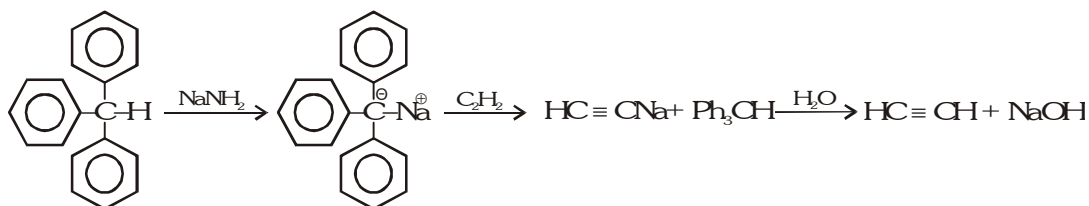
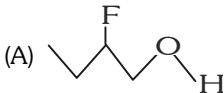


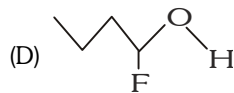



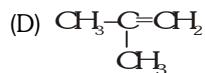
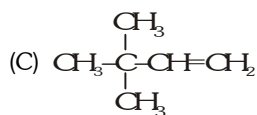
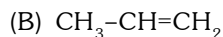
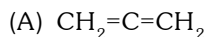
EXERCISE-01**CHECK YOUR GRASP****SELECT THE CORRECT ALTERNATIVE (ONLY ONE CORRECT ANSWER)**

- Carbanion is a :-
(A) Base (B) Nucleophile (C) Both (A) and (B) (D) None
- Electrophile is :
(A) H_2O (B) NH_3 (C) AlCl_3 (D) $\text{C}_2\text{H}_5\text{NH}_2$
- Which of the following species has a pyramidal shape-
(A) CH_3^+ (B) BF_3 (C) CH_3^- (D) $\cdot\text{CH}_3$
- Increasing order (least basic first) of basic strength is shown by the set
(A) CINH_2 , NH_3 , CH_3NH_2 (B) CINH_2 , CH_3NH_2 , NH_3
(C) NH_3 , CINH_2 , CH_3NH_2 (D) CH_3NH_2 , CINH_2 , NH_3
- The decreasing order of acid strength indicated by the following sequence of reaction is :-



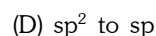
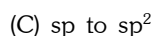
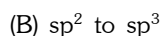
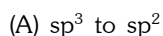
- (A) $\text{NH}_3 > \text{Ph}_3\text{CH} > \text{C}_2\text{H}_2 > \text{H}_2\text{O}$ (B) $\text{H}_2\text{O} > \text{HC}\equiv\text{CH} > \text{Ph}_3\text{CH} > \text{NH}_3$
(C) $\text{HC}\equiv\text{CH} > \text{H}_2\text{O} > \text{Ph}_3\text{CH} > \text{NH}_3$ (D) $\text{Ph}_3\text{CH} > \text{HC}\equiv\text{CH} > \text{H}_2\text{O} > \text{NH}_3$
- In which of the following compounds is hydroxylic proton the most acidic -
(A)  (B)  (C)  (D) 
 - Correct arrangement of the following acids in correct K_a order is :-
(I) $\text{H}_3\text{N}^{\oplus}-\text{CH}_2-\text{COOH}$ (II) $\text{NC}-\text{CH}_2-\text{COOH}$ (III) $\text{H}_3\text{C}-\text{CH}_2-\text{COOH}$ (IV) $\text{OOC}^{\ominus}-\text{CH}_2-\text{COOH}$
(A) I > II > III > IV (B) II > I > III > IV (C) I > III > II > IV (D) IV > III > II > I
 - Which of the following orders of acid strength is correct :-
(A) $\text{RCOOH} > \text{ROH} > \text{HOH} > \text{HC}\equiv\text{CH}$ (B) $\text{RCOOH} > \text{HOH} > \text{ROH} > \text{HC}\equiv\text{CH}$
(C) $\text{RCOOH} > \text{HOH} > \text{HC}\equiv\text{CH} > \text{ROH}$ (D) $\text{RCOOH} > \text{HC}\equiv\text{CH} > \text{HOH} > \text{ROH}$
 - Which of them is false for order of -I effect
(A) $-\text{F} > -\text{Cl} > -\text{Br} > \text{I}$ (B) $-\text{NR}_3^{\oplus} > -\text{NH}_3^{\oplus} > -\text{NO}_2$
(C) $-\text{OCH}_3 > -\text{OH} > -\text{NH}_2$ (D)  > $-\text{C}\equiv\text{CH} > \text{H}$
 - The order of basicity of halides is :
(A) $\text{Cl}^- < \text{Br}^- < \text{I}^- < \text{F}^-$ (B) $\text{F}^- < \text{I}^- < \text{Br}^- < \text{Cl}^-$
(C) $\text{I}^- < \text{Br}^- < \text{Cl}^- < \text{F}^-$ (D) $\text{Cl}^- < \text{F}^- < \text{I}^- < \text{Br}^-$

11. Which of the following molecule has longest C=C bond length -

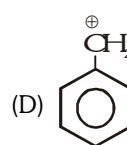
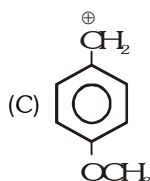
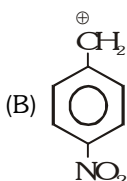
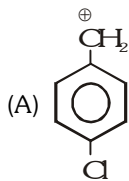


12. In the reaction $\text{CH}_3\text{CN} \xrightarrow[\text{heat}]{\text{H}_3\text{O}^+} \text{CH}_3\text{COOH}$

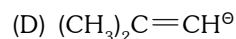
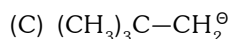
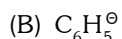
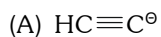
the hybridization state of the functional carbon changes from



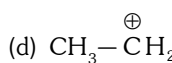
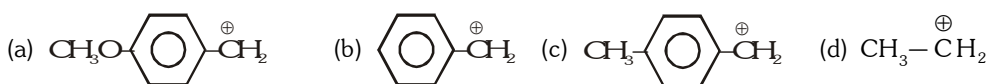
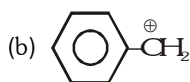
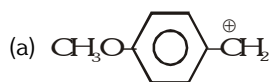
13. Most stable carbocation is :-



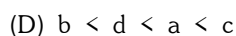
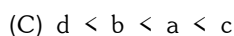
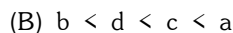
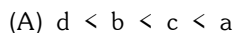
14. Most stable carbanion is :-



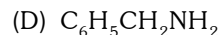
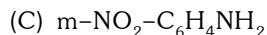
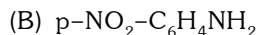
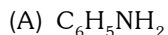
15. Consider the following carbocations



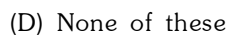
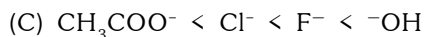
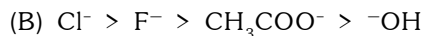
The relative stabilities of these carbocations are such that :-



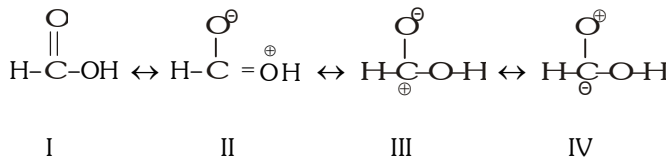
16. Among the following, the strongest base is :-



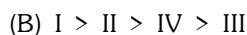
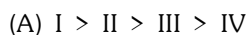
17. The increasing order of base strength of Cl^- , CH_3COO^- , OH^- and F^- is :



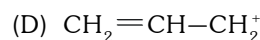
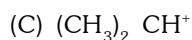
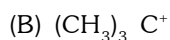
18. Formic acid is considered as a hybrid of the four structures



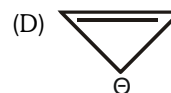
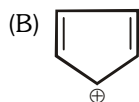
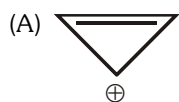
Which of the following order is correct for the stability of the four contributing structures.



19. Which of the following carbonium ion is most stable



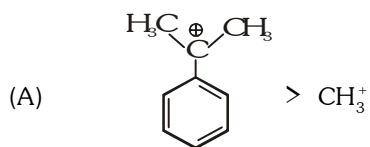
20. Among the following the aromatic compound is



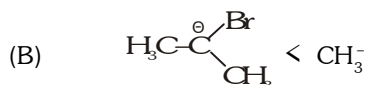
21. Match List- I with List- II and select the correct answer using the codes given below -

List-I (Stability)

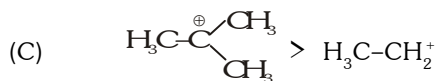
List -II (Reason)



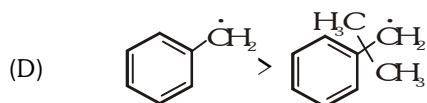
(1) Inductive effect



(2) Resonance



(3) Hyperconjugation and resonance



(4) Hyperconjugation and inductive effect

Codes :

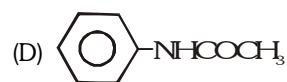
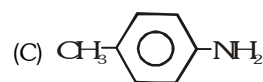
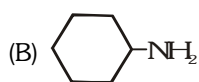
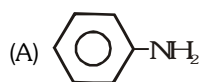
(A) A - 2 ; B - 3 ; C - 4 ; D - 1

(B) A - 3 ; B - 1 ; C - 4 ; D - 2

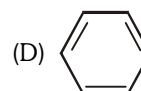
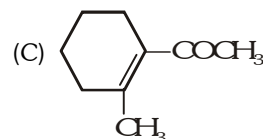
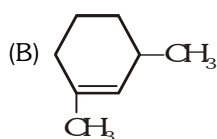
(C) A - 4 ; B - 3 ; C - 1 ; D - 2

(D) A - 3 ; B - 4 ; C - 2 ; D - 1

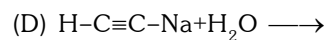
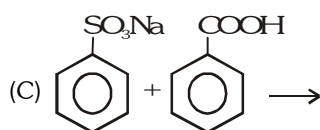
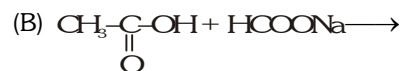
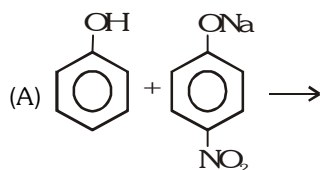
22. Which of the following compounds is the strongest base -

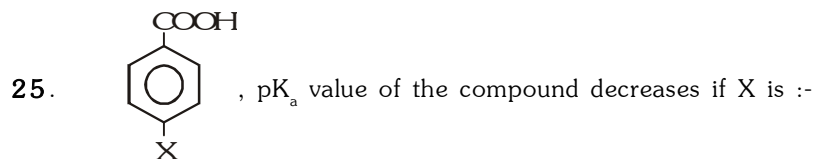


23. In which of the following molecule all the effect namely inductive, mesomeric & hyperconjugation operate:



24. Which of the following reaction is possible :

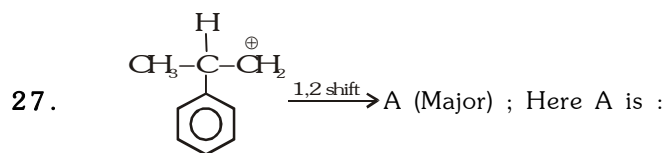


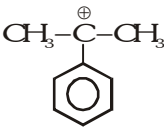
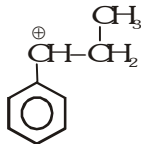
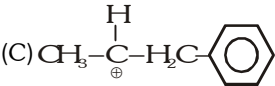
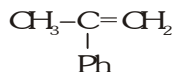


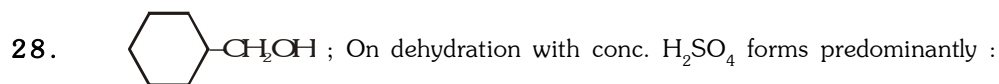
- (A) $-\text{NO}_2$ (B) $-\text{NH}_2$ (C) $-\text{OH}$ (D) $-\text{OCH}_3$

26. Which one of the following results most stable carbon free radical :

- (A)  (B) 
 (C) $(\text{Ph})_2\text{C} = \text{C}(\text{Ph})_2 \xrightarrow{\dot{\text{C}}\text{H}_3}$ (D) $\text{CH}_2 = \text{CH}_2 \xrightarrow{\dot{\text{C}}\text{H}_3}$

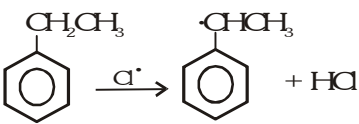
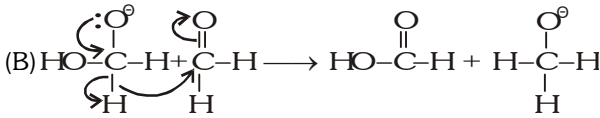
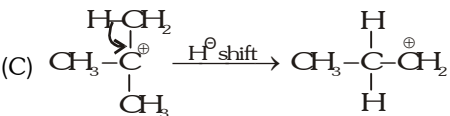


