)  $p - ClC_6H_4CH_2OH$ .



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14. Arrange the following in the decreasing order of acidity :

(i) (1)  $n$  - Butanol

(2) Methyl alcohol

(3) sec-Butanol

(4) tert-Butanol

(ii) (1)  $HCOOH$

(2)  $CH_3COOH$

(3)  $C_2H_5COOH$

(4)  $C_6H_5COOH$

(5)  $(CH_3)_2CHCOOH$

(6)  $CH_2ClCOOH$

(iii) (1)  $CH_3CH_2CH_2COOH$

(2)  $CH_3CH_2CHClCOOH$

(3)  $CH_3CHClCH_2COOH$

(4)  $CH_2ClCH_2CH_2COOH$

(iv) (1)  $CH_3COOH$

(2)  $CH_2ClCOOH$

(3)  $CHCl_2COOH$

(4)  $CCl_3COOH$

(v) (1)  $CH_3BrCOOH$

(2)  $CH_2ClCOOH$

(3)  $CH_2FCOOH$

(4)  $CH_2ICOOH$

(vi) (1)  $C_6H_5COOH$

(2)  $p - OHC_6H_4COOH$

(3)  $p - CH_3C_6H_4COOH$

(4)  $p - ClC_6H_4COOH$

(5)  $p - BrC_6H_4COOH$

(6)  $p - BO_2C_6H_4COOH$

(vii) (1) o-Hydroxybenzoic acid

(2) p-Hydroxybenzoic acid

(3) 2, 6 – Dihydroxybenzoic acid.

(viii) (1)  $HCOOH$

(2)  $C_6H_5COOH$

(3)  $C_6H_5OH$

(4)  $HCl$

(ix)  $RCOOH$

(2)  $ROH$

(3)  $RH$

(4)  $NH_3$

(5)  $HOH$

(6)  $CH \equiv CH$

(x) (1) Phenol

(2) p-Chlorophenol

(3) p-Nitrophenol

(4) m-Cresol

(xi) (1) Phenol

(2) m-Chlorophenol

(3) m-Nitrophenol

(4) m-Cresol

(xii) (1) Phenol

(2) Benzoic acid

(3) p-Nitrophenol

(4) Carbonic acid

(xiii) (1) Phenol

(2) Benzyl alcohol

(3) Benzene sulphonic acid

(4) Benzoic acid

(xiv) (1) Phenol

(2) p-Chlorophenol

(3) 2,4,-Dichlorophenol

(4) 2,4,6-Trichlorophenol

(xv) (1) Nitroform  $HC(NO_2)_3$

(2) Cyanoform  $HC(CN)_3$

(3)  $CHCl_3$

(xvi) (1)  $CH_3SO_2CH_3$

(2)  $CH_3NO_2$

(xvii) (1)  $CH_3BO - O^\ominus$

(2)  $CH_3CHO$

(3)  $CH_3COOR$ .



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15. Arrange the following in the order of decreasing basic character :

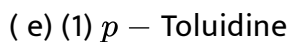
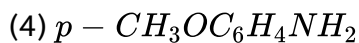
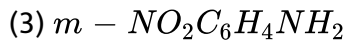
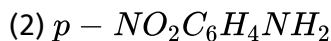
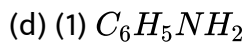
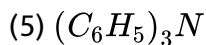
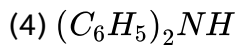
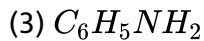
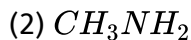
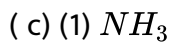
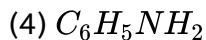
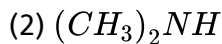
(a) (1)  $CH_3NH_2$

(2)  $(CH_3)_2NH$

(3)  $C_6H_5NH_2$

$NH_3$

(b) (1)  $CH_3NH_2$



(4) *N* – Methylaniline

(g) (1) *RCN*

(2) *RNH<sub>2</sub>*

(3) *RN = CHR*

(h) (1) *C<sub>2</sub>H<sub>5</sub>NH<sub>2</sub>*

(2) (*iso* – *C<sub>3</sub>H<sub>7</sub>*)<sub>3</sub>*N*

(3) *CH<sub>3</sub>CONH<sub>2</sub>*

(4) *CH<sub>3</sub>NHNa<sup>⊖</sup>*

(i) (1) *NH<sub>2</sub><sup>⊖</sup>*

(2) *HC ≡ C<sup>⊖</sup>*

(3) *.<sup>⊖</sup> OH*

(4) *.<sup>⊖</sup> OR*

(5) *R<sup>⊖</sup>*

(6) *RCOO<sup>⊖</sup>*

(j) (1) *H<sup>⊖</sup>*

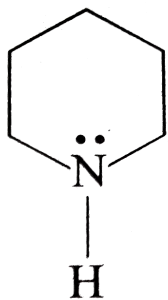
(2) *C1<sup>⊖</sup>*

(3) *NH<sub>2</sub><sup>⊖</sup>*

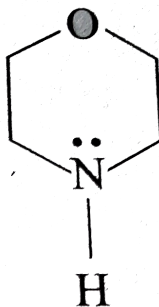
(4) *RCOO<sup>⊖</sup>*

(5)  $RO^{\ominus}$

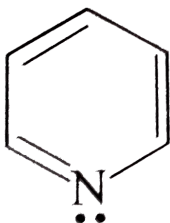
k. (1)



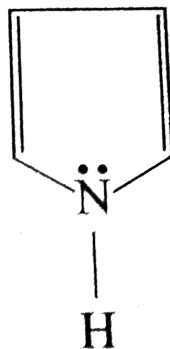
(2)



(3)

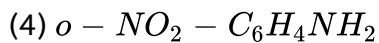
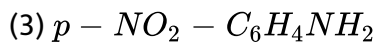
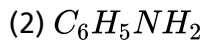
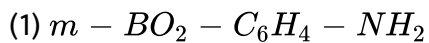


(4)



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16. Arrange in decreasing order of basicity.

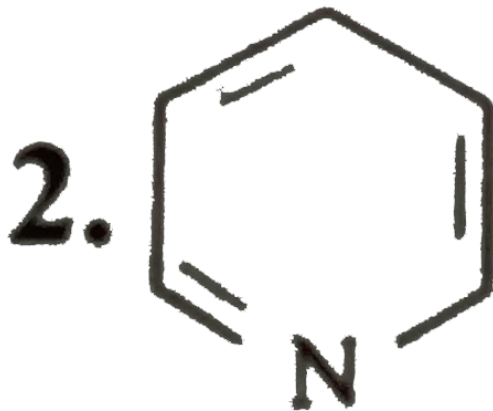




(b) Acidic character of :

(1) 3 - *Butenoic acid* (2) 3-Butynoic acid

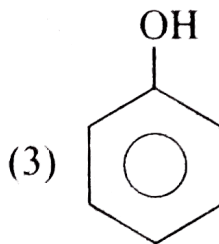
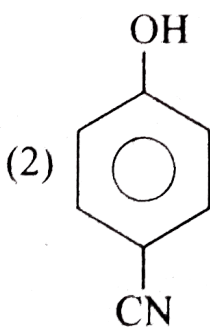
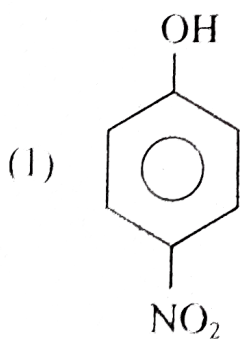
(c) (1)  $(CH_3)_3N$



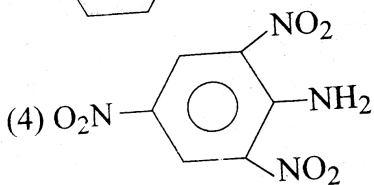
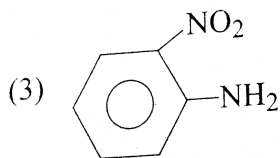
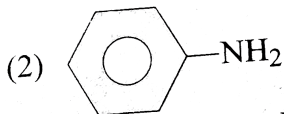
(2)

(3)  $CH_3 - C \equiv N$

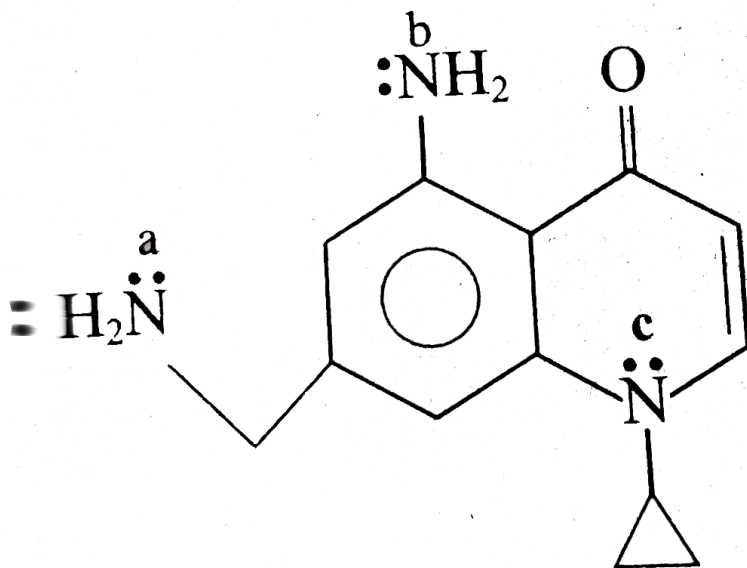
(d) Acidic character of :



(e) Basic character of :



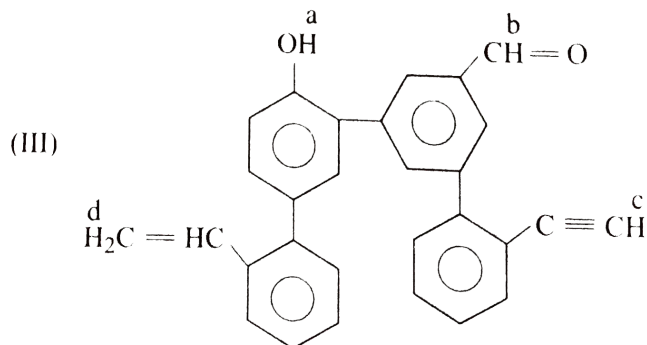
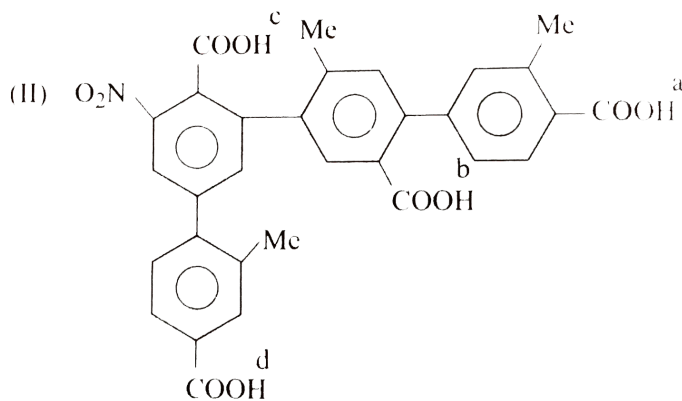
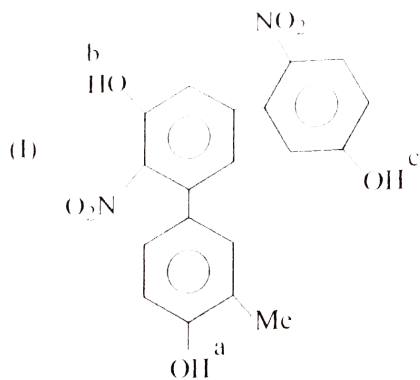
(f) Basic character at  $a$ ,  $b$ , and  $c$ :  $H_2^a$   
 $N$



(g) Acidic Character :  $o$  - ,  $m$  - , and  $p$  - a min *obenzoic acid* and benzoic acid.