- (A)  (B) 
 (C)  (D) 



- (A)  (B)  (C)  (D) 

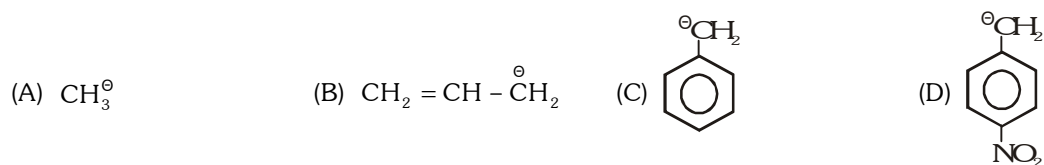
29. Which of the following is incorrect :

- (A)  (B) 
 (C)  (D) $\text{CH}_3\text{CH}_2\text{CHO} \xrightarrow{\text{HO}^-} \text{CH}_3\text{C}^-\text{HCHO} + \text{H}_2\text{O}$

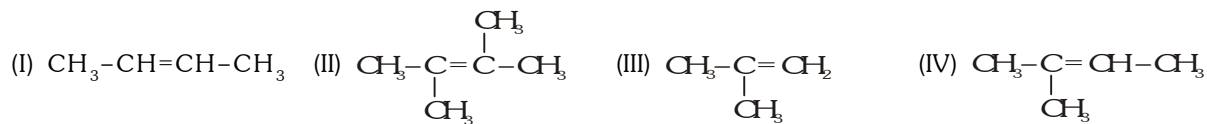
30. The K_a values of alcohols, water and phenol are of order 10^{-17} , 10^{-14} and 10^{-10} respectively. Which of the following reactions is possible :

- (I) $\text{C}_6\text{H}_5\text{O}^\ominus + \text{H}_2\text{O} \longrightarrow \text{C}_6\text{H}_5\text{OH} + \text{OH}^\ominus$ (II) $\text{C}_2\text{H}_5\text{O}^\ominus + \text{H}_2\text{O} \longrightarrow \text{C}_6\text{H}_5\text{OH} + \text{OH}^\ominus$
 (A) Both I and II (B) only II (C) only I (D) neither of two

31. Most stable carbanion is :




32. Stability of :



in the increasing order is :

(A) I < III < IV < II (B) I < II < III < IV (C) I < IV < III < I (D) II < III < IV < I

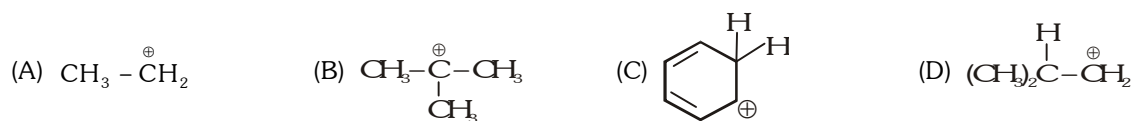
33.  $\xrightarrow{\text{H}_2\text{O}}$ [A] ; the product (A) is :



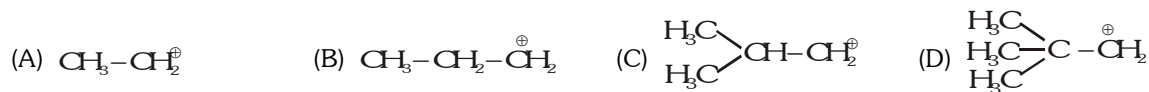
34. Spin multiplicity of Triplet nitrene is :

(A) 1 (B) 2 (C) 3 (D) 4

35. The maximum probability of proton loss is in the case of :



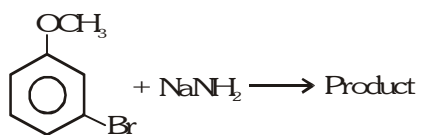
36. Select the least stable one :



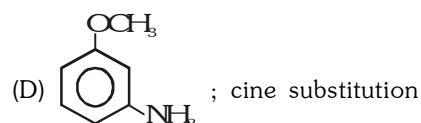
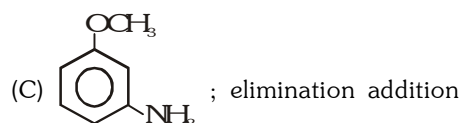
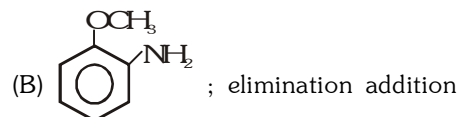
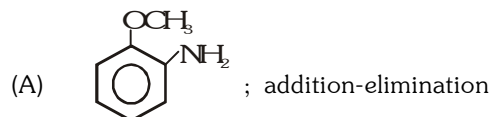
37. Which of the following will react fastest with conc. HCl :



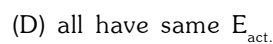
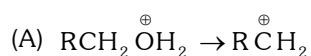
38. Consider the following reaction :



The product (P) and reaction (R) are :



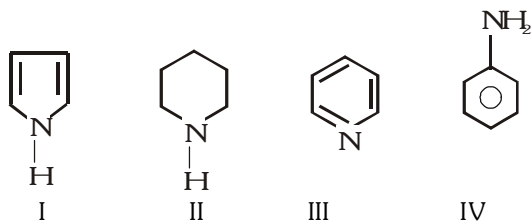
39. Energy of activation is lower for which reaction :



CHECK YOUR GRASP						ANSWER KEY				EXERCISE -1					
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	C	C	C	A	B	D	A	B	D	C	D	C	C	A	A
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	D	A	A	A	A	B	B	C	D	A	C	A	B	C	B
Que.	31	32	33	34	35	36	37	38	39						
Ans.	D	A	B	C	C	D	B	C	C						

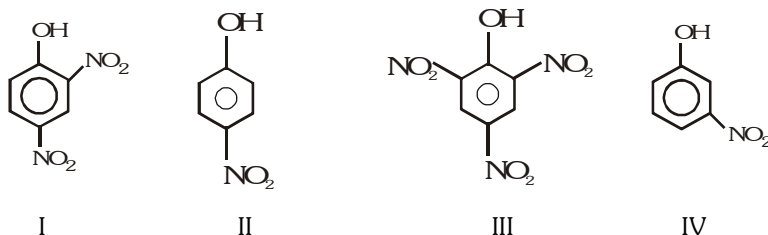
SELECT THE CORRECT ALTERNATIVES (ONE OR MORE THEN ONE CORRECT ANSWERS)

1. The correct order of decreasing basic strength is :



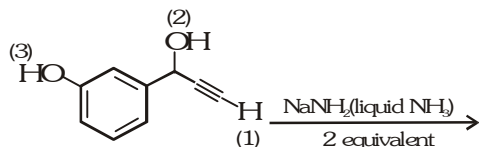
- (A) I > II > III > IV (B) II > III > I > IV (C) II > IV > I > III (D) II > III > IV > I

2. The correct order of increasing dissociation constant of the following compound is :-



- (A) II < IV < I < III (B) IV < III < I < II (C) IV < II < I < III (D) IV < I < II < III

3. In the following arrange the H (numbered) for their ease of displacement during acid base reaction :

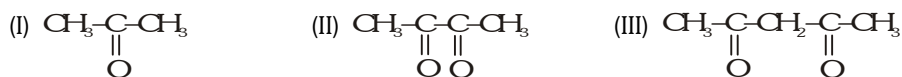


- (A) 1 > 2 > 3 (B) 3 > 2 > 1 (C) 3 > 1 > 2 (D) 2 > 3 > 1

4. Which one of the following is the strongest base in aqueous medium :-

- (A) (C₂H₅)₃N (B) C₂H₅NH₂ (C) NH₃ (D) (C₂H₅)₂NH

5. The correct order of acid strength of the following compound is -

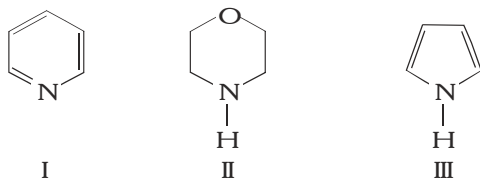


- (A) III > II > I (B) III > I > II (C) II > I > III (D) I > II > III

6. Which of the following shows the correct order of decreasing basicity in aqueous medium -

- (A) (CH₃)₃N > (CH₃)₂NH > CH₃NH₂ > NH₃ (B) (CH₃)₂NH > (CH₃)₃N > CH₃NH₂ > NH₃
(C) (CH₃)₂NH > CH₃NH₂ > (CH₃)₃N > NH₃ (D) (CH₃)₂NH > CH₃NH₂ > NH₃ > (CH₃)₃N

7. For the compounds



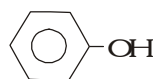
the order of basicity is -

- (A) III > II > I (B) II > III > I (C) I > II > III (D) II > I > III

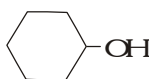
8. Which of the following shows the correct order of decreasing acidity-

- (A) $\text{PhCO}_2\text{H} > \text{PhSO}_3\text{H} > \text{PhCH}_2\text{OH} > \text{PhOH}$
 (B) $\text{PhSO}_3\text{H} > \text{PhOH} > \text{PhCO}_2\text{H} > \text{PhCH}_2\text{OH}$
 (C) $\text{PhCO}_2\text{H} > \text{PhOH} > \text{PhCH}_2\text{OH} > \text{PhSO}_3\text{H}$
 (D) $\text{PhSO}_3\text{H} > \text{PhCO}_2\text{H} > \text{PhOH} > \text{PhCH}_2\text{OH}$

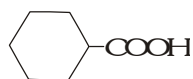
9. Give the correct order of increasing acidity of the following compounds-



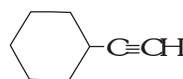
I



II



III



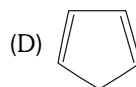
IV

- (A) $\text{II} < \text{I} < \text{III} < \text{IV}$ (B) $\text{IV} < \text{II} < \text{I} < \text{III}$ (C) $\text{I} < \text{II} < \text{IV} < \text{III}$ (D) $\text{IV} < \text{I} < \text{II} < \text{III}$

10. Which of the following is the most acidic

- (A) $\text{CH}_2 = \text{CH}_2$ (B) $\text{HC} \equiv \text{CH}$

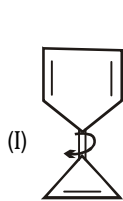
- (C) $\text{CH}_2 = \text{CHCH}_2\text{CH} = \text{CH}_2$



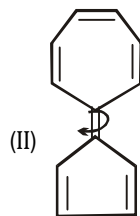
(D)

11. Which of the following substituents will increase the acidity of phenol -

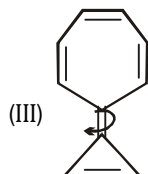
- (A) $-\text{NO}_2$ (B) $-\text{CN}$ (C) $-\text{CHO}$ (D) $-\text{CH}_3$



(I)



(II)



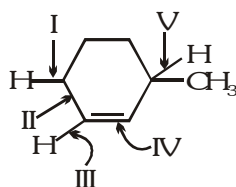
(III)

12.

Compare carbon-carbon bond rotation across I, II, III.

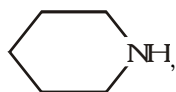
- (A) $\text{I} > \text{II} > \text{III}$ (B) $\text{I} > \text{III} > \text{II}$ (C) $\text{II} > \text{I} > \text{III}$ (D) $\text{II} > \text{III} > \text{I}$

13. Which of the following s-bonds participate in hyperconjugation :

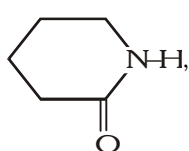


- (A) I and II (B) I and V (C) I and V (D) III and IV

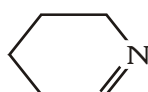
14.



(x)



(y)

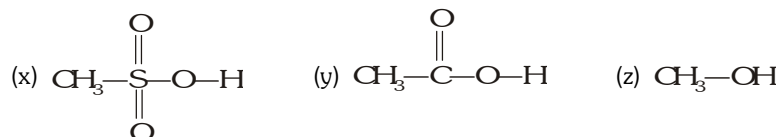


(z)

The correct order of decreasing basic strengths of x, y and z is :

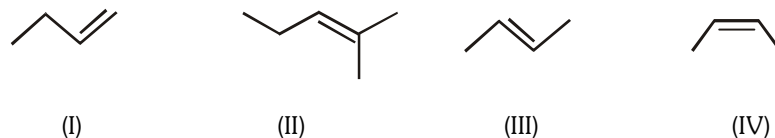
- (A) $x > y > z$ (B) $x > z > y$ (C) $y > x > z$ (D) $y > z > x$

15. Set the following in increasing order of their pK_a values:



- (A) $y > x > z$ (B) $x < y < z$ (C) $y > z > x$ (D) $x < z < y$

16. Rank the following alkenes in order of decreasing heats of hydrogenation (largest first):

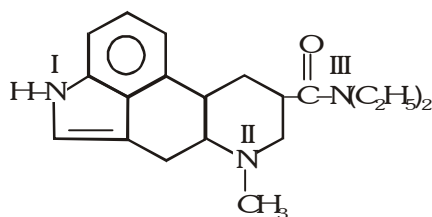


- (A) $\text{II} > \text{III} > \text{IV} > \text{I}$ (B) $\text{II} > \text{IV} > \text{III} > \text{I}$ (C) $\text{I} > \text{III} > \text{IV} > \text{II}$ (D) $\text{I} > \text{IV} > \text{III} > \text{II}$

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

- (A) $\text{C}_2\text{H}_5\text{Cl}$ (B) $\text{CH}_3-\text{CH}=\text{CH}_2$
 (C) $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$ (D) $\text{CH}_3-\text{CH}=\text{CH}-\text{C}(=\text{O})-\text{CH}_3$

18. Which nitrogen in LSD (Lysergic acid diethylamide) is more basic :



- (A) I (B) II (C) III (D) all are equally basic

19. Which of the following substituted carboxylic acids has the highest K_a value :

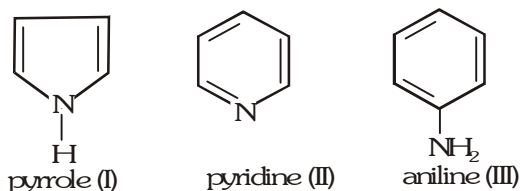
- (A) $\text{CH}_3-\text{CH}_2-\underset{\text{Cl}}{\text{CH}}-\text{COOH}$ (B) $\text{CH}_3-\underset{\text{Cl}}{\text{CH}}-\text{CH}_2-\text{COOH}$
 (C) $\underset{\text{Cl}}{\text{CH}_2}-\text{CH}_2-\text{CH}_2-\text{COOH}$ (D) $\text{CH}_3-\underset{\text{Br}}{\text{CH}}-\text{CH}_2-\text{COOH}$

SELECT THE CORRECT ALTERNATIVES (ONE OR MORE THEN ONE CORRECT ANSWERS)

20. Which of the following compounds yield most stable carbanion after rupture of (C_1-C_2) bond :

- (A) $\text{CH}_3-\overset{\text{O}}{\underset{\text{1}}{\text{C}}}-\overset{\text{O}}{\underset{\text{2}}{\text{C}}}-\text{CH}_3$ (B) $\text{CH}_3-\overset{\text{O}}{\underset{\text{1}}{\text{C}}}-\overset{\text{O}}{\underset{\text{2}}{\text{C}}}-\text{Br}_3$
 (C) $\text{CH}_3-\text{CH}_2-\overset{\text{O}}{\underset{\text{1}}{\text{C}}}-\overset{\text{O}}{\underset{\text{2}}{\text{C}}}-\text{CH}_3$ (D) None of these

21.

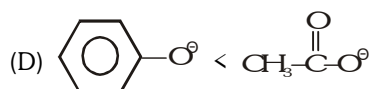
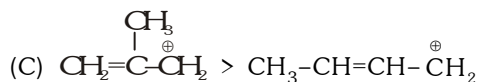
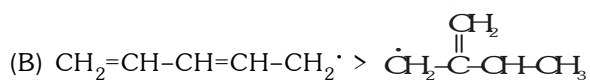
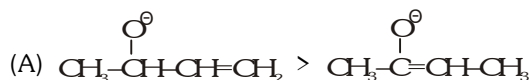


Which is/are correct statements ?

- (A) I is more basic than II (B) II is more basic than I and III
(C) III is more basic than II (D) all are aromatic bases

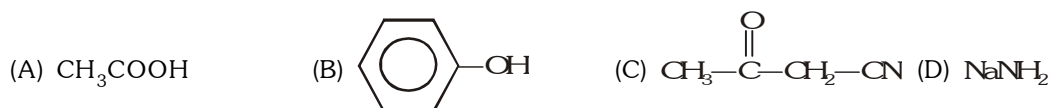
22.

Following is true for stability between the two structures :



23.

Which have acidic hydrogen :



24.

C—C and C=C bond lengths are unequal in :

- (A) Benzene (B) 1,3 buta-di-ene
(C) 1, 3 cyclohexa-di-ene (D) None

25.

The acid strength of substituted carboxylic acids is known to be dependent on the nature and position of the substituent. In the following examples, an attempt has been made to arrange the acids in order of acid strength, the strongest first. One of the series is incorrect-which one :

- (A) $\text{CH}_3\cdot\text{CH}_2\text{CH}(\text{Cl})\cdot\text{COOH} > \text{CH}_3\cdot\text{CH}(\text{Cl})\cdot\text{CH}_2\text{COOH} > \text{CH}_3\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{COOH}$
(B) $\text{NO}_2\cdot\text{CH}_2\cdot\text{COOH} > \text{HOCH}_2\cdot\text{COOH} > \text{CH}_3\cdot\text{COOH}$
(C) $\text{Cl}_3\text{C}\cdot\text{COOH} > \text{BrCH}_2\cdot\text{COOH} > \text{FCH}_2\cdot\text{COOH}$
(D) $\text{CH}_3\cdot\text{COOH} > \text{CH}_3\cdot\text{CH}_2\cdot\text{COOH} > (\text{CH}_3)_3\text{C}\cdot\text{COOH}$

26.

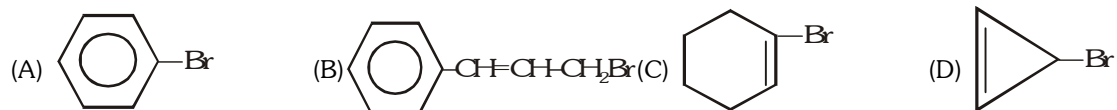
Which species is not aromatic :



27. Select the correct option :

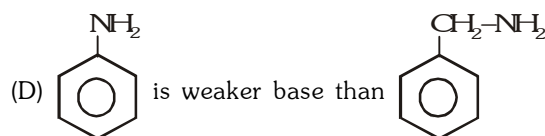
- (A) carbonic acid is weaker acid than acetic acid
- (B) the boiling points of acids are higher than corresponding alcohols
- (C) chloroacetic acid is stronger acid than acetic acid
- (D) phenol is more acidic than ethanol

28. Which reacts with AgNO_3 to give ppt. :

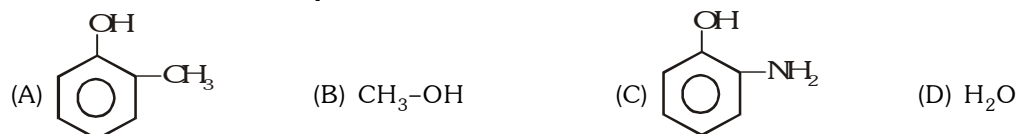


29. Which statement is true :

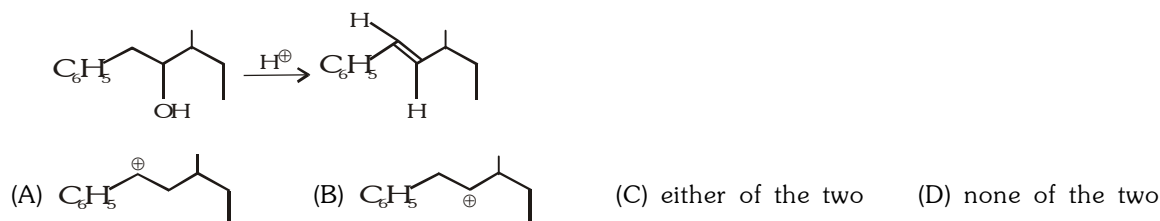
- (A) $\ddot{\text{N}}\text{H}_2$ is stronger base than $\ddot{\text{O}}\text{H}$
- (B) $\text{NH}_2\text{-OH}$ is less basic than NH_3
- (C) $\text{CH}_3\text{-NH}_2$ is weaker base than $\text{N}(\text{CH}_3)_3$ in (aq) medium



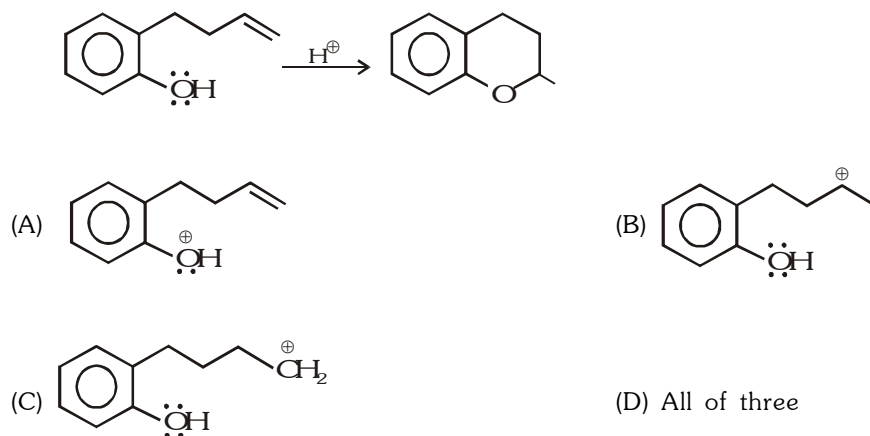
30. Which is less acidic than phenol :

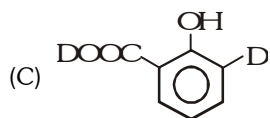
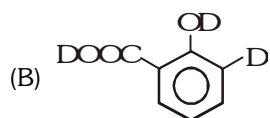
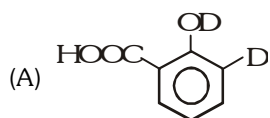


31. The precursor carbocation to the product in the following reaction is :



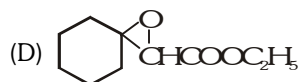
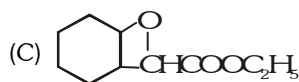
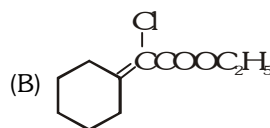
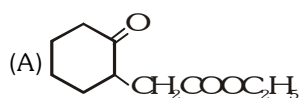
32. Which of the following ion is formed in the following reaction :



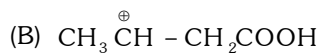
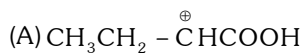
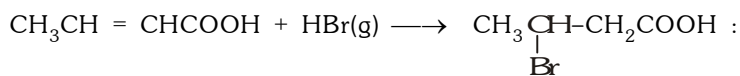


(D) Reaction not possible

34. Predict the nature of A in the following reaction :

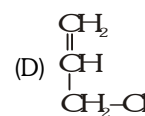
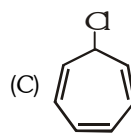
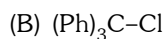
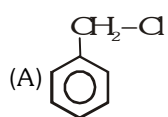


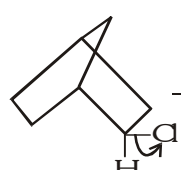
35. Which of the following intermediate is most likely to be formed during addition of HBr on crotonic acid :

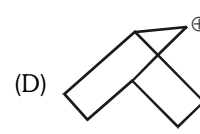
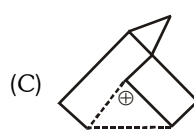
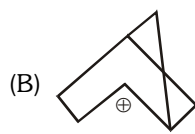
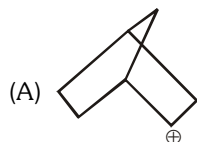


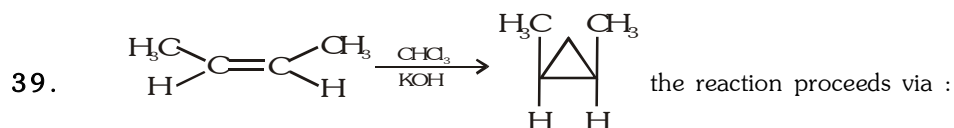
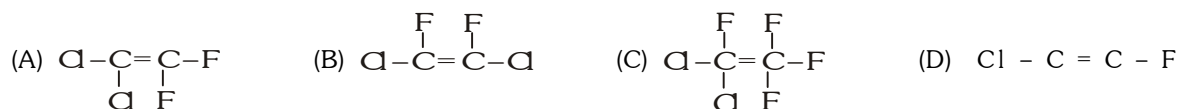
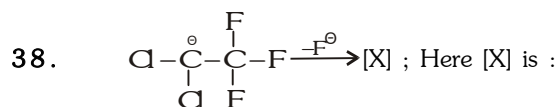
(D) none of these

36. Which will give most stable cation upon strong heating :

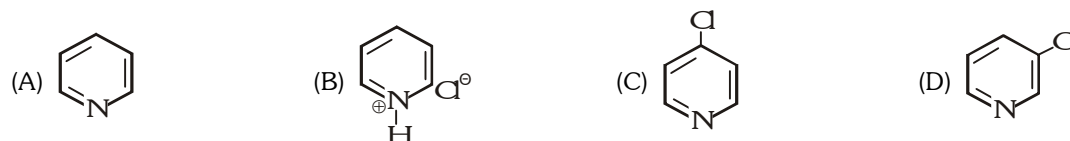
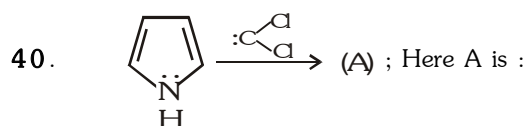


37.  $\xrightarrow{\text{OH}^-}$ (A); Here (A) is :