(h) Acidic character of  $p$  - chl or  $o$ , bromo, iodo, and fluoro phenols and phenol.

(i) Give the decreasing order of acidic character at *a*, *b*, *c* and *d*.

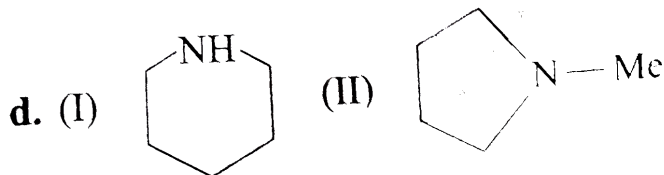
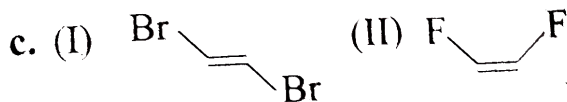
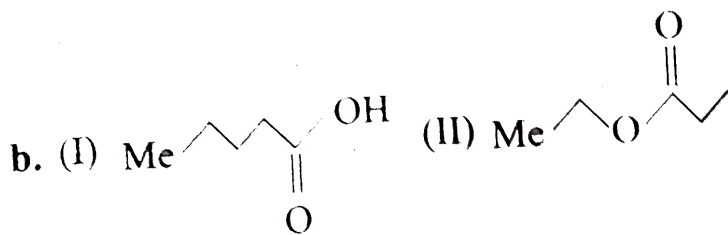
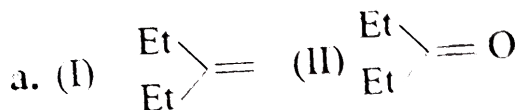


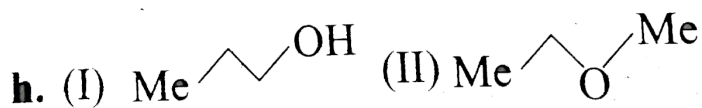
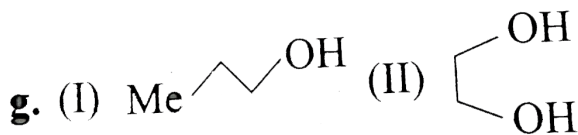
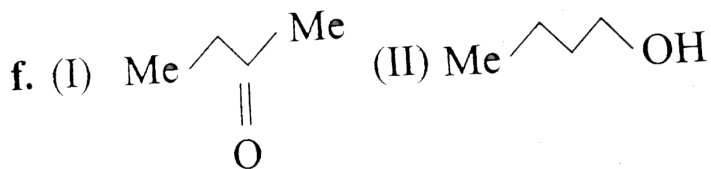
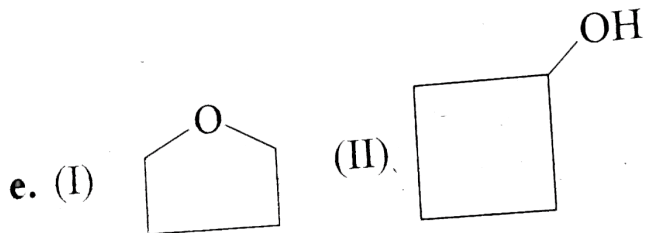
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17. Compare the acidities of amide  $\left( R - \underset{\begin{array}{c} || \\ O \end{array}}{C} - NH_2 \right)$  and sulphonamide  $\left( R - \underset{\begin{array}{c} | \\ O \\ || \\ O \end{array}}{S} - NH_2 \right)$

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18. Which of the following pairs would have higher boiling points ?





i. (I) Heptane (II) Decane

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Subjective

1. Give the decreasing order of acidic character of the following :

(a) (1) Benzene

(2)  $CH_3OH$

(3)  $H_2O$

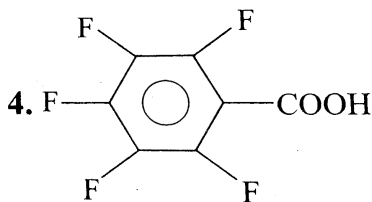
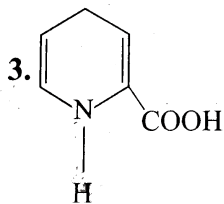
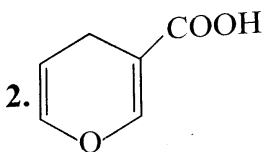
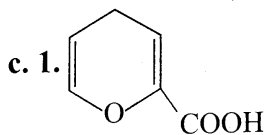
(4)  $CH_3SH$

(b) (1)  $CH_3CH_2COOH$

(2)  $HOCH_2CH_2COOH$

(3)  $ClCH_2CH_2COOH$

(4)  $O_2NCH_2CH_2COOH$



(c)

(d) (1)  $[Fe(H_2O)_6]^{2+}$

(2)  $[Fe(H_2O)_6]^{3+}$

(3)  $[Al(H_2O)_6]^{3+}$

(4)  $[Cr(H_2O)_6]^{3+}$

(e) (1)  $HCHO$

(2)  $CH_3CHO$

$PhCHO$

(4)  $CH_3 - \overset{\overset{O}{||}}{C} - CH_3$  (5)  $R - \overset{\overset{O}{||}}{C} - Cl$

(6)  $(CH_3CO)_2$

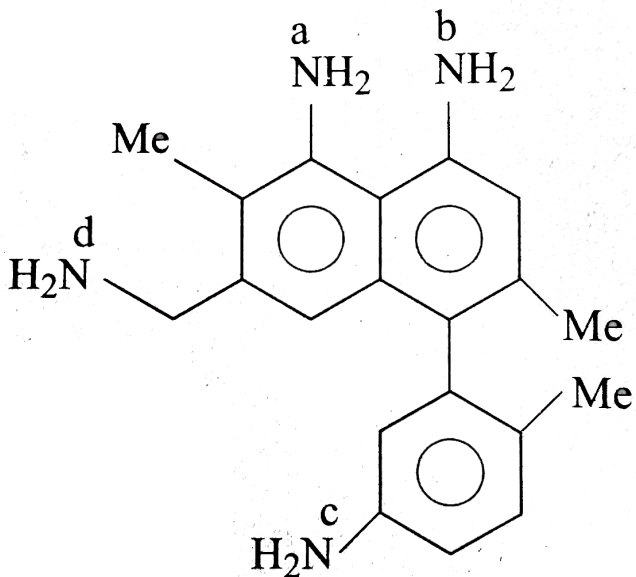
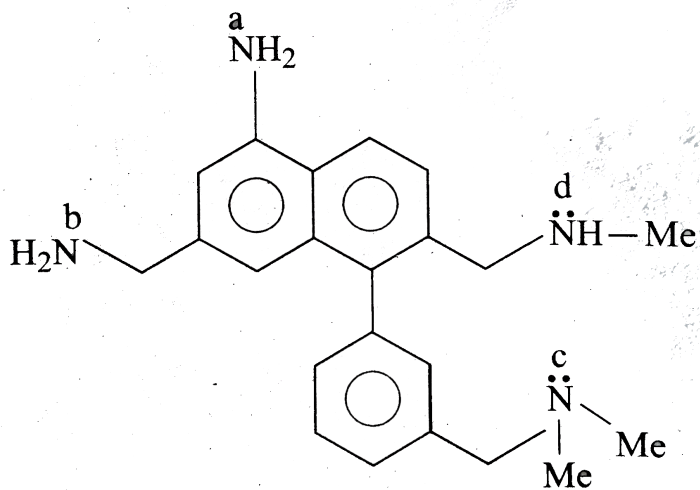
(7)  $(RCOOR)$

(8)  $RCONH_2$ .



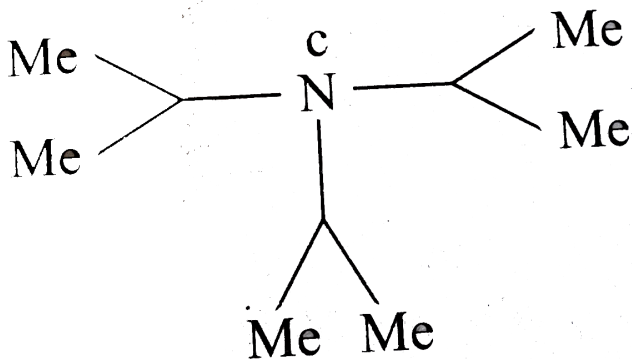
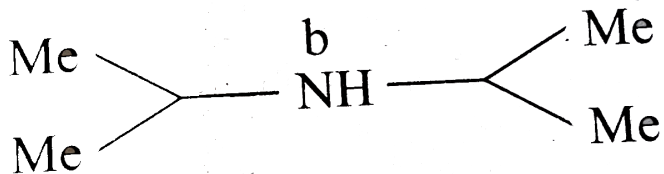
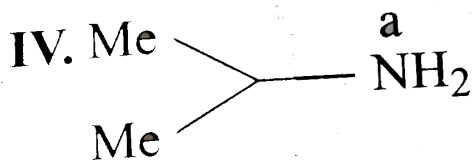
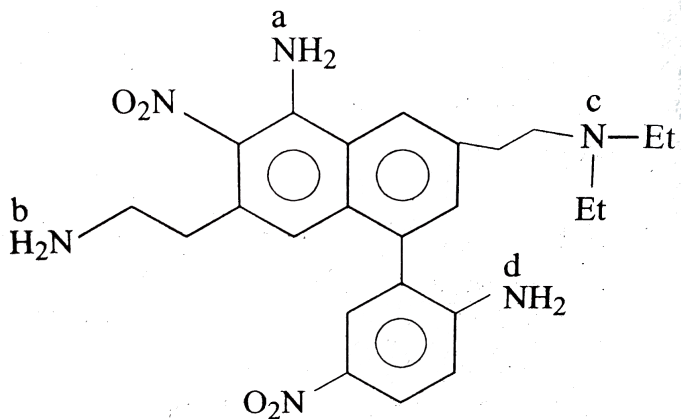
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2. Give the decreasing order of basic character at  $a, b, c, d$  in the following compounds :

**I.****II.**



III.



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3. Why cyanoanilinium ion  $\left(C_6H_4(CN)\overset{\oplus}{N}H_3\right)(I)$  is a stronger acid than anilinium ion (II) ?

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4. Give the order of acidic character, *o* – , *p* – , and *m* – cyanoanilinium ions.

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5. Give the order of acidic character of the following :

- (i) (a) *p*-Nitrobenzoic acid
- (b) 2, 4 – dinitrobenzoic acid
- (c) 2, 4, 5 – Trimethylbenzoic acid
- (d) 2, 3, 4 – Trinitrobenzoic acid
- (ii) (a)  $Ph_3CH$
- (b)  $Ph_2CH_2$
- (c)  $PhCH_3$

(iii) 2, 6-Di-tert-butyl phenol is a much weaker acid than phenol.