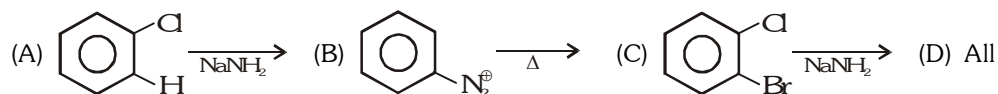




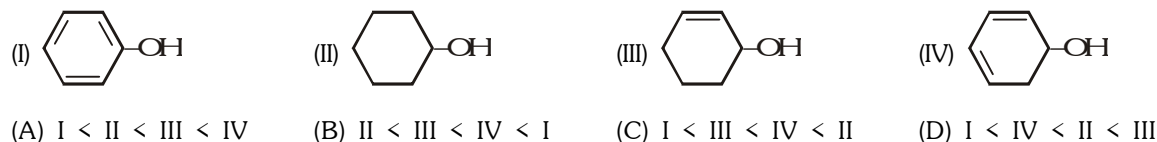
- (A) carbene (B) Carbon free radical (C) Carbocation (D) Carbanion



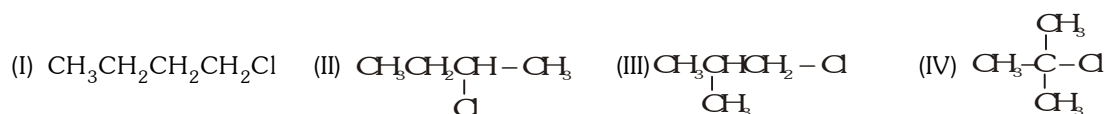
41. Which of the following can give benzyne :



42. Dehydration of the following in increasing order is :



43. Increasing tendency for $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reaction is :

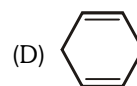
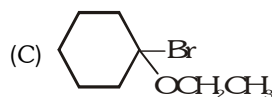
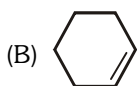
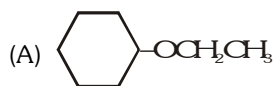


- (A) $\text{S}_{\text{N}}1$; I < III < II < IV (B) $\text{S}_{\text{N}}2$; IV < II < III < I
 (C) (A) and (B) both are correct (D) Both incorrect

44. Cyclopentyl ethyl ether can be obtained by :



45. Major product in the following reaction is :



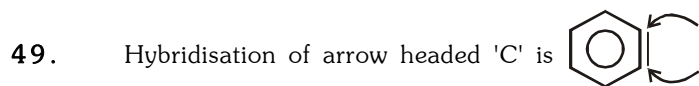
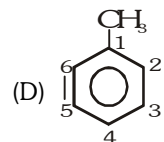
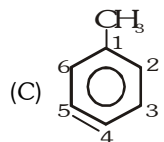
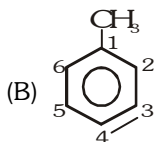
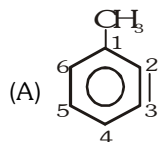
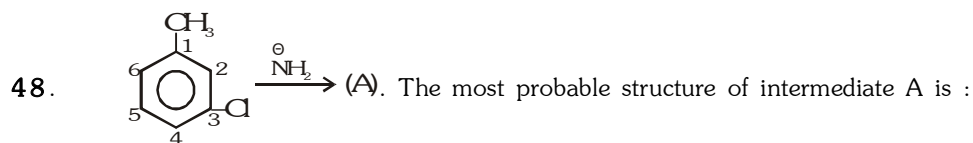
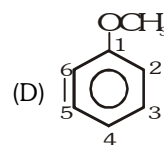
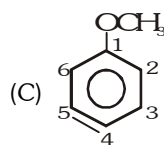
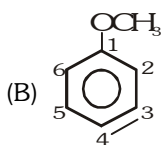
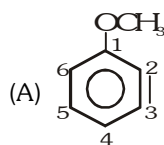
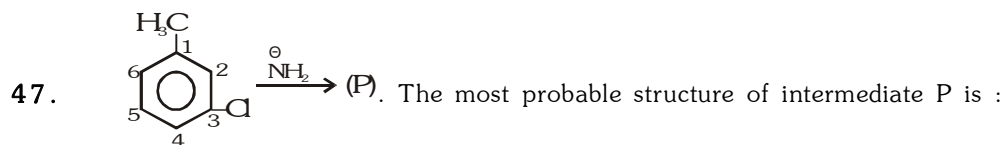
46. Mechanism of insertion reaction is of :

(A) One step for triplet carbene

(B) Two step for singlet carbene

(C) One step for singlet carbene

(D) Two step for both



(A) $sp^2 sp^3$

(B) $sp^3 sp^3$

(C) $sp^2 sp^2$

(D) $sp^3 sp^3 d$

50. Which of the following is most strongest electrophile :

(A) singlet $\text{H}-\ddot{\text{N}}\cdot$

(B) triplet $\text{H}-\ddot{\text{N}}\cdot$

(C) singlet $\text{C} \equiv \text{C} \cdot$

(D) triplet $\text{C} \equiv \text{C} \cdot$

51. In benzyne two external unshared electronic orbital :

(A) do not overlap to form a π bond

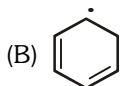
(B) can overlap to form a complete π bond

(C) poorly overlap to form a very weak bond

(D) contribute in benzene ring

52. Which of the following is aromatic intermediate :

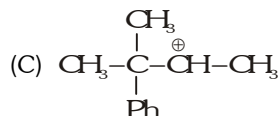
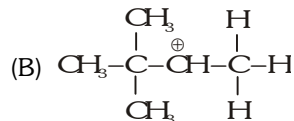
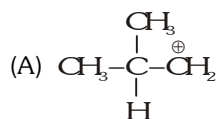
(A) carbene



(C) Benzyne

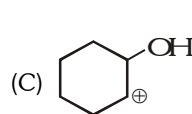
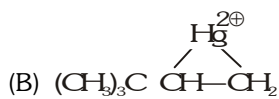
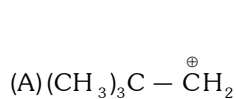


53. In which of the following case 'H' shift is more preferable than 'CH₃' shift :



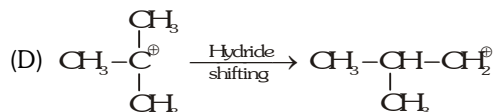
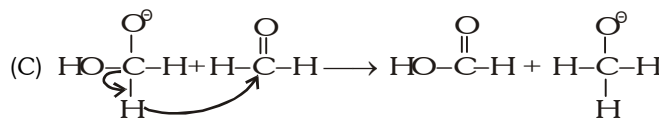
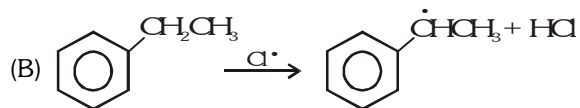
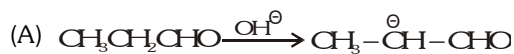
(D) all

54. Which of the following will not give 1, 2, shift :

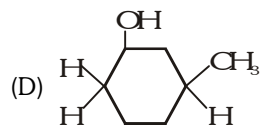
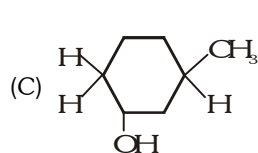
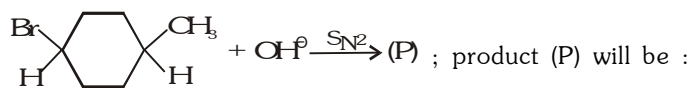


(D) all

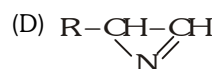
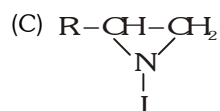
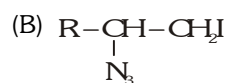
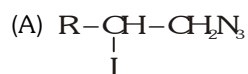
55. Which of the following reactions is wrong :

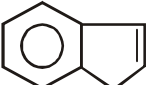


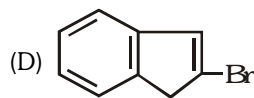
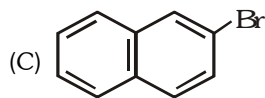
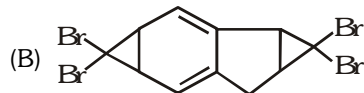
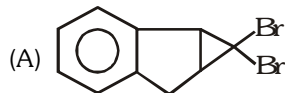
56. Methyl benzylic carbonium ion is the most stable one, hence it will react fastest consider the following reaction :

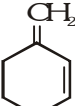


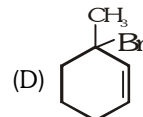
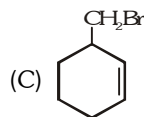
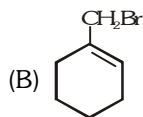
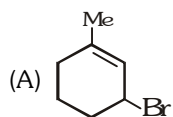
57. Consider the following reaction -
 $R-CH=CH_2 + IN_3 \longrightarrow A$, A is :

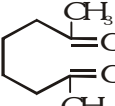


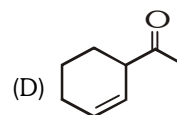
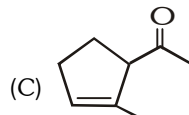
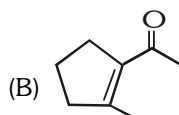
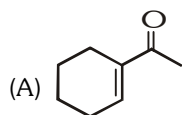
58.  + $\text{CHBr}_3 \xrightarrow{1. \text{BuOK}}$ product ; product will be :



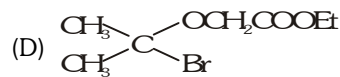
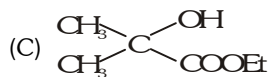
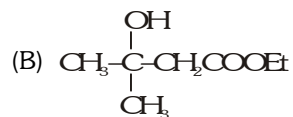
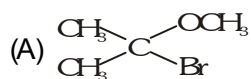
59.  $\xrightarrow{\text{HBr}}$ major product will be :

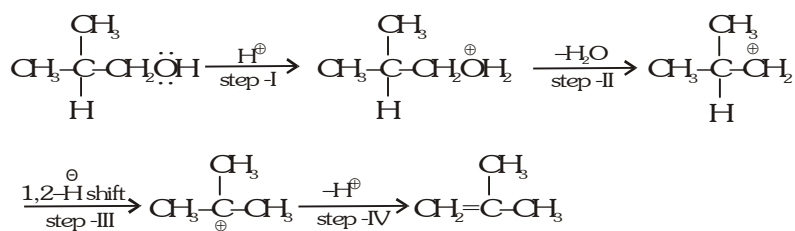
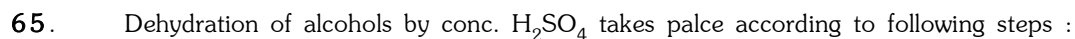
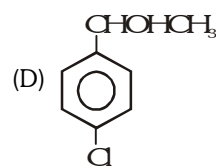
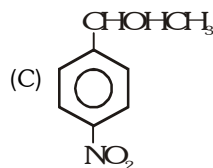
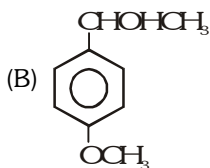
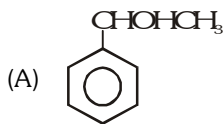
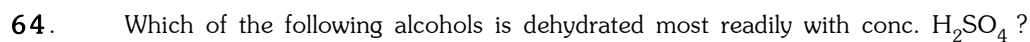
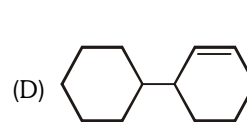
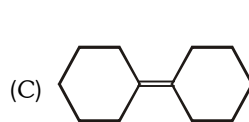
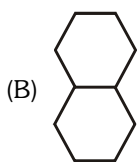
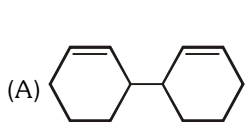
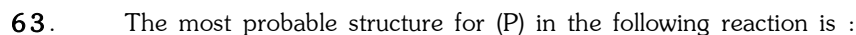
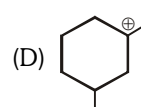
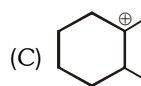
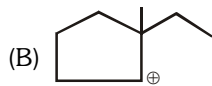
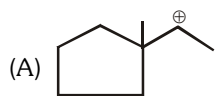
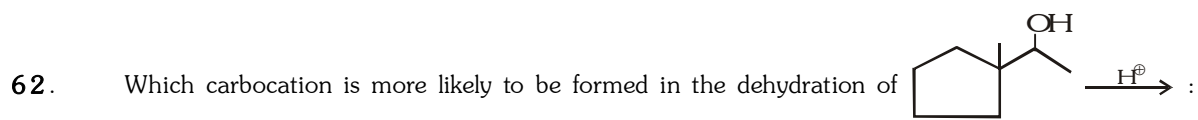


60.  $\xrightarrow[\Delta]{\text{OH}^-}$ Product ; major product of the reaction can be :



61. $\text{CH}_3\text{COCH}_3 + \text{BrCH}_2\text{COOEt} \xrightarrow[\text{(ii) H}_2\text{O/H}^+]{\text{(i) Zn}}$ (A) ; the product (A) is :

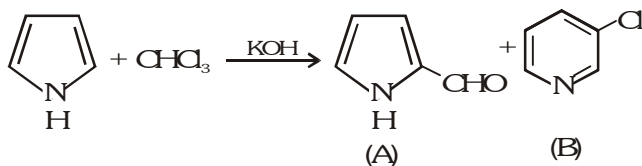




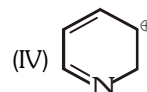
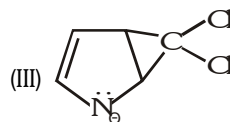
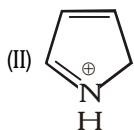
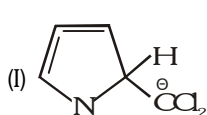
the slowest and fastest steps in the above reaction are :

- (A) step I is slowest, while III is fastest
 (B) step II is slowest, while III is fastest
 (C) step II is slowest, while IV is fastest
 (D) all steps proceed at equal rate

66. Pyrrole is treated with alkaline chloroform to form two products A and B ?



Which of the following intermediate is likely to be formed ?