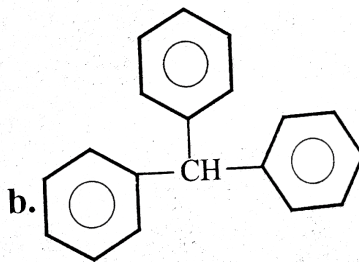
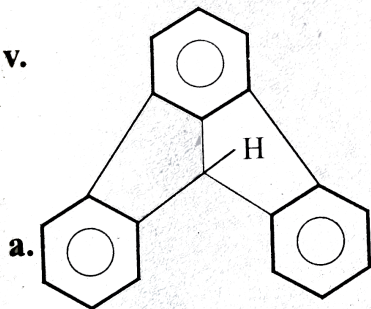
(iv) (a) Phenol

(b) Cyclohexanol

(c) p-Bromophenol

(d) p-Methoxy phenol

v.



(v)

(vi) (a) Benzoic acid

(b) *p* – tert-Butylbenzoic acid

(c) p-Nitrobenzoic acid.

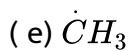
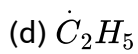
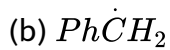
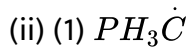
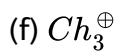
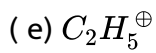
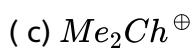


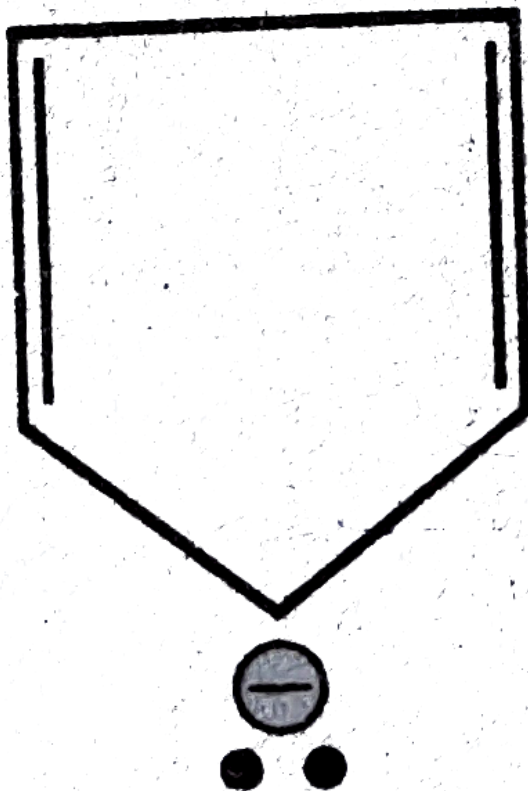
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6. Give the order of the stabilities of the following :

(i) (a)  $PhCH_2^{\oplus}$

(b)  $Ph_2CH^{\oplus}$





(iii) (a)

b)  $Ph_3C^\ominus$

(c)  $Me_2CH^\ominus$

(d)  $CH_3^\ominus$

(e)  $C_2H_5^\ominus$

(f)  $Me_3C^\ominus$ .

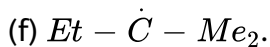
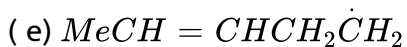
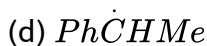
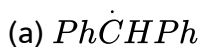


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7. Why pyridine is a much weaker base than aliphatic amines ?

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8. Give the decreasing order of the stabilities of the following free radicals :



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9. Give the decreasing order of acidic strength of the following :



(c)  $HF$

(d)  $NH_3$

(e)  $LiH$

(f)  $BeH_2$ .



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10. Which is a stronger base towards a proton  $\overset{\ominus}{P}H_2$  or  $\overset{\ominus}{N}H_2$  ?



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11. Give the decreasing order of basic strength of the following :

(a)  $NH_3$

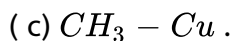
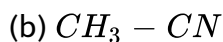
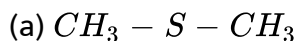
(b)  $NH_2OH$

(c)  $NH_2 - NH_2$ .



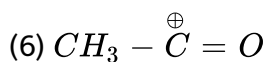
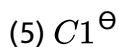
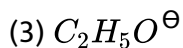
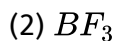
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1. Using the curved-arrow notation, show the formation of reactive intermediates when the following covalent bonds undergo heterolytic cleavage :

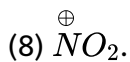
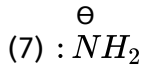


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2. Categorise the following molecules/ions as nucleophile or electrophile.

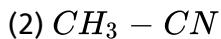
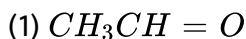






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3. Identify electrophilic centre in the following :



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4. Which bond is more polar in the following pairs of molecules ?



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5. In which ( $C - C$ ) bond of  $\left( H_3\overset{3}{C} - \overset{2}{C}H_2 - \overset{1}{C}H_2 - Br \right)$ , the inductive effect is expected to be the least ?

A. 1

B. 2

C. 3

D. 2 and 3

**Answer: C**



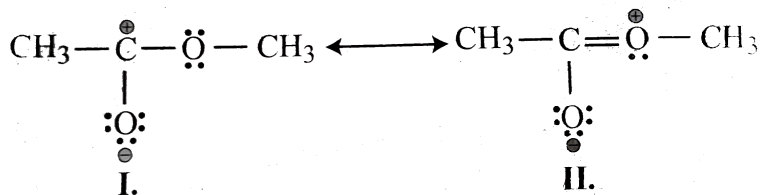
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6. Write the resonance structures of (1)  $CH_3COO^\ominus$  and (2)  $CH_2 = CH - CHO$ . Indicate the relative stability of the contributing structures.



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7. Explain why the following two structures (I) and (II) cannot be the major contributors to the real structures of  $CH_3COOCH_3$ .



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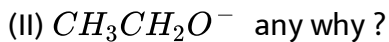
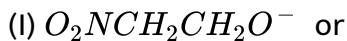
8. Explain why  $(CH_3)_3C^{\oplus}$  is more stable than  $CH_3\overset{\oplus}{C}H_2$  and  $\overset{\oplus}{C}H_3$  is less stable.

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9. Draw the complete structures of bromomethane, bromoethane, 2-bromopropane, and tert-butylbromide. Arrange them in the order of increasing steric hindrance.

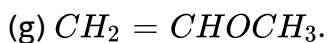
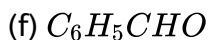
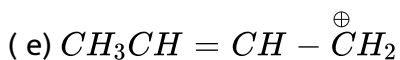
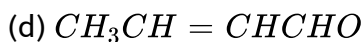
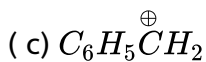
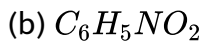
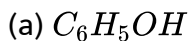
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10. Which is expected to be more stable,



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11. Draw the resonance structures for the following compounds. Show the electron shift using curved-arrow notation.

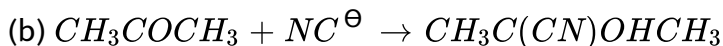
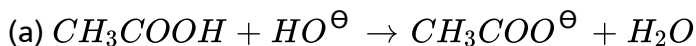


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12. Explain why alkyl groups act as electron donors when attached to a  $\pi$  - system.

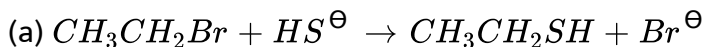
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13. Classify the reagents shown in bonds in the following equations as nucleophiles or electrophiles. Use curved-arrow notation to show the electron movement.



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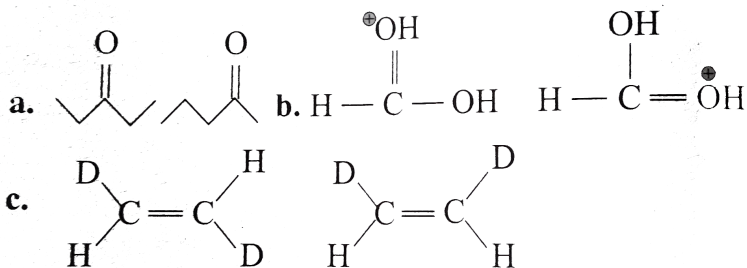
14. Classify the following in one of the reaction type studied.





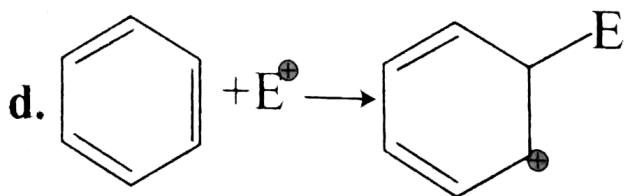
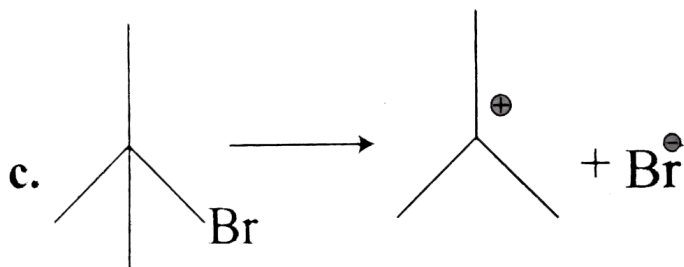
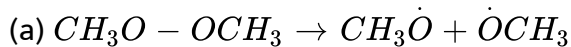
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15. What is the relationship between the members of the following pairs of structures? Are they identical, structural, or geometrical isomers, or resonance contributors?



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16. For the following bond cleavages, use curved-arrow to show the electron flow and classify each as homolysis or heterolysis. Identify intermediate products as free radical, carbocation, and carbanion.



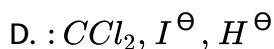
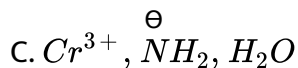
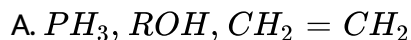
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## Comprehension

1. An organic reaction occurs by using reagents called electrophiles and nucleophiles via the formation of some reactive intermediates called carbocations, carbanions, free radicals, carbenes, nitrenes, radical cations,

and radical anions.

Which of the following contains nucleophiles only ?



**Answer: A**



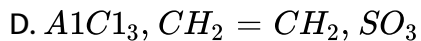
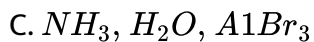
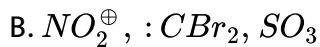
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2. An organic reaction occurs by using reagents called electrophiles and nucleophiles via the formation of some reactive intermediates called carbocations, carbanions, free radicals, carbenes, nitrenes, radical cations, and radical anions.

Which of the following contains electrophiles only ?





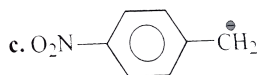
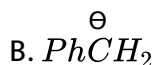
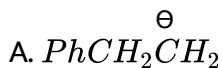


**Answer: B**

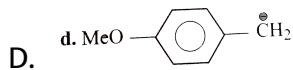
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3. An organic reaction occurs by using reagents called electrophiles and nucleophiles via the formation of some reactive intermediates called carbocations, carbanions, free radicals, carbenes, nitrenes, radical cations, and radical anions.

The most stable carbanion is :



C.