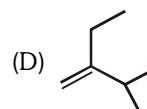
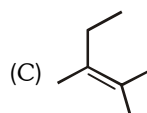
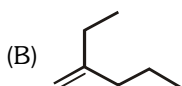
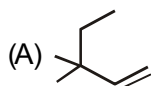
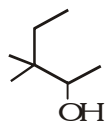
(A) I and IV

(B) I and III

(C) III and IV

(D) I, III and IV

67. $\xrightarrow{\text{conc. H}_2\text{SO}_4}$ Major product is :



BRAIN TEASERS						ANSWER KEY				EXERCISE -2					
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	D	C	B	D	A	C	D	D	B	D	A,B,C	C	B	B	B
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	D	D	B	A	A	B,D	A,C	A,B,C	C	C	B	A,B,C,D	B,D	A,D	A,B,D
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	A	B	C	D	C	C	C	A	A	D	D	A	A	A	B
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	C	A	B	C	B	C	C	A	B	D	A	B	C	A	B
Que.	61	62	63	64	65	66	67								
Ans.	B	C	C	B	C	B	C								

EXERCISE-03**MISCELLANEOUS TYPE QUESTIONS****TRUE OR FALSE :**

1. In benzene, carbon uses all the three p-orbitals for hybridization.
2. All the carbon atoms in bicyclbutane are sp^2 -hybridized.
3. Allene ($CH_2=C=CH_2$) is a planar molecule.
4. The greater stability of trans-but-2-ene over cis-but-2-ene can be explained on the basis of hyperconjugation effect.
5. In a two step reaction, the rate determining step has the lowest energy of activation.

FILL IN THE BLANKS :


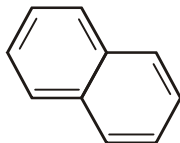
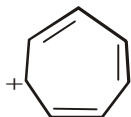
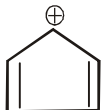
1. Out of benzene, ethylene and acetylene, the carbon-carbon bond is longest in
2. The cyclopentadienyl cation is while cyclopentadienyl anion is
3. The type of delocalization involving sigma bond orbitals with π bond or vacant orbital is called
4. Hydroperoxide ion is a stronger but weaker than hydroxide ion.
5. Catalytic hydrogenation of cis-2, 3-diphenyl-2-butene gives.....

MATCH THE COLUMN

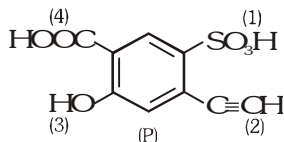
1. Match the column I with column II.

Column-I		Column-II	
(A)	$-\text{NO}_2$	(p)	- m effect
(B)	$-\text{O}^-$	(q)	+ m effect
(C)	$-\text{O}-\text{CH}_3$	(r)	+ I effect
(D)	$-\text{C} \equiv \text{N}$	(s)	- I effect

2. Match the column I with column II.

Column-I		Column-II	
(A)		(p)	Aromatic
(B)		(q)	Non-aromatic
(C)		(r)	Anti-aromatic
(D)		(s)	Aliphatic

3. Observe the following compound P and match the column I with column II.



Column-I		Column-II	
(A)	Strongest acidic group in P	(p)	1
(B)	Weakest acidic group in P	(q)	2
(C)	Number of Intra molecular H-Bonding in P	(r)	3
(D)	Number of mole of hydrogen gas that is liberated on reaction of 'P' with excess of sodium metal if one mole of P is used	(s)	4

ASSERTION & REASON QUESTION :

These questions contains, Statement-I (assertion) and Statement-II (reason).

- (A) Statement-I is True, Statement-II is True ; Statement-II is a correct explanation for Statement-I
 (B) Statement-I is True, Statement-II is True ; Statement-II is NOT a correct explanation for Statement-I
 (C) Statement-I is True, Statement-II is False.
 (D) Statement-I is False, Statement-II is True.

1. **Statement-I** : Greater the s-character of the hybrid orbital, the smaller is its size.

Because

Statement-II : Bond formed by the overlap of sp^3-sp^3 hybrid orbital is the longest while the bond formed by the overlap of $sp-sp$ hybrid orbital is shortest.

2. **Statement-I** : $Me_3\overset{+}{C}$ is more stable than $Me_2\overset{+}{CH}$ and $Me_2\overset{+}{CH}$ is more stable than the $Me\overset{+}{CH_2}$.

Because

Statement-II : Greater the number of hyperconjugative structures, more is the stability of carbocation.

3. **Statement-I** : Cyclopentadienyl anion is much more stable than allyl anion.

Because

Statement-II : Cyclopentadienyl anion is aromatic in nature.

4. **Statement-I** : CH_3OCH_3 and C_2H_5OH have comparable molecular masses but boiling point of C_2H_5OH is higher than dimethyl ether.

Because

Statement-II : C_2H_5OH forms intermolecular H-bonding while CH_3OCH_3 forms intramolecular H-bonding.

5. **Statement-I** : In the compound, $\overset{IV}{CH_3}-\overset{III}{CH_2}-\overset{II}{C}\equiv\overset{I}{N}$, the most electroegative carbon is II.

Because

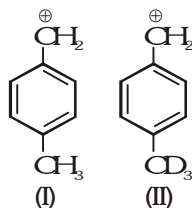
Statement-II : Carbon atom II has more s-character.

6. **Statement-I** : pK_{a1} of fumaric acid is more than maleic acid.

Because

Statement-II : Conjugate base of fumaric acid is stabilised by intramolecular H-bonding.

7. **Statement-I** : Carbocation (II) is more stable than carbocation (I)



Because

Statement-II : Carbocation (II) has more positive inductive effect of $-CD_3$ group as compared to $-CH_3$ group.

8. **Statement-I** : Carbon-oxygen bonds are of equal length in acetate ion.

Because

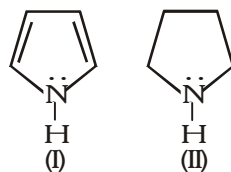
Statement-II : Bond length decreases with the multiplicity of bond between two atoms.

9. **Statement-I** : The potential energy barrier for rotation about C=C bond in 2-butene is much higher than that in ethylene.

Because

Statement-II : Hyperconjugation effect decreases the double bond character.

10. **Statement-I** : Pyrrolidine (II) is more basic than pyrrole (I).



Because

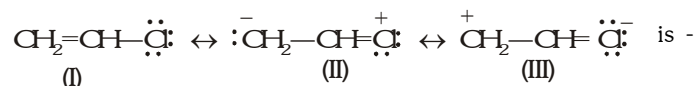
Statement-II : Protonated pyrrole has resonance stabilization of positive charge in aromatic ring.

COMPREHENSION BASED QUESTIONS :

Comprehension # 1

The intramolecular delocalisation of π and /non-bonding electrons without any change in the position of atoms is called resonance. Delocalisation may occur in conjugated system involving carbon atom and atom other than the carbon. Delocalisation makes system stable. More is the number of resonating structures, more is the stability of the system. A conjugated structure is least stable when a higher electronegative atom has positive charge and when identical charges are present on adjacent atoms.

1. The decreasing order of stability of the following resonating structures :

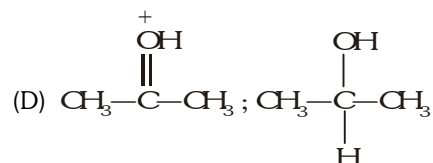
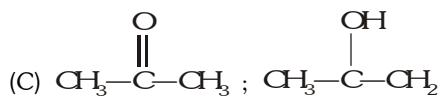
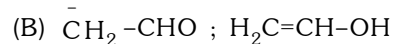
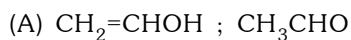


- (A) I > II > III (B) II > III > I (C) III > II > I (D) I > III > II

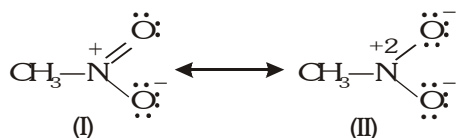
2. If A is $PhCH_2^+$ and B is $CH_2=CH-CH_2^+$, the greater number of resonating structure is of -

- (A) A (B) B (C) both A and B (D) None of these

3. Which of the following pairs represent resonance ?



4. Examine the structures I and II for nitromethane and choose the statement correctly :



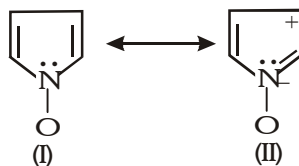
(A) II is less important because electrons have shifted to oxygen

(B) II is less important because nitrogen has sextet of electrons

(C) II is acceptable and important structure

(D) none of these

5. Examine the following two structures for pyrrole and choose the correct statement given below :



(A) II is not an acceptable resonating structure because carbonium ions is less stable than nitride ion

(B) II is not an acceptable resonating structure because there is charge separation

(C) II is not an acceptable resonating structure because nitrogen has ten valance electrons

(D) II is an acceptable resonating structure

6. Delocalization of electrons increases molecular stability because :

(A) Potential energy of the molecule decreases

(B) Electron-nuclei attraction decreases

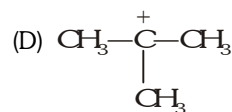
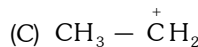
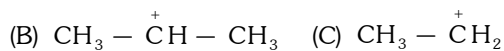
(C) Both (A) and (B)

(D) Electron-electron repulsion increases

Comprehension # 2

Carbocation is a group of atoms with positively charged carbon atom having six electrons in the valence shell after sharing. Carbocations are formed in the heterolysis of a bond and are planar species. Stability of carbocation is determined by inductive effect, hyperconjugation and resonance effect. Greater the number of contributing structures, more is the stability of a Carbocation. Electron releasing groups (+I effect) increases the stability of a carbocation whereas the electron withdrawing groups (-I effect) have an opposite effect.

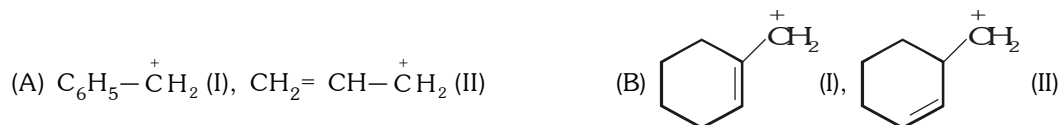
1. Which of the following is most stable carbocation ?