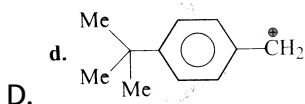
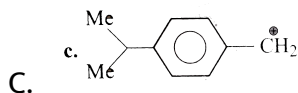
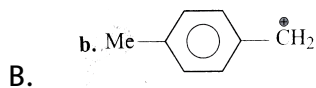


Answer: C

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4. An organic reaction occurs by using reagents called electrophiles and nucleophiles via the formation of some reactive intermediates called carbocations, carbanions, free radicals, carbenes, nitrenes, radical cations, and radical anions.

The most stable carbocation is :



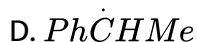
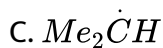
**Answer: B**



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5. An organic reaction occurs by using reagents called electrophiles and nucleophiles via the formation of some reactive intermediates called carbocations, carbanions, free radicals, carbenes, nitrenes, radical cations, and radical anions.

The most stable free radical is :



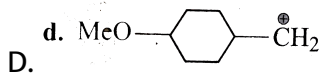
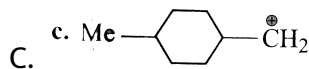
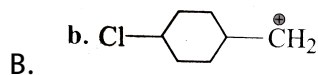
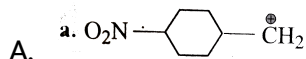
**Answer: D**



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6. An organic reaction occurs by using reagents called electrophiles and nucleophiles via the formation of some reactive intermediates called carbocations, carbanions, free radicals, carbenes, nitrenes, radical cations, and radical anions.

The least stable carbocation is :



**Answer: A**



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7. Carbene intermediates are produced by the photolysis of diazomethane ( $CH_2N_2$ ) or ketene ( $CH_2 = C = O$ ). They are also produced by the reaction of  $CHX_3$  with base or by Simmons-Smith

reaction. There are two types of carbenes, singlet and triplet. They are so called due to their spin state.

Spin state of carbene is determined by using the formula :

where  $S$  is the sum of all electron spin numbers.

A.  $S + 2$

B.  $2S + 1$

C.  $2S + 2$

D.  $S + 1$

**Answer: B**



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8. Carbene intermediates are produced by the photolysis of diazomethane ( $CH_2N_2$ ) or kenene ( $CH_2 = C = O$ ). They are also produced by the reaction of  $CHX_3$  with base or by Simmons-Smith reaction. There are two types of carbenes, singlet and triplet. They are so

called due to their spin state.

Singlet and triplet carbene are same in :

- A. Types of hybridisation
- B. Number of unshared  $\bar{e}$  pairs (or  $LP\bar{e}$ 's)
- C. Number of  $\sigma$  – bonds
- D. Bond angle

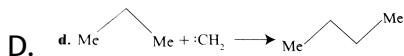
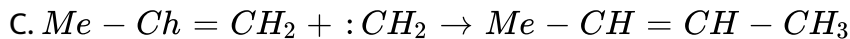
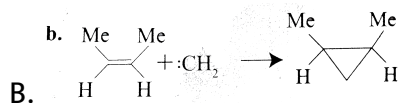
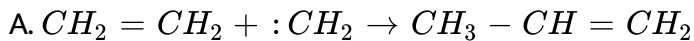
**Answer: C**



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9. Carbene intermediates are produced by the photolysis of diazomethane ( $CH_2N_2$ ) or kenene ( $CH_2 = C = O$ ). They are also produced by the reaction of  $CHX_3$  with base or by Simmons-Smith reaction. There are two types of carbenes, singlet and triplet. They are so called due to their spin state.

In which reaction, the insertion of methylene increases potential energy ?

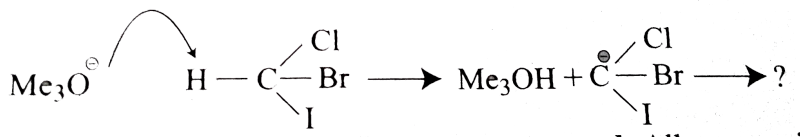


Answer: B

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10. Carbene intermediates are produced by the photolysis of diazomethane ( $CH_2N_2$ ) or ketene ( $CH_2 = C = O$ ). They are also produced by the reaction of  $CHX_3$  with base or by Simmons-Smith reaction. There are two types of carbenes, singlet and triplet. They are so called due to their spin state.

Which carbene is produced in the following reactions ?



A. :  $CClBr$

B. :  $CBrI$

C. :  $CClI$

D. All

**Answer: A**

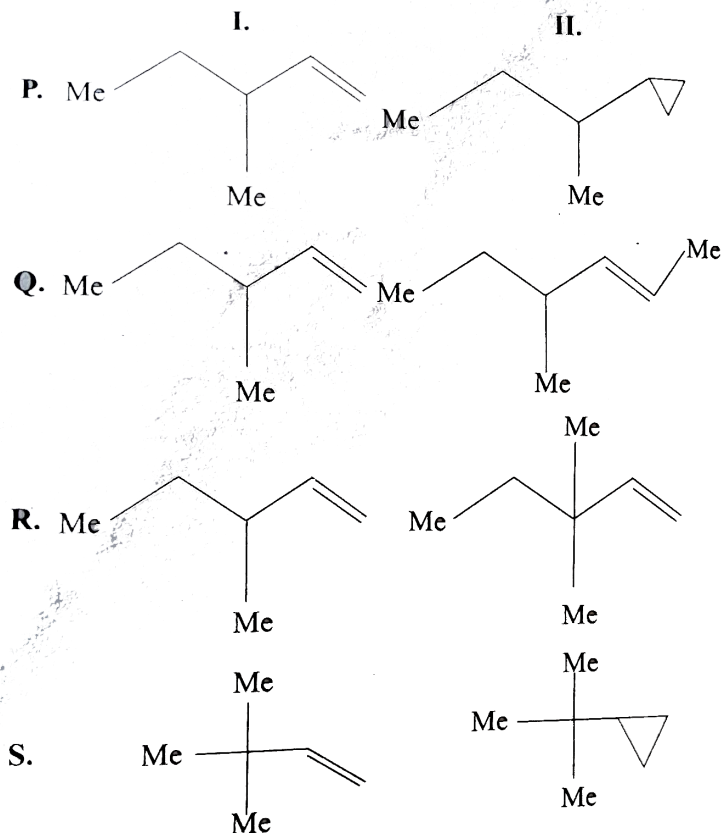
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11. Carbene intermediates are produced by the photolysis of diazomethane ( $CH_2N_2$ ) or ketene ( $CH_2 = C = O$ ). They are also produced by the reaction of  $CHX_3$  with base or by Simmons-Smith reaction. There are two types of carbenes, singlet and triplet. They are so called due to their spin state.

An optically active alkene ( $I$ ) with lowest molecular mass on hydrogenation gives optically inactive alkane, but on insertion of methylene carbene ( $:CH_2$ ) in ( $I$ ), it gives optically active compound



(II). The compounds (I) and (II) are :



A. P

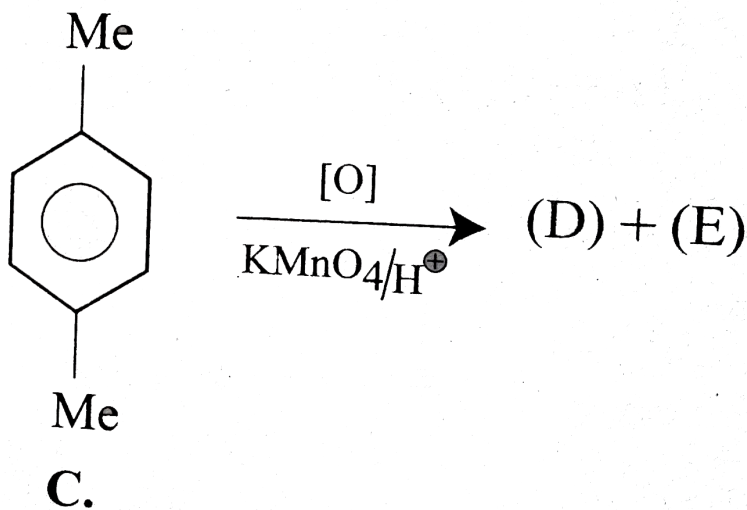
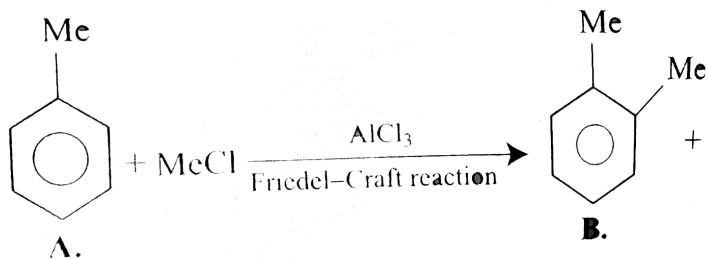
B. P,R

C. P,Q,

D. P,Q,R

Answer: C

12. Consider the following reaction :



The compound *D* is an ortho-isomer and *E* is a *p*-isomer. The compounds *D* and *E*, respectively, are :

A. Phthalic and isophthalic acids

B. Isophthalic and phthalic acids

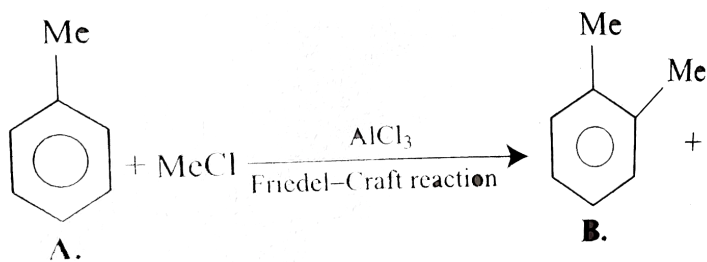
C. Terephthalic and phthalic acids

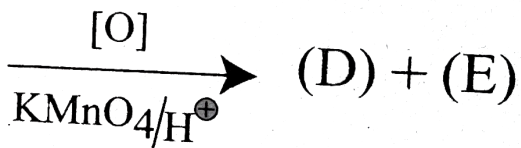
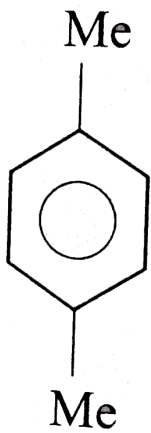
D. Phthalic and terephthalic acids.

Answer: D

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13. Consider the following reaction :





C.

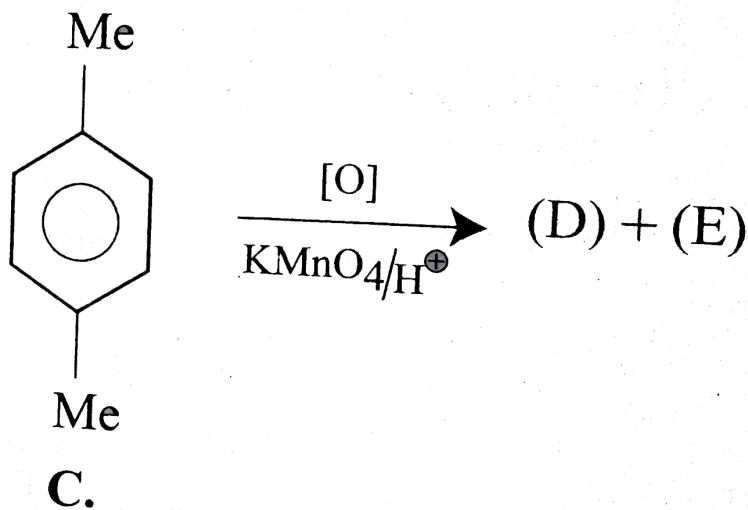
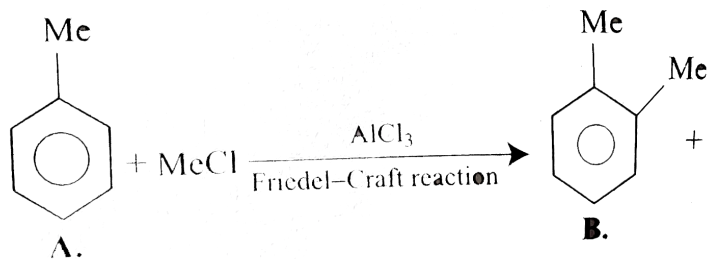
The *m* - isomer of *D* and *E* is called :

- A. Phthalic acid
- B. Isophthalic acid
- C. Terephthalic acid
- D. None

**Answer: B**

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14. Consider the following reaction :



The decreasing order of acidic strengths of (*I*) phthalic (*II*) terephthalic, and (*III*) isophthalic acids is :

A.  $I > II > III$

B.  $I > III > II$

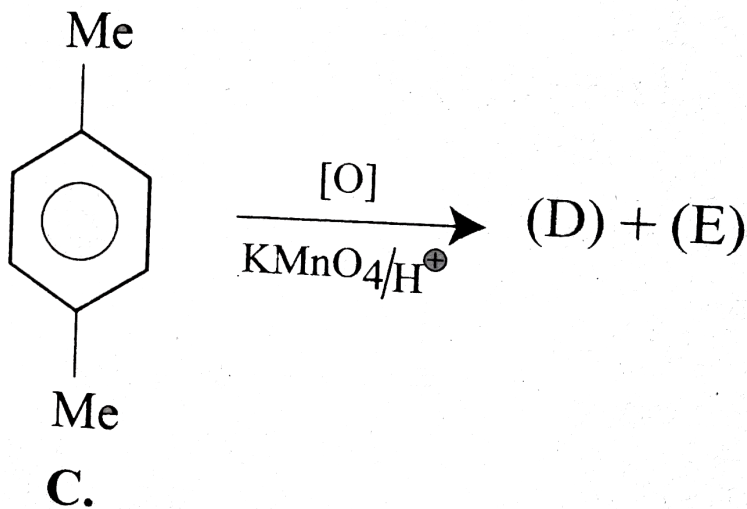
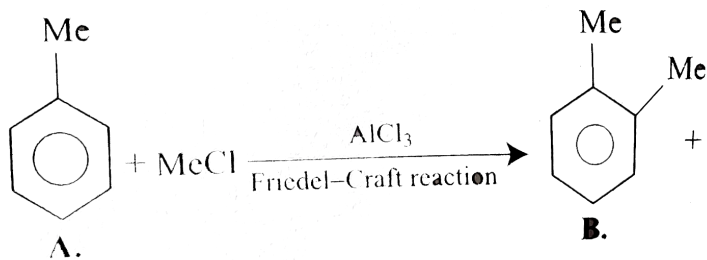
C.  $III > II > I$

D.  $II > III > I$

Answer: A

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15. Consider the following reaction :



Which of the above three acids, *I*, *II*, and *III* forms anhydride on heating ?

A. I

B. II

C. III

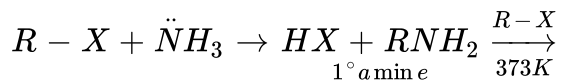
D. All

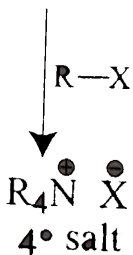
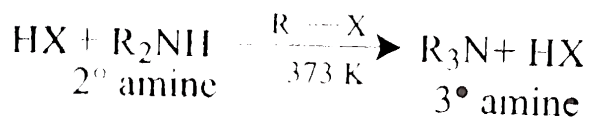
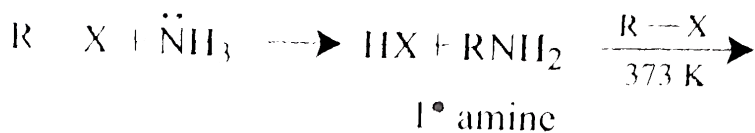
**Answer: A**



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**16.** Consider the Hofmann ammonolysis reaction :





If  $R = CH_3$ , the correct order of basic character of  $1^\circ$  amine,  $2^\circ$  amine,  $3^\circ$  amine, and  $NH_3$  in aqueous medium is :

- A.  $1^\circ > 2^\circ > 3^\circ > NH_3$
- B.  $2^\circ > 3^\circ > 1^\circ > NH_3$
- C.  $2^\circ > 1^\circ > 3^\circ > NH_3$
- D.  $2^\circ > 1^\circ > NH_3 > 3^\circ$

**Answer: C**

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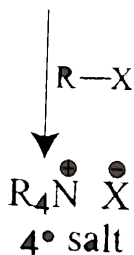
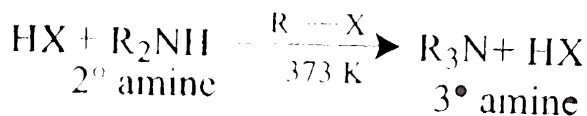
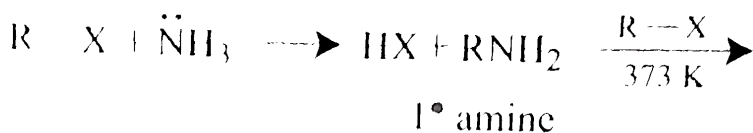
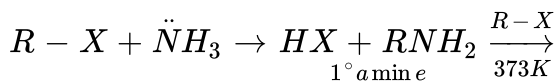




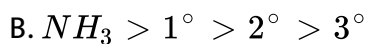
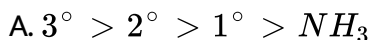
Answer: A

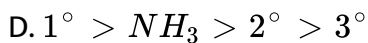
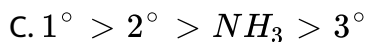
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18. Consider the Hofmann ammonolysis reaction :



If  $R = Me_2CH - (iso \ \alpha \ yl)$ , the correct order of basic character of the above amines in aqueous medium is :

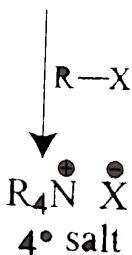
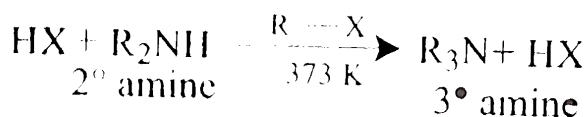
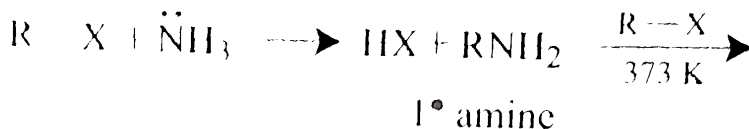
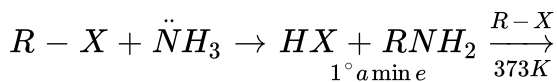




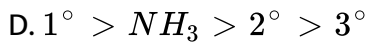
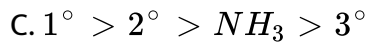
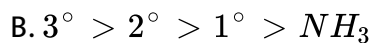
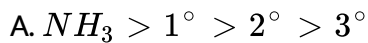
Answer: D

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19. Consider the Hofmann ammonolysis reaction :



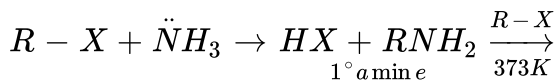
If  $R = Me_3C - (t - butyl)$ , the correct order of basic character of the above amines in aqueous medium is :

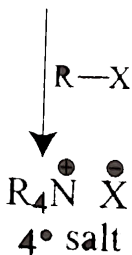
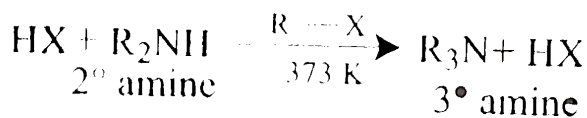
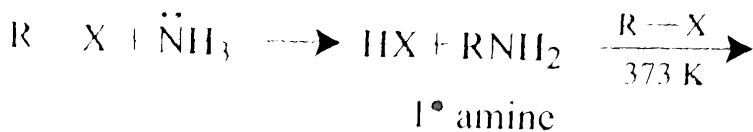


Answer: A

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20. Consider the Hofmann ammonolysis reaction :





For any value of  $R$ , the correct order of basic character of the above amines in gaseous phase of nonpolar solvent is :

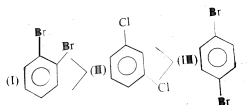
- A.  $3^\circ > 2^\circ > NH_3 > 1^\circ$
- B.  $3^\circ > 2^\circ > 1^\circ > NH_3$
- C.  $2^\circ > 3^\circ > NH_3 > 1^\circ$
- D.  $1^\circ > 2^\circ > 3^\circ > NH_3$

**Answer: B**

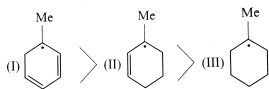
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1. Which of the following statement is correct ?

A. Dipole moment :



B. Stability of free radical :



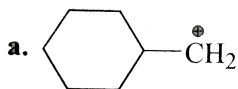
C. Basic strength :  $CH_3O^\ominus > OH^\ominus > RS^\ominus$

D. Basic and nucleophilic strength :  $I^\ominus > Br^\ominus > Cl^\ominus > F^\ominus$

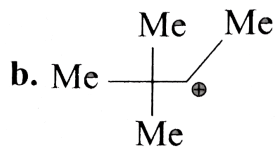
Answer: A:B

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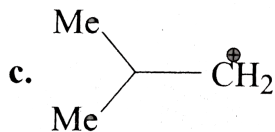
2. In which of the following  $\Delta G$  decreases if there can be some intramolecular rearrangement ?



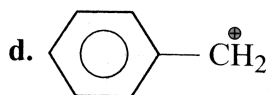
A.



B.



C.



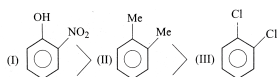
D.

Answer: A::B::C

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3. Which of the following statement is/are correct ?

A. Dipole moment of :



B. Dipole moment of :  $CH_3F > CH_3Cl > CH_3Br > CH_3I$

C. Dipole moment of :  $NH_3 > NF_3$

D. Dipole moment of :  $CH_3Cl > CH_2Cl_2 > CHCl_3 > CCl_4$

**Answer: A::C::D**

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4. Which of the following is a hard acid ?

A.  $Br_2$

B.  $Cd^{2+}$

C.  $CO_2$

D.  $Fe^{3+}$

**Answer: C::D**

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5. Which of the following statement is/are correct ?

- A.  $pK_{a1}$  of maleic acid is less than  $pK_{a1}$  of fumaric acid.
- B.  $pK_{a2}$  of maleic acid is greater than  $pK_{a2}$  of fumaric acid.
- C. Phthalic acid is a stronger acid than isophthalic acid.
- D. Isophthalic acid is a stronger acid than terephthalic acid.

Answer: A::B::C



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6. Which of the following statement (s) is/are correct ?

- A. Inductive effect is permanent shifting of  $\sigma e^-$ 's towards more *EN* element.
- B. Mesomeric effect is delocalisation of  $LP\bar{e}$ , s with  $\pi\bar{e}$ , s in conjugation.