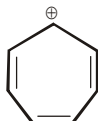


2. The most stable carbocation among the following :



3. In which of the following cases, the carbocation (I) is less stable than the carbocation (II) ?



4. The most stable and the least stable carbocation among  (I), $CH_2=CH-\overset{+}{C}H_2$ (II), $C_6H_5-\overset{+}{C}H_2$ (III)

and $CH_3-\overset{+}{C}H-CH_3$ (IV) are respectively :

(A) II, I (B) III, IV (C) I, II (D) I, IV

5. Most stable carbocation is formed by the heterolysis of :

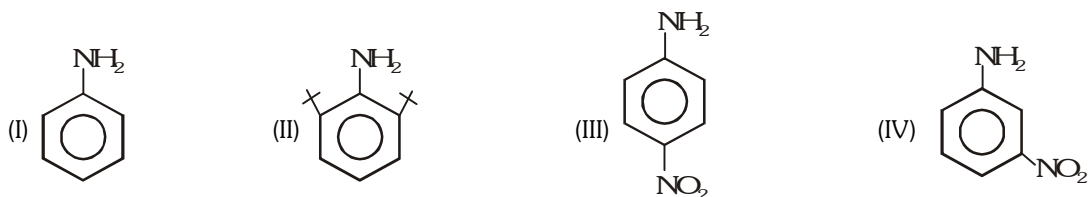
(A) $(CH_3)_3CBr$ (B) $(C_6H_5)_3CBr$ (C) $(C_6H_5)_2CHBr$ (D) $C_6H_5CH_2Br$

Comprehension # 3

The most important condition for resonance to occur is that the involved atoms in resonating structure must be coplanar or nearly coplanar for maximum delocalisation. If this condition does not fulfil, involved orbitals cannot be parallel to each other and as a consequence delocalisation cannot occur. Bulky groups present on adjacent atoms inhibit the of orbitals. This phenomenon is known as steric inhibition of resonance. Steric inhibition of resonance has profound effect on

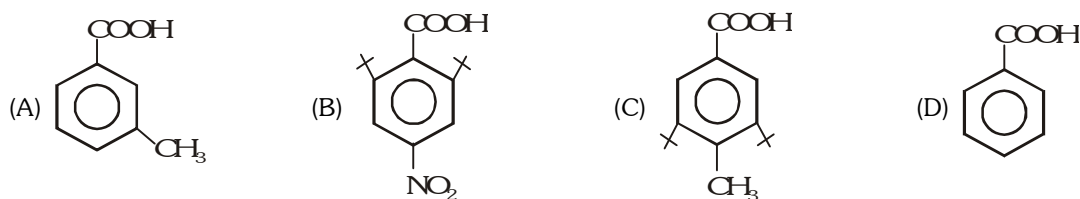
(1) Physical properties (2) Acidity and basicity (3) Reactivity of organic compounds

1. Arrange the following in the increasing order of basicity :

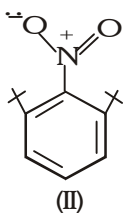
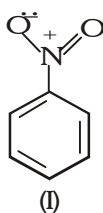


(A) I > II > III > IV (B) IV > III > II > I (C) II > I > IV > III (D) I > IV > III > II

2. Which of the following is most acidic :

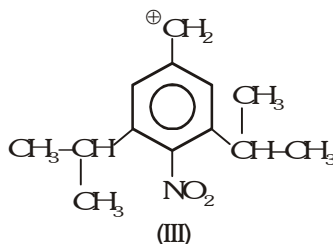
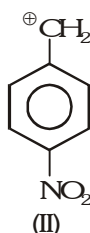
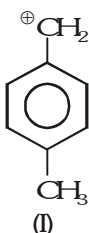


3. Consider the following two structures and choose the correct statements -



- (A) carbon-nitrogen bond length structure I is greater than that in structure II
 (B) carbon-nitrogen bond length in structure I is less than in structure II
 (C) carbon-nitrogen bond length in both structure is same
 (D) It can not be compared

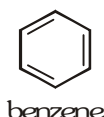
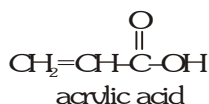
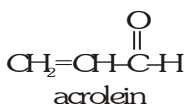
4. Arrange the following carbocation in the increasing order of stability :



- (A) I < II < III (B) II < III < I (C) III < II < I (D) III < I < II

Comprehension # 4

1-Butene (A) and 1,3-Butadiene (B) differ not only in the number of π bonds, but (B) also has σ and π bonds at alternate positions. This type of the system is called conjugate system. Following are some of the conjugate system.



in such systems, π electron shifting takes place consecutively giving permanent polarity on the chain. This type of π -electron shift in the conjugate systems is called mesomeric effect or resonance.

Rules for resonance forms :

- Individual resonance forms are imaginary, not real
- Resonance forms differ only in the placement of their π electrons or nonbonding electrons.
- Different resonance forms of a substance don't have to be equivalent.
- Resonance forms must be valid Lewis structures and obey normal rules of valency.
- The resonance hybrid is more stable than any individual resonance.

Rules for stability :

- Structures with more covalent bonds are more stable than other structures.
- Structures in which all of the atoms have a complete valence shell of electrons (i.e. the noble gas structure) are especially stable and make large contribution to the hybrid.
- Stability is decreased by an increase in charge separation.
- Structure that carry negative charge on a more electronegative atom and positive charge on less electronegative atom are comparatively more stable.

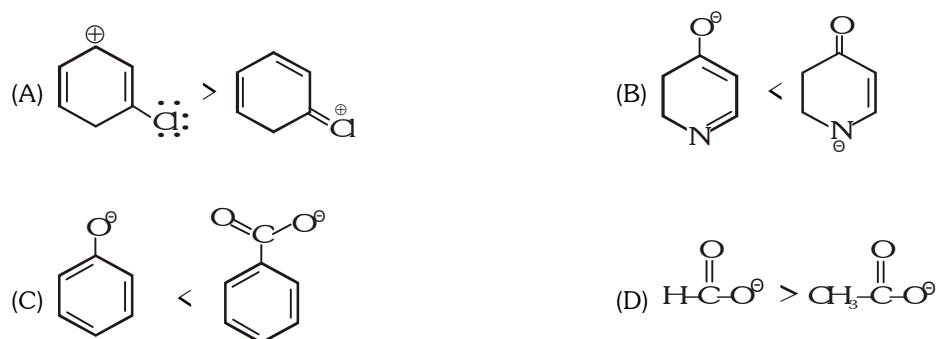
1. In which of the following compound, resonance is not possible :



2. Which of the following statement is incorrect -

- (A) In a resonance hybrid all the molecules are the same. A resonance hybrid cannot be expressed by any single structure.
 (B) The value of the resonance energy of any resonance hybrid is not an absolute value
 (C) The energy of hybrid structures is always less than that of any resonating structure
 (D) Only one individual resonating structure explains all characteristics of the molecule

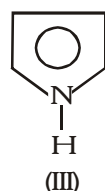
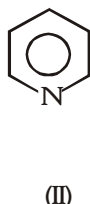
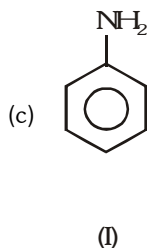
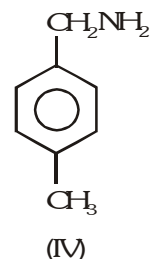
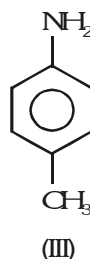
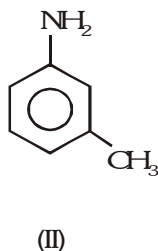
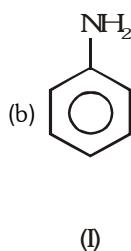
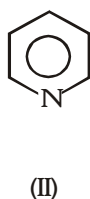
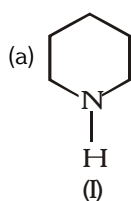
3. Choose the correct option about stability of resonating structure :



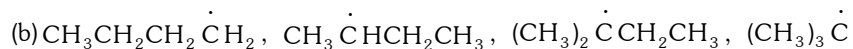
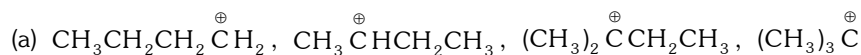
MISCELLANEOUS TYPE QUESTION	ANSWER KEY	EXERCISE -3
• <u>True / False</u>		
1. F	2. F	3. T
4. F	5. F	
• <u>Fill in the Blanks</u>		
1. benzene	2. antiaromatic, aromatic	3. hyperconjugation
5. 2,3-diphenylbutane (optically inactive, meso)	4. nucleophile, base	
• <u>Match the Column</u>		
1. (A) → p,s ; B → q,r ; (C) → q,s ; (D) → p,s	2. (A) → q ; (B) → p ; (C) → p ; (D) → r	
3. (A) → p ; (B) → q ; (C) → p ; (D) → q		
• <u>Assertion - Reason Questions</u>		
1. B	2. A	3. A
4. C	5. A	
6. C	7. D	8. B
9. D	10. C	
• <u>Comprehension Based Questions</u>		
Comprehension #1 : 1. (A)	2. (A)	3. (B)
4. (B)	5. (C)	6. (C)
Comprehension #2 : 1. (D)	2. (C)	3. (C)
4. (D)	5. (B)	
Comprehension #3 : 1. (C)	2. (B)	3. (B)
4. (B)		
Comprehension #4 : 1. (A)	2. (D)	3. (C,D)

EXERCISE-04 [A]**CONCEPTUAL SUBJECTIVE EXERCISE**

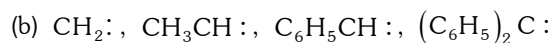
1. Rank the following amines in increasing basic nature :



2. Rank the following intermediates according to the stability (most stable first).



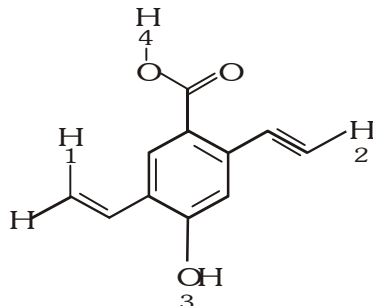
3. Rank the following intermediates according to the stability (most stable first).



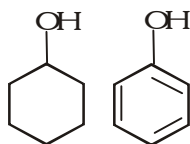
4. Show why the phenolate ion, $\text{C}_6\text{H}_5\text{O}^-$, has a greater resonance stabilization than phenol, $\text{C}_6\text{H}_5\text{OH}$.

5. Is phenol a stronger acid than acetic acid. Explain your answer with proper reasoning.

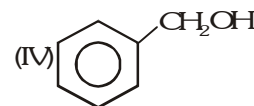
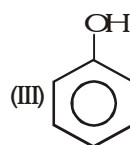
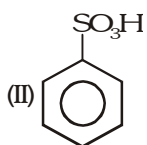
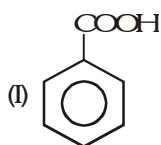
6. Arrange all these numbered H in order of their decreasing acidic strength.



7. Between $\begin{array}{c} | & | \\ \text{---C} & \text{---C---} \end{array} \ddot{\text{F}}$ and $\begin{array}{c} | & | \\ \text{---C} & \text{---C---} \end{array} \ddot{\text{Cl}}$ which lone pair- p conjugation will be more preferred.
8. Which is more acidic and why ?



9. Arrange the following compound in the correct order of acidity :

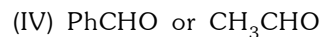
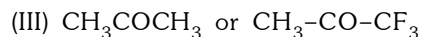
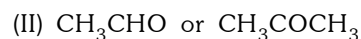
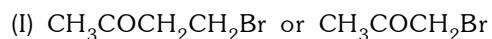


10. Why a cation like is not possible.

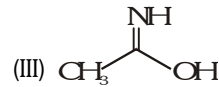
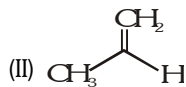
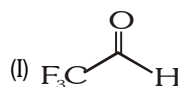
11. (A) Product.

12. $\text{CH}_2=\text{CHCHO} + \text{C}_2\text{H}_5\text{MgBr} \xrightarrow{\text{H}_3\text{O}^+} \text{P}$; Here P is :

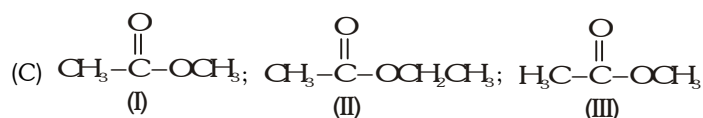
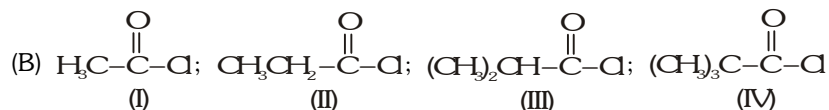
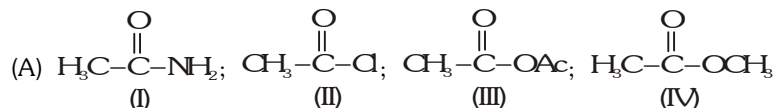
13. Within each set, select the compound which is more reactive in nucleophilic addition at carbonyl carbon :



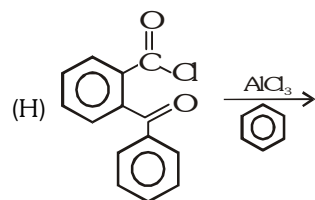
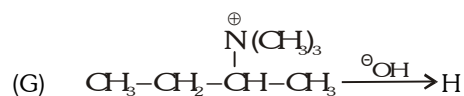
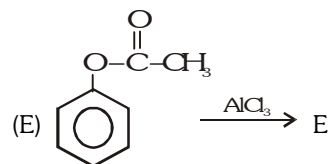
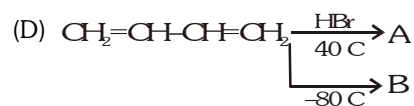
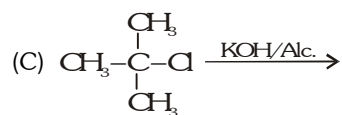
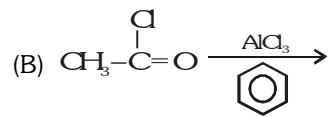
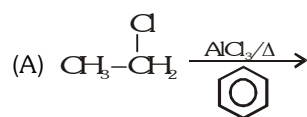
14. Rank of the following compounds in increasing order of electrophilicity :