C. Hyperconjugation is simultaneous shift of  $\sigma$  and  $\pi e^-$ 's at

1, 3 – *position* without the movement of  $H$  atom from its position.

D. Tautomerism is simultaneous shift of  $\sigma$  and  $\pi e^-$ 's at 1, 3 – *position*

with the movement of  $H$  atom from its position.

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

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7. Which of the following group (s) is/are  $o$  – and  $p$ -directing ?

A. –  $CN$

B. –  $SO_3H$

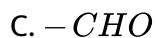
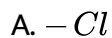
C. –  $NH_2$

D. –  $O - \overset{O}{\parallel} C - R$

**Answer: C::D**

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8. Which of the following group (s) is/are m-directing ?

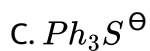


Answer: C::D



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9. Which of the following are nucleophiles ?



D.  $H_2O$

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



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**10. Which of the following are electrophiles ?**

A.  $BeCl_2$

B.  $CH_2 = CH_2$

C.  $HCl$

D.  $BCl_3$

**Answer: A::B::C**



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11. Which of the following have  $+M$  effect ( $\bar{e}$  - donating mesomeric effect) ?

A.  $-NO$

B.  $-COOH$

C.  $-NH_2$

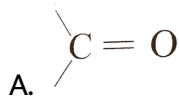
D.  $-SR$

Answer: C::D



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12. Which of the following have  $-M$  effect ( $\bar{e}$  - withdrawing mesomeric effect) ?



B.  $-SO_3H$

C.  $-OR$

D.  $-Br$

**Answer: A::B**



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13. Which of the following statement (s) is/are correct ?

A.  $HCOOH$  is stronger acid than  $PhCOOH$

B. Oximes ( $R_2C = N - OH$ ) are more acidic than hydroxyl-amine  
( $NH_2OH$ )

C.  $R_3SiCH_2COOH$  is more acidic than  $R_3CCH_2COOH$ .

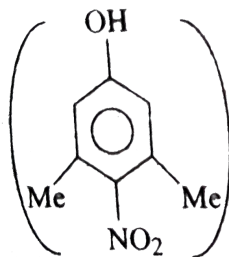
D. Highly branched carboxylic acids are less acidic than unbranched acids.

**Answer: A::B::D**



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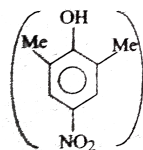
14. Which of the following statement (s) is/are correct ?



A. 3, 5 – Dimethyl-4-nitrophenol (I)

is less acidic

than the isomeric 2, 6 – demthy-4-nitrophenol (II)



B. (I) is more acidic than (II)

C. *I* is less acidic than (*II*) due to steric inhibition of resonance of two (*Me*) groups with (*NO*<sub>2</sub>) group.

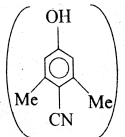
D. (*I*) is more acidic than (*II*) due to less +*I* effect of two (*Me*) groups in (*I*)

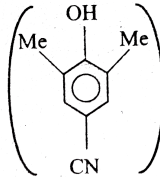
Answer: C



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15. Which of the following statement is/are correct ?

A. 3,3-Dimethyl-4-cyanophenol (I)  is more acidic than the

(II)  isomeric 2,6-dimethyl-4-cyanophenol (II)

B. (II) is more acidic than (I)

C. (I) is more acidic than (II) due to no steric inhibition of the two *Me* groups with (*CN*) groups, since (–*CN*) group is linear.

D. Acidic character of (I) and (II) is determined by +*I* effect of two *Me* groups in (I) and +*I* and *H. C* effects of two *Me* groups in (II)

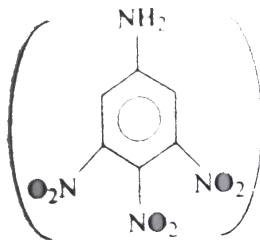
Answer: A



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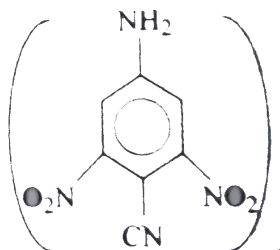


16. Which of the following statement (s) is/are correct ?



A. 3, 4, 5 – Trinitroaniline (I)

than 4-cyano-3,5-



dinitroaniline (II)

B. (II) is more basic than (I)

C. (I) is more basic than (II) due to steric inhibition of resonance in (I)

D. There is no steric inhibition resonance in (II)

Answer: A

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17. Which benzene sulphuric acid and *p* – nitrophenol are treated with  $NaHCO_3$ , the gases released, respectively are :

A.  $SO_2, NO_2$

B.  $SO_2, NO$

C.  $SO_2, CO_2$

D.  $CO_2, CO_2$

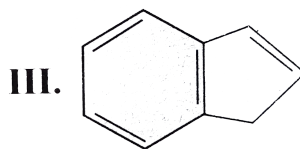
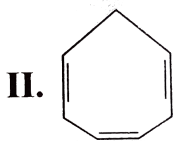
Answer: D

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18. The decreasing order of  $pK_a$  value of the following is :

(I)  $CH \equiv CH$

I.  $CH \equiv CH$



(II)

A.  $III > I > II$

B.  $II > I > III$

C.  $I > III > II$

D.  $I > II \equiv III$

**Answer: B**

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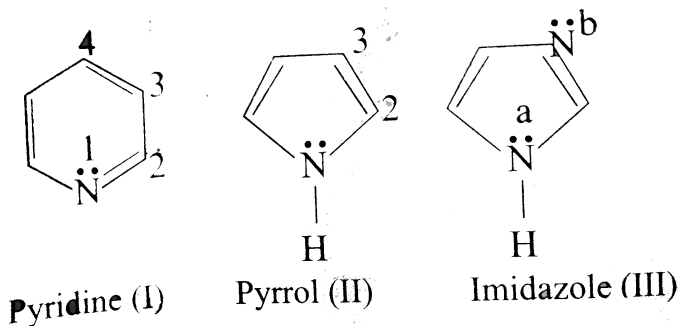
19. Among the following which is correct ?

- A. Both cyclopentadienyl anion and benzene are aromatic and have the same stability.
- B. Benzene is aromatic and more stable than cyclopentadienyl anion and it is nonaromatic.
- C. Both cyclopentadienyl anion and benzene are aromatic, but benzene is more stable than cyclopentadienyl anion.

D. Cyclopentadienyl anion is more stable than benzene although both are aromatic.

Answer: C

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Which one (s) is/are true ?

- A. (I) and (III) are modest Bronsted bases whereas (II) is not.
- B. In (III)  $N^a$  is more basic than  $N^b$ .
- C. When (II) is protonated in the presence of a strong acid, protonation occurs at  $C - 2$ .

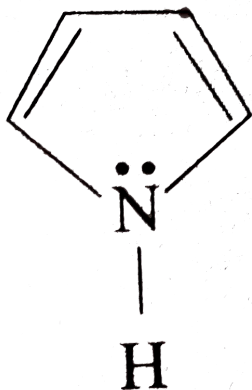
D. All the nitrogen present in (I), (II), and (III) is  $sp^2$  hybridised.

**Answer: A**

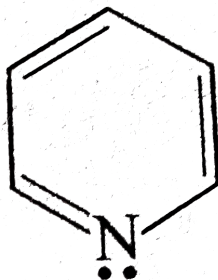


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21.

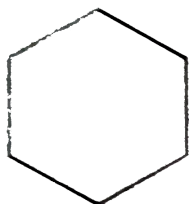


(I)

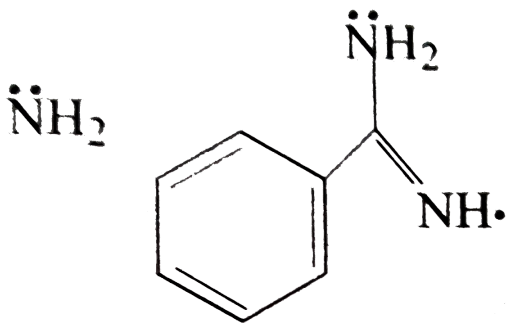


(II)

21.



(III)



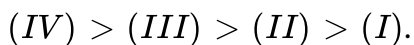
(IV)

Which of the following statement is/are correct ?

A. (I) and (II) are aromatic and have equal basic strength.

B. (I) is aromatic and (II) is anti-aromatic, but (II) is stronger base than (I)

C. The order of basicity of the above compounds is

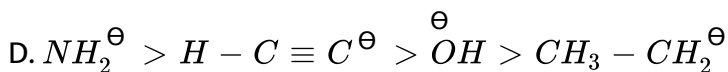
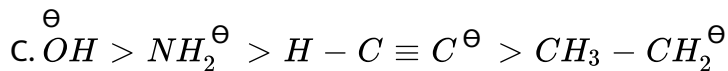
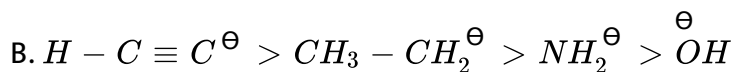
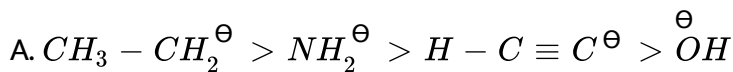
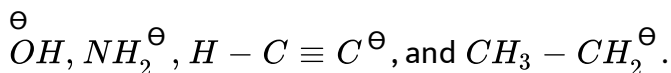


D. The conjugate acid of (IV) is more stabilised than the conjugate acid of (II).

Answer: C

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22. What is the decreasing order of strengths of the following bases ?



Answer: A



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Single Correct

1. The decreasing order of acidic character of the following is :

(I)  $CH_3SH$

(II)  $CH_3OH$

(III)  $H_2O$

(IV)  $EtOH$ .

A.  $I > II > III > IV$

B.  $IV > III > II > I$

C.  $I > III > II > IV$

D.  $III > I > II > IV$

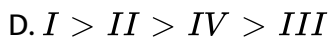
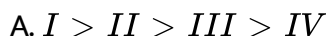
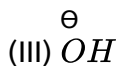
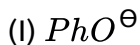
Answer: A



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2. The decreasing basic character of the following is :



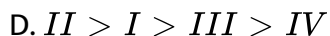
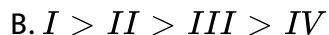
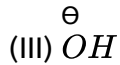
Answer: B



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3. The decreasing nucleophilicity of the following is :

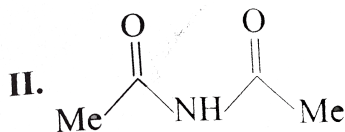
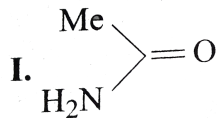




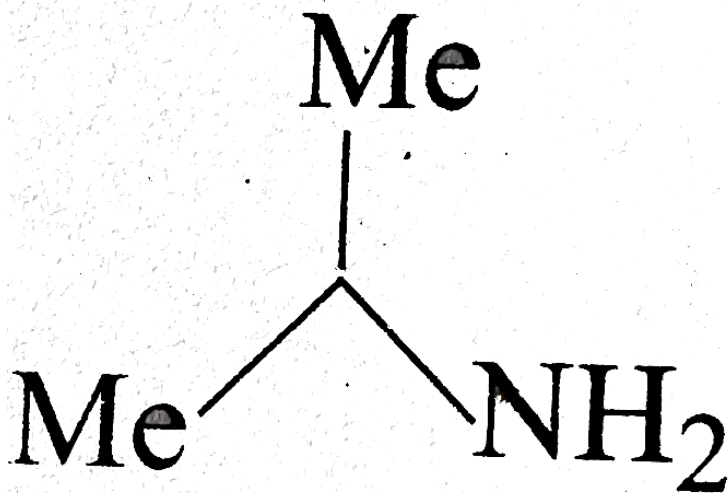
Answer: C

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4. Arrange the following in their decreasing order of acidity.



(I)



(III)

(IV)  $NH_3$ .

A.  $III > IV > I > II$

B.  $I > II > III > IV$

C.  $IV > III > II > I$

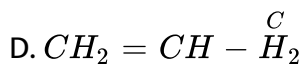
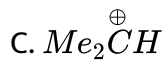
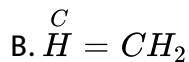
D.  $II > III > I > IV$

Answer: A



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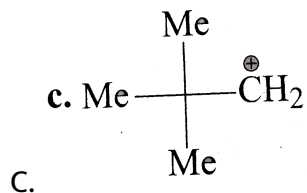
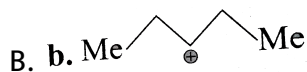
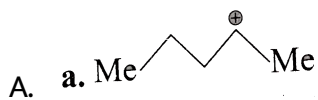
5. Which of the following carbocations is least stable ?

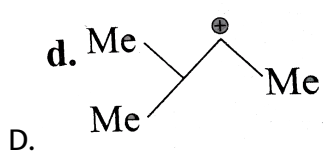


Answer: B

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6. Which of the following carbocations is most stable ?

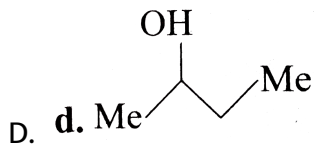
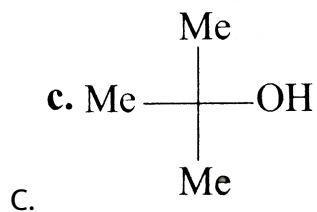
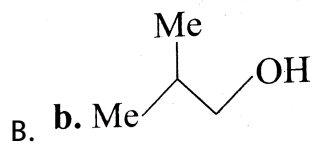
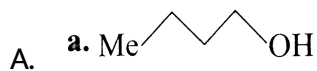




Answer: A

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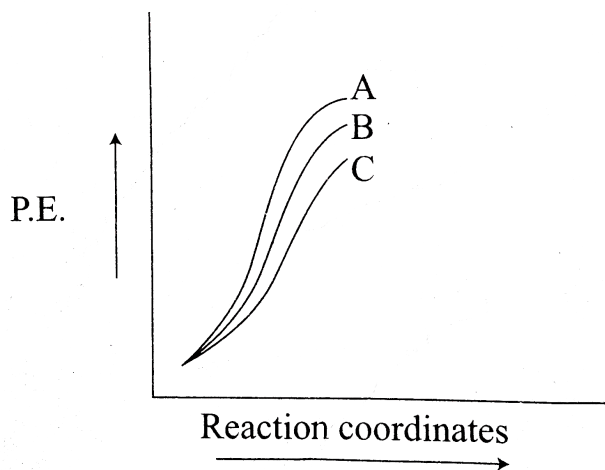
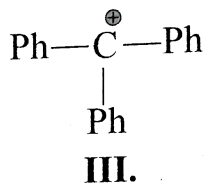
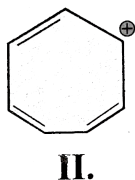
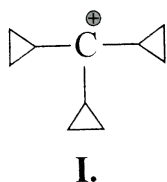
7. The compound which would give the most stable carbocation on dehydration is :



Answer: C

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8. In the following graph, stability of different carbocations have been shows :



Match the potential energy curve with carbocation.

A.  $I \quad II \quad II$   
 $A \quad B \quad C$

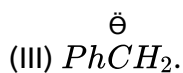
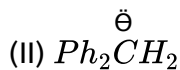
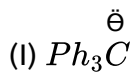
- B.  $I \quad II \quad II$   
 $B \quad A \quad C$
- C.  $I \quad II \quad II$   
 $C \quad B \quad A$
- D.  $I \quad II \quad II$   
 $C \quad A \quad B$

**Answer: C**



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9. The decreasing order of stabilities of the following carbanions is :



A.  $I > II > III$

B.  $II > I > III$

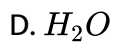
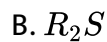
C.  $III > II > I$

D.  $III > I > II$

**Answer:**

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**10.** Which of the following is a soft base ?



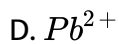
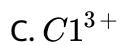
**Answer:**

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**11.** Which of the following is a soft base ?





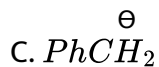
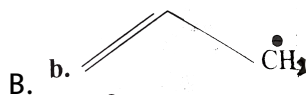
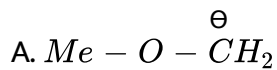


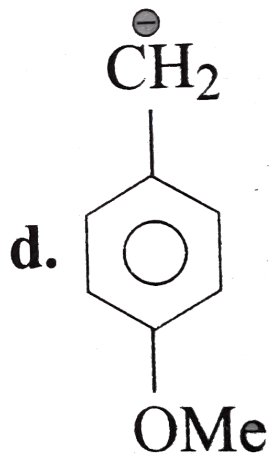
Answer: A



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12. Which of the following is least stable ?

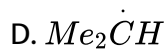
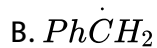
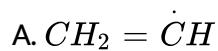




Answer: A

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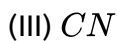
13. Which of the following species is most stable ?



**Answer: B**

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**14.** The decreasing order of  $-I$  effect of the following is :



**Answer: A**

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15. The decreasing order of  $-I$  effect of the following is :

(I)  $COOH$

(II)  $F$

(III)  $OR$

(IV)  $NH_2$

(V)  $OH$

(VI)  $Ph -$

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

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

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

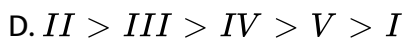
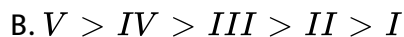
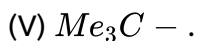
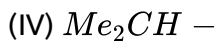
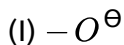
D.  $II > I > V > III > IV > VI$

Answer: C



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16. The decreasing order of +I effect of the following is :



**Answer: C**



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17. The decreasing order of  $-I$  effect of the orbitals is :



(II)  $sp^2$

(III)  $sp^3$ .

A.  $I > II > III$

B.  $III > II > I$

C.  $I > III > II$

D.  $II > III > I$

**Answer: A**



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**18.** Give the decreasing order of hyperconjugative effect of  $R$  in

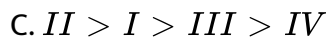
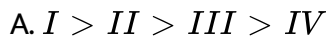
$R - CH = CH_2$ , where  $R$  is :

(I)  $Me -$

(II)  $Et -$

(III)  $Me_2CH -$

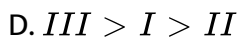
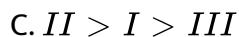
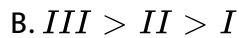
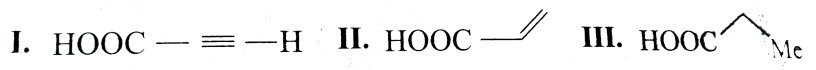
(IV)  $Me_3C -$  .



Answer: A

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19. The decreasing order of the acidic character is :



Answer: A



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20. The decreasing order of boiling points of the following is :

(I)  $RCOCl$

(II)  $(RCO)_2O$

(III)  $RCONH_2$

(IV)  $RCOOH$ .

A.  $I > IV > II > III$

B.  $III > II > IV > I$

C.  $IV > III > I > II$

D.  $II > I > III > IV$

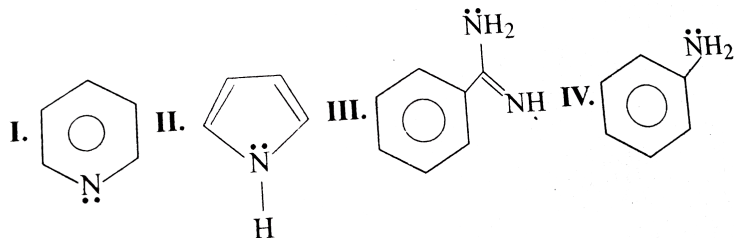
**Answer:**



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21. The decreasing order of basic character of the following is :



A.  $III > IV > I > II$

B.  $II > I > IV > III$

C.  $IV > III > II > I$

D.  $I > II > III > IV$

Answer:

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22. The decreasing order of acidic character of the following is :

(I)  $CH = CH$



A.  $I > II > III$

B.  $II > I > III$

C.  $III > II > I$

D.  $I > III > II$

Answer: B

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23. The decreasing order of acidic character of the following is :

(I) p-Nitrophenol

(II) o-Nitrophenol

(III) m-Nitrophenol

(IV) Phenol.

A.  $I > II > III > IV$

B.  $II > I > III > IV$

C.  $I > II > IV > III$

D.  $II > I > IV > III$

**Answer:**



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**24.** The decreasing order of basic characters of the following is :

(I) Aniline

(II) o-Nitroaniline

(III) m-Nitroaniline

(IV) p-Nitroaniline.

A.  $I > II > III > IV$

B.  $IV > III > II > I$

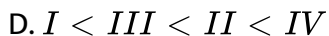
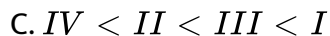
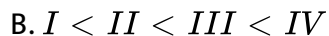
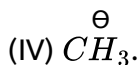
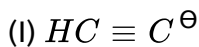
C.  $I > III > IV > II$

D.  $I > III > II > IV$

**Answer:**

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25. The increasing order of  $pK_b$  value of the following is :



**Answer: A**

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1. Alkene  $A(\text{Me}_2\text{C} = \text{CMe}_2)$  is more stable than alkene  $B(\text{Et}_2\text{C} = \text{CEt}_2)$ .

Baker-Nathan effect.

- A. If both (A) and (R) are true and (R) is the correct explanation of (A).
- B. If both (A) and (R) are true but (R) is not correct explanation of (A).
- C. If (A) is true but (R) is false.
- D. If (A) is false but (R) if true.

Answer: A

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2. Methylene has a sextet of  $\bar{e}$ 's.

Methylene behaves as a nucleophile.

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

- B. If both (A) and ( R) are true but ( R) is not correct explanation of (A).
- C. If (A) is true but ( R) is false.
- D. If (A) is false but ( R) if true.

**Answer: C**

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3. Assertion(A):p-methyl benzyl carbocation (*I*) is more stable than benzyl carbocation (*II*).

Reason(R) Heterovalent or no bond resonance.

- A. If both (A) and ( R) are true and ( R) is the correct explanation of (A).
- B. If both (A) and ( R) are true but ( R) is not correct explanation of (A).
- C. If (A) is true but ( R) is false.
- D. If (A) is false but ( R) if true.

**Answer: A**



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4. Assertion(A):  $Me_3\bar{C}$  is more stable than  $\bar{C}H_3$ .

The  $+I$  effect of the three  $Me$  groups in  $Me_3\bar{C}$  tends to make it more stable than  $\bar{C}H_3$ .