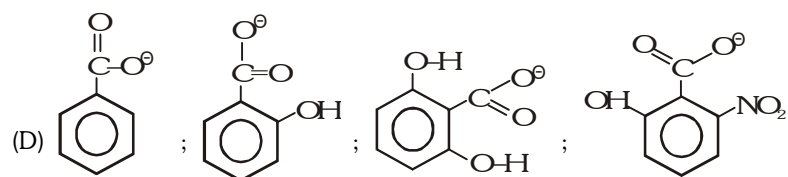
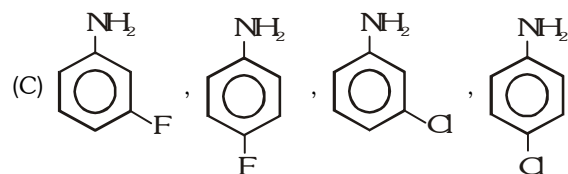
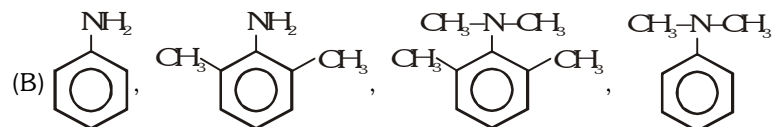
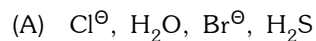
15. Arrange the followings in increasing order of reactivity towards nucleophile :



16. Suggest the product of the reactions :



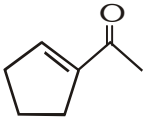
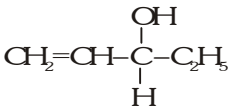
17. Arrange the following in increasing order of basic character :



18. Heat of hydrogenation of $\text{CH}_2=\text{CH}_2$ is greater than $\text{CH}_3-\text{CH}=\text{CH}_2$. Why ?

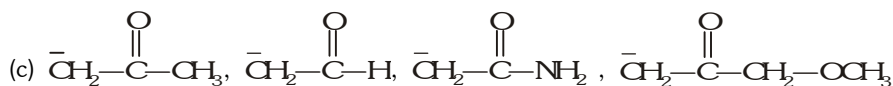
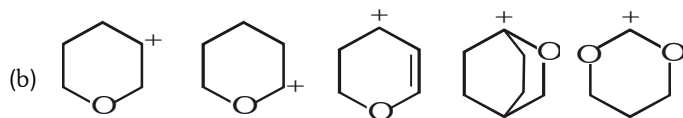
19. In the case of $\left[\text{CH}_3-\text{CH}_2-\overset{\oplus\text{N}(\text{CH}_3)_3}{\underset{|}{\text{CH}}}-\text{CH}_3 \right] \text{OH}^-$, less stable 1-Butene is obtained. Why ?

20. When carbene attacks cis 2-butene singlet gives cis product while triplet gives trans product. Why ?

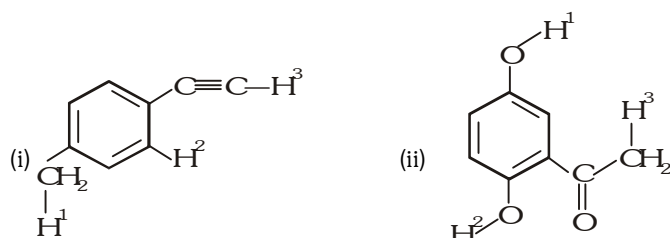
1. (a) $I > III > II > IV$ (b) $IV > III > II > I$ (c) $II > I > III$
2. (a) $(CH_3)_3\overset{\oplus}{C} > (CH_3)_2\overset{\oplus}{C}CH_2CH_3 > CH_3\overset{\oplus}{C}HCH_2CH_3 > CH_3CH_2CH_2\overset{\oplus}{C}H_2$
 (b) $(CH_3)_3\dot{C} > (CH_3)_2\dot{C}CH_2CH_3 > CH_3\dot{C}HCH_2CH_3 > CH_3CH_2CH_2\dot{C}H_2$
3. (a) $CH_3CH_2CH_2\bar{C}H_2 > CH_3\bar{C}HCH_2CH_3 > (CH_3)_2\bar{C}CH_2CH_3 > (CH_3)_3\bar{C}$
 (b) $(C_6H_5)_2C: > C_6H_5CH: > CH_3CH: > CH_2:$
4. Free charge has more reactivity than bound charge.
5. No
 Anion of acetic acid is more stabilised by resonance than phenoxide ion.
6. $4 > 3 > 2 > 1$
7. In $\begin{array}{c} | \quad | \\ -C=C-\ddot{F} \end{array}$, lone pair - p conjugation will be more due to more overlapping of orbitals involved in conjugation.
8. Phenol is more acidic as after loss of H^+ , phenoxide ion is Resonance stabilised. No such resonance is seen in conjugate base of cyclohexanol.
9. $II > I > III > IV$
10. Due to the non-planar structure.
11. 
12. 

EXERCISE-04 [B]**BRAIN STORMING SUBJECTIVE EXERCISE**

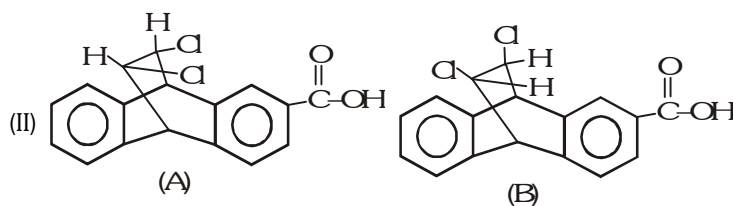
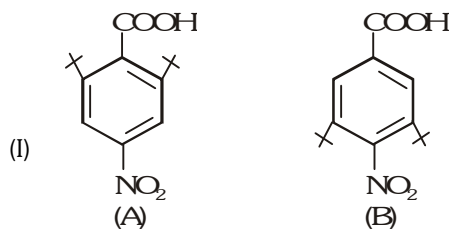
1. Rank the following sets of intermediates in increasing order of their stability giving appropriate reasons for your choice.



2. For the following compounds, arrange the labelled proton in increasing order of their ease of deprotonation :



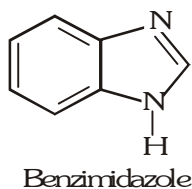
3. Benzene sulphonic acid is a stronger acid than benzoic acid, explain.
4. Which is a stronger acid, A or B and why ?



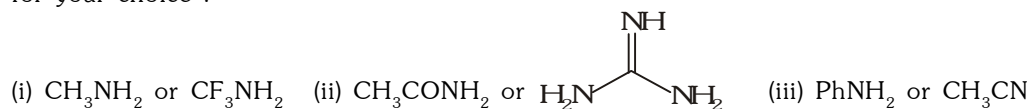
5. Discuss the following observations :

- (a) C-Cl bond in vinyl chloride is stronger than in chloroethane.
- (b) Carbon-carbon bond length in ethene is shorter than in $\text{CH}_2=\text{CHOCH}_3$.
- (c) CH_3SH is stronger acid than CH_3OH .
- (d) $\text{CH}_3\text{CH}_2\text{NH}_2$ is stronger base than $\text{CH}_2=\text{CHNH}_2$.

6. Discuss the basic strength of two nitrogens in benzimidazole.

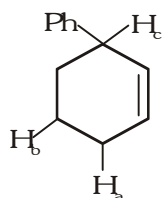


7. In each of the following pair of compounds, which is more basic in aqueous solution ? Give an explanation for your choice :



8. Answer the following questions :

- (i) Which of the indicated H is abstracted rapidly by bromine radical and why ?



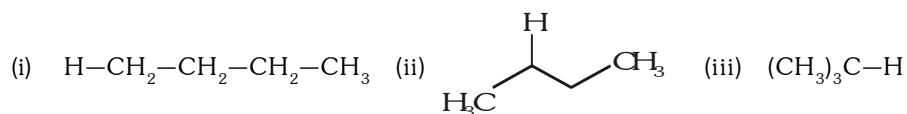
- (ii) One of the indicated proton H_a or H_b , is approximately 10^{30} times more acidic than other, which is more acidic and why ?



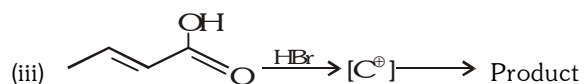
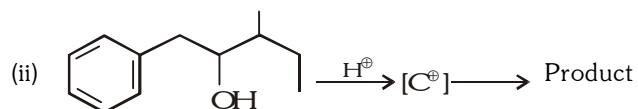
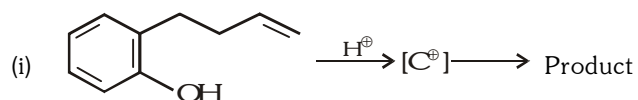
9. Explain the following

- (i) $\text{NC}-\text{CH}_2-\text{CN}$ is a stronger acid than $\text{CH}_3-\text{CO}-\text{C}_2\text{H}_5$.
 (ii) $\text{CH}_3-\text{CO}-\text{C}_2\text{H}_5$ is more acidic than $\text{CH}_3-\text{CH}=\text{CH}_2$.
 (iii) $\text{CH}_3-\text{CH}=\text{CH}-\text{OH}$ is more acidic than $\text{CH}_2=\text{CH}-\text{CH}_2-\text{OH}$.

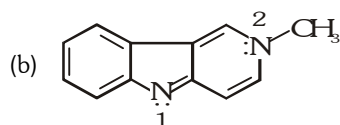
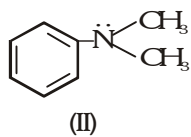
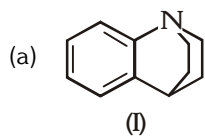
10. Compare the bond dissociation energies of C-H bonds in the following



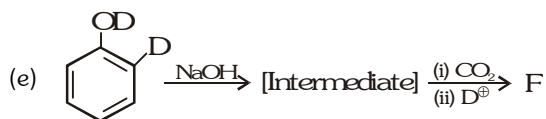
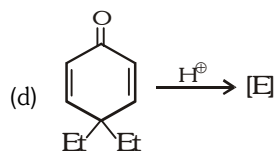
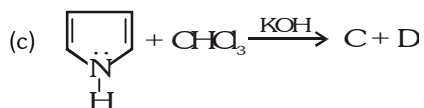
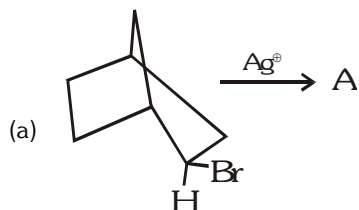
11. The most stable intermediary carbocation and major product in following reactions :



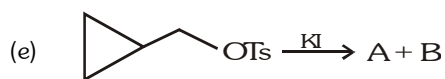
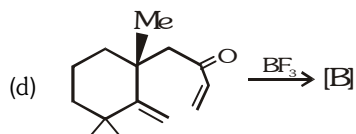
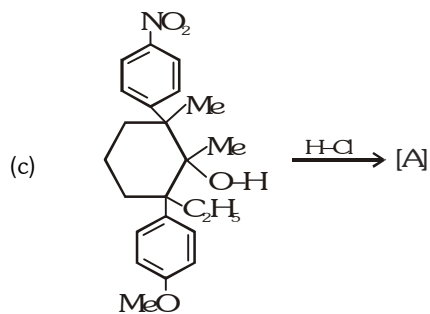
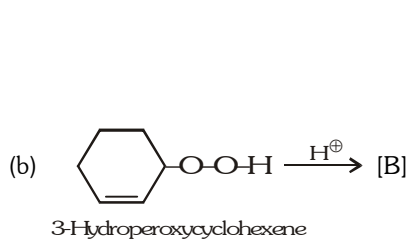
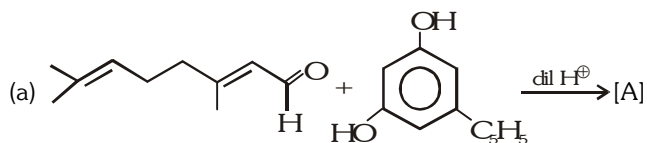
12. Which one of the following is more basic and why ?



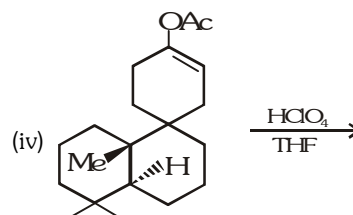
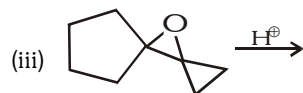
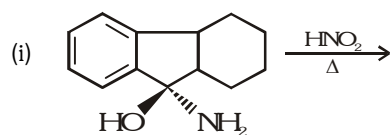
13. Find the product in following reaction :



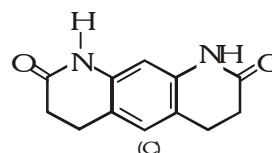
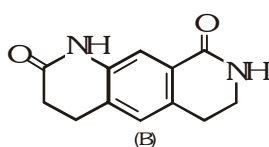
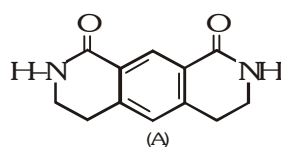
14. Write the mechanism of following reaction :



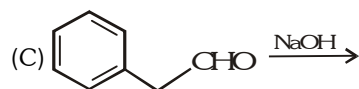
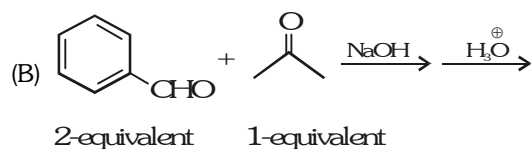
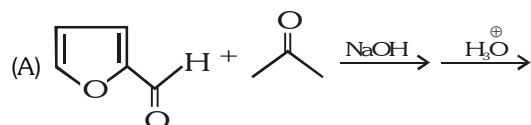
15. Find the major product in the reaction the following :



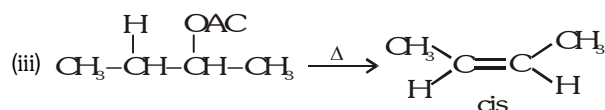
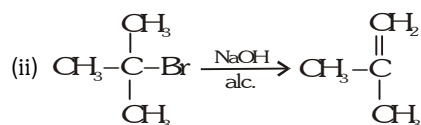
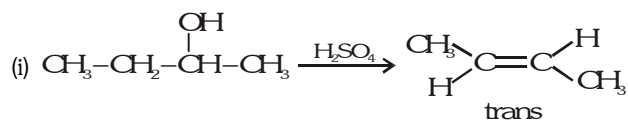
16. Decreasing order of E.S.R.