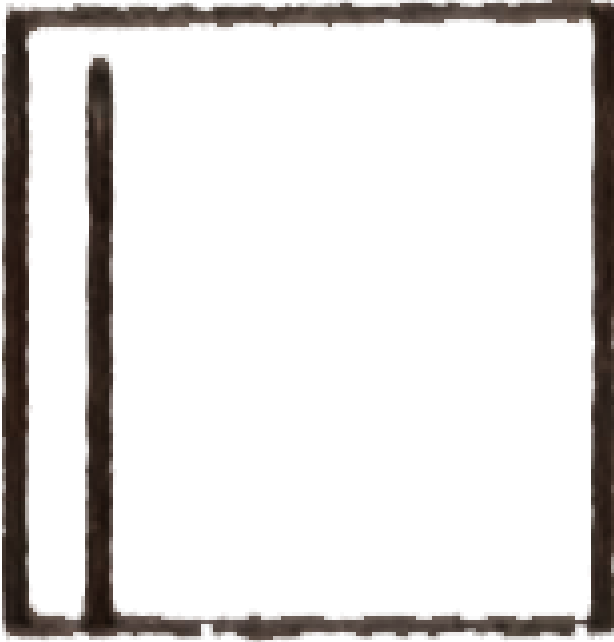
- A. If both (A) and ( R) are true and ( R) is the correct explanation of (A).
- B. If both (A) and ( R) are true but ( R) is not correct explanation of (A).
- C. If (A) is true but ( R) is false.
- D. If (A) is false but ( R) if true.

Answer: D



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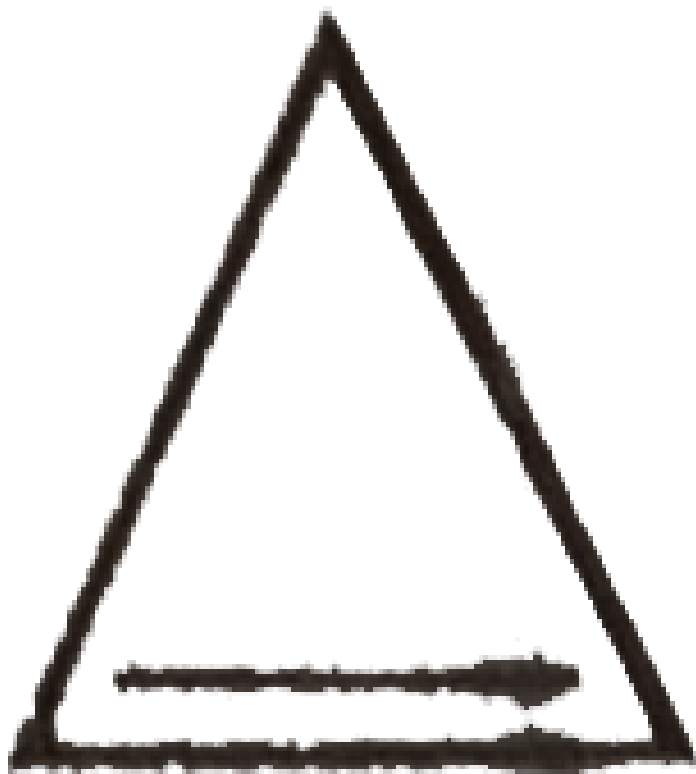
5. The  $pK_a$  value of



(I) is more

than the  $pK_a$  value to





(II).

Nonaromatic compounds are more stable than anti-aromatic compounds.

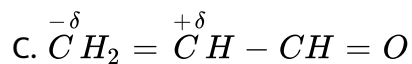
- A. If both (A) and ( R) are true and ( R) is the correct explanation of (A).
- B. If both (A) and ( R) are true but ( R) is not correct explanation of (A).
- C. If (A) is true but ( R) is false.
- D. If (A) is false but ( R) if true.

Answer: A

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Archives

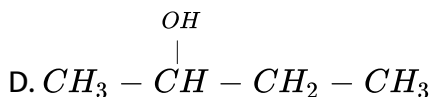
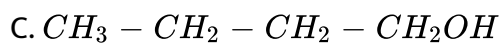
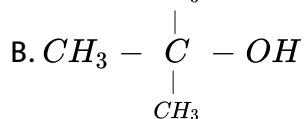
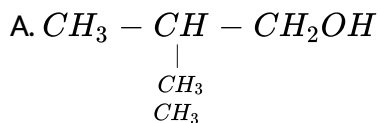
1. Polarisation of electrons in acrolein may be written as :



Answer: D

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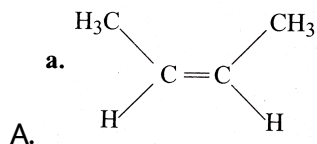
2. The compound which would give the most stable carbocation on dehydration is :

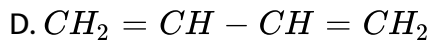
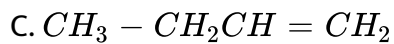
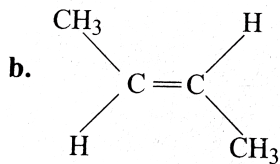


**Answer: B**

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3. Which of the following hydrocarbons has the lowest dipole moment ?





**Answer: B**

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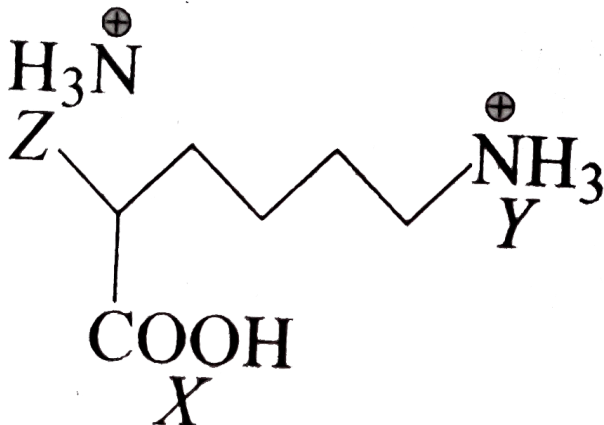
4. Among the following, the molecule with the highest dipole moment is :



**Answer: A**

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5. Arrange in the order of increasing acidic strengths.



A.  $X > Z > Y$

B.  $Z < X > Y$

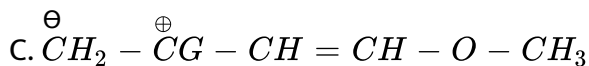
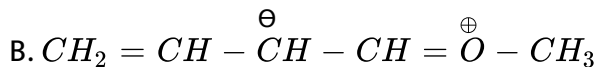
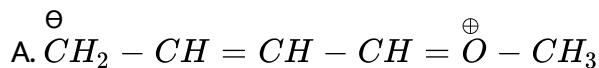
C.  $X > Y > Z$

D.  $Z > X > Y$

**Answer: A**

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6. Which of the following resonating structures of 1-methoxy-1,3-butadiene is least stable ?



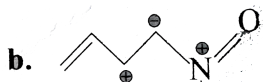
Answer: C

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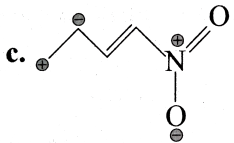
7. Among the following, the least stable resonance structure is :



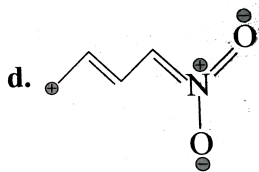
A.



B.



C.



D.

Answer: A

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8. Hyperconjugation involves the overlapping of the following orbitals :

A.  $\sigma - \sigma$

B.  $\sigma - p$

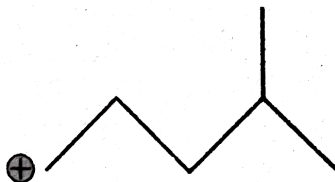
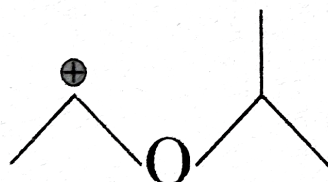
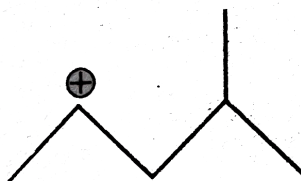
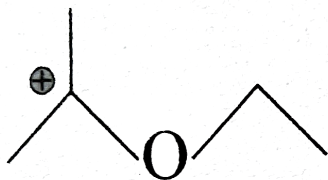
C.  $p - p$

D.  $\pi - \pi$

Answer: B

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9. The correct of stability for the following species is :



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

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

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

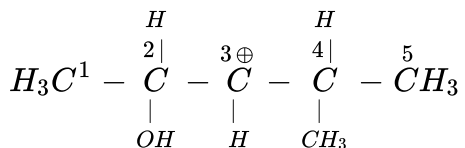
D. (I) > (III) > (II) > (IV)

Answer: D



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



A.  $CH_3$  at  $C - 4$

B.  $H$  at  $C - 4$

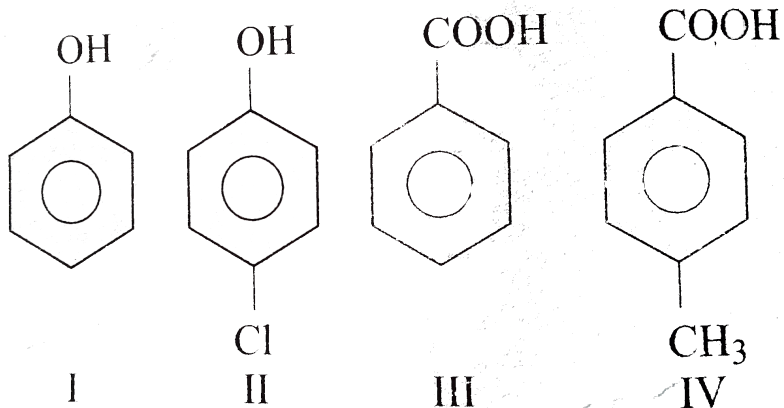
C.  $CH_3$  at  $C - 2$

D.  $H$  at  $C - 2$

Answer:

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11. The correct of acidities of the following is :



A.  $III > IV > II > I$

B.  $IV > III > I > II$

C.  $III > II > I > IV$

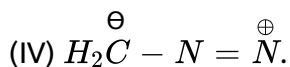
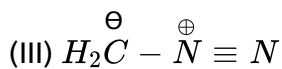
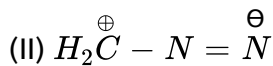
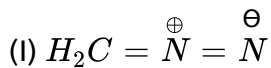
D.  $II > III > IV > I$

Answer: A

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12. The correct order of stabilities of the following resonance structures is

:



A.  $I > II > IV > III$

B.  $I > III > II > IV$

C.  $II > I > III > IV$

D.  $III > I > IV > II$

Answer: B



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Fill In The Blanks

1. Among the given cations,.....is most stable (sec-butyl carbonium ion, tert-butyl carbonium ion, n-butyl carbonium ion).

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2. The shape of  $(CH_3)^{\oplus}$  is.....

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3. The bond dissociation energy needed to form the benzyl radical from toluence is..... Than the formation of the methyl radical from methane.

A. Lesser

B. Higher

C. Equal

D. Insufficient data

**Answer: A**

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4. The kind of delocalisation involving sigma bond orbitals is called.....

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## Analytical And Descriptive

1. Arrange the following in the increasing order of their basicities.

(I) *p* – Toluidine

(II) *N, N* – Dimethyl-*p*-toluidine

(III) *p* – Nitroaniline`

(IV) Aniline.

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