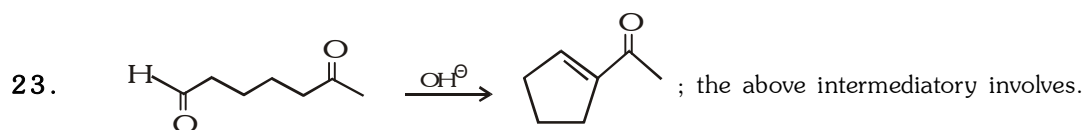
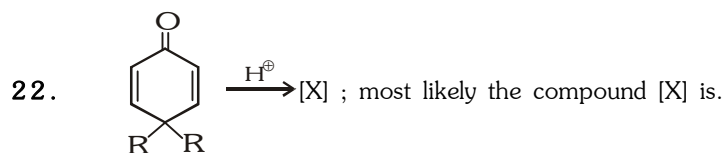
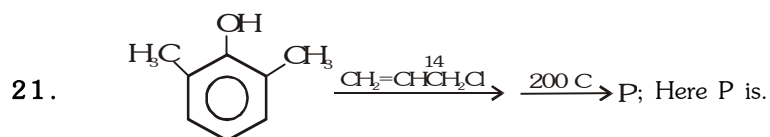
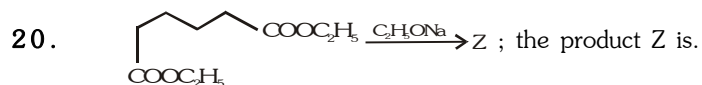
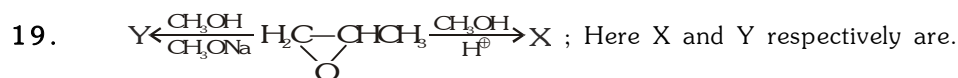
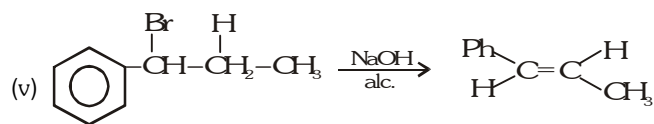
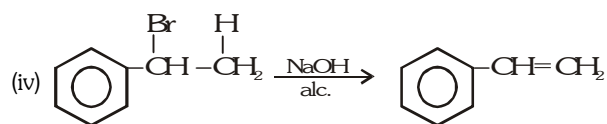


17. Complete the following equations :

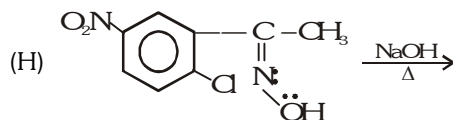
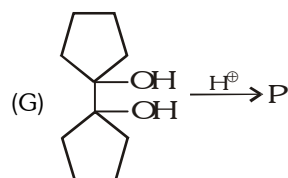
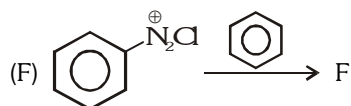
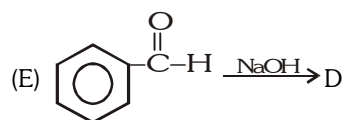
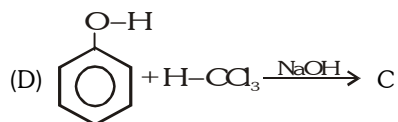
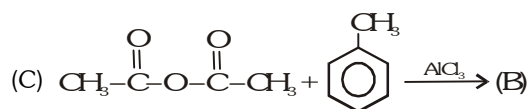
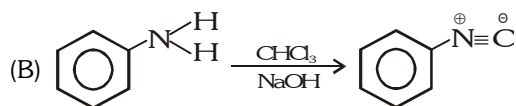
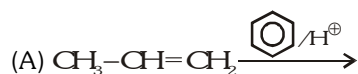


18. Suggest the mechanism of the following reaction :

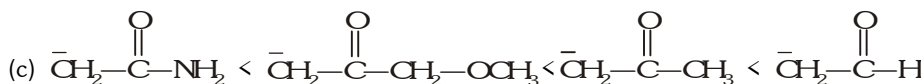
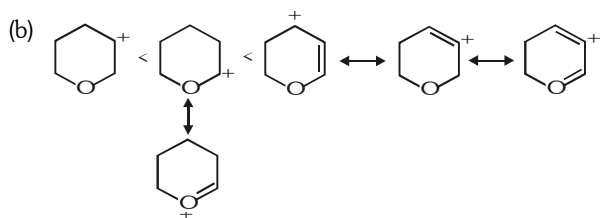




24. Suggest the product of the reactions :



1. (a) $\text{O}_2\text{NCH}_2\text{CH}_3 < \text{CH}_3\text{CH}_2\text{CH}_3 < \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3 < (\text{C}_6\text{H}_5)_2\text{C}:$



2. (i) $2 < 1 < 3$ (ii) $3 < 1 < 2$

3. Conjugate base of benzene sulphonic acid has greater resonance stabilization than benzoate ion, hence benzene sulphonic acid is stronger acid than benzoic acid. PhSO_3^- has three equivalent resonance structure, so more stable. but PhCOO^- has only two equivalent resonance structure, so less stable.

4. B is stronger base than A. Here basic strength is controlled by $-\text{R}$ effect of $-\text{NO}_2$. In B, due to steric inhibition to resonance of $-\text{NO}_2$ by two bulky tertiary butyl group, it is not decreasing basic strength by $-\text{R}$ effect, hence B is stronger base than A.

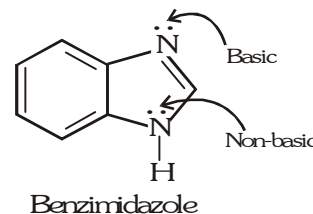
5. (a) Due to resonance in vinyl chloride, $\text{C}-\text{Cl}$ bond acquire some double bond character while in chloroethane, $\text{C}-\text{Cl}$ bond is pure, single sigma covalent bond.

(b) Due to resonance in methyl vinyl ether, bond order of $\text{C}-\text{C}$ is slightly reduced from two while in ethene $\text{C}-\text{C}$ bond order is exactly 2.

(c) Larger size of sulphur compared to oxygen gives greater acidity to CH_3SH .

(d) Lone-pair of electron in vinyl amine is involved partly in resonance delocalization and less available for donation to a Lewis acid, hence a weaker Lewis base.

6. Lone pair of the basic nitrogen is fully available with nitrogen, i.e. not involved in delocalization while lone pair of non-basic nitrogen is part of aromatic delocalization.



7. (i) CH_3NH_2 , (ii) $\text{H}_2\text{N}-\text{C}(=\text{NH})-\text{NH}_2$ (iii) PhNH_2

8. (i) $\text{H}_c > \text{H}_a > \text{H}_b$ (ii) H_a : Conjugate base is aromatic

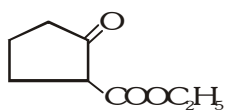
9. Acidic strength \propto stability of anion formed after removal of $\text{H}^+ \propto$ number of e^- withdrawing groups.

10. $\text{III} > \text{II} > \text{I}$

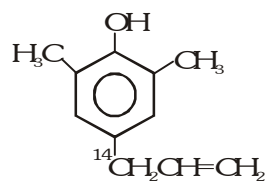
$$\text{B.D.E.} \propto \frac{1}{\text{stability of intermediate formed}}$$

19. X : $\text{HOCH}_2-\text{CH}(\text{OCH}_3)-\text{CH}_3$ and Y : $\text{CH}_2=\text{CH}(\text{OCH}_3)-\text{CH}_3$

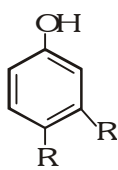
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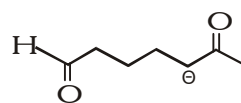
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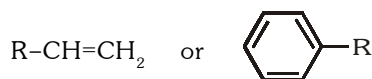


23.



EXERCISE-05(A)**PREVIOUS YEARS QUESTIONS**

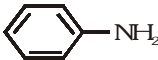
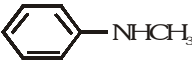
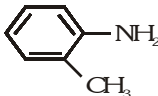
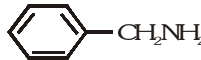
1. In the following benzyl/allyl system



[AIEEE 2002]

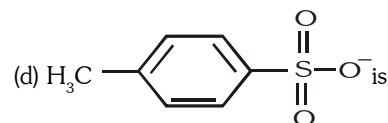
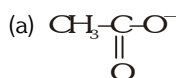
(R is alkyl group)

decreasing order of inductive effect is-

- (1) $(CH_3)_3C- > (CH_3)_2CH- > CH_3CH_2-$
(2) $CH_3-CH_2- > (CH_3)_2CH- > (CH_3)_3C-$
(3) $(CH_3)_2CH- > CH_3CH_2- > (CH_3)_3CH-$
(4) None of these
2. In the anion $HCOO^-$ the two carbon-oxygen bonds are found to be of equal length. What is the reason for it- [AIEEE 2003]
- (1) Electronic orbits of carbon atoms are hybridised
(2) The $C=O$ bond is weaker than the $C-O$ bond
(3) The anion $HCOO^-$ has two resonating structure
(4) The anion is obtained by removal of a proton from the acid molecule
3. The correct order of increasing basic nature for the bases NH_3 , CH_3NH_2 and $(CH_3)_2NH$ is-[AIEEE 2003]
- (1) $CH_3NH_2 < NH_3 < (CH_3)_2NH$
(2) $(CH_3)_2NH < NH_3 < CH_3NH_2$
(3) $NH_3 < CH_3NH_2 < (CH_3)_2NH$
(4) $CH_3NH_2 < (CH_3)_2NH < NH$
4. Consider the acidity of the carboxylic acids- [AIEEE 2004]
- (i) $PhCOOH$ (ii) $o-NO_2C_6H_4COOH$
(iii) $p-NO_2C_6H_4COOH$ (iv) $m-NO_2C_6H_4COOH$
- which of the following order is correct for acidic strength-
- (1) $i > ii > iii > iv$ (2) $ii > iv > iii > i$
(3) $ii > iv > i > iii$ (4) $ii > iii > iv > i$
5. Which of the following is the strongest base- [AIEEE 2004]
- (1)  (2)  (3)  (4) 
6. Rate of the reaction $R-\overset{\overset{O}{\parallel}}{C}-Z + Nu^- \rightarrow R-\overset{\overset{O}{\parallel}}{C}-Nu + Z^-$ is fastest when Z is [AIEEE 2004]
- (1) $OCOCH_3$ (2) NH_2
(3) OC_2H_5 (4) Cl
7. Which one of the following does not have sp^2 hybridised carbon [AIEEE 2004]
- (1) Acetamide (2) Acetic acid
(3) Acetonitrile (4) Acetone
8. Due to the presence of an unpaired electron, free radicals are [AIEEE-2005]
- (1) Chemically inactive (2) Chemically reactive
(3) Cations (4) Anions

9. The decreasing order of nucleophilicity among the nucleophiles

[AIEEE-2005]



(1) (d), (c), (b), (a)

(2) (a), (b), (c), (d)

(3) (c), (b), (a), (d)

(4) (b), (c), (a), (d)

10. Tertiary alkyl halides are practically inert to substitution by SN^2 mechanism because of [AIEEE-2005]

(1) unstability

(2) insolubility

(3) steric hinderance

(4) inductive effect

11. Among the following acids which has the lowest pK_a value- [AIEEE-2005]

(1) $\text{CH}_3\text{CH}_2\text{COOH}$

(2) $(\text{CH}_3)_2\text{CHCOOH}$

(3) HCOOH

(4) CH_3COOH

12. Amongst the following the most basic compound is- [AIEEE-2005]

(1) p-nitro aniline

(2) Acetanilide

(3) Aniline

(4) Benzylamine

13. The increasing order of the rate of HCN addition to compounds A-D is [AIEEE-2006]

(A) HCHO

(B) CH_3COCH_3

(C) PhCOCH_3

(D) PhCOPh

(1) $\text{D} < \text{B} < \text{C} < \text{A}$

(2) $\text{D} < \text{C} < \text{B} < \text{A}$

(3) $\text{C} < \text{D} < \text{B} < \text{A}$

(4) $\text{A} < \text{B} < \text{C} < \text{D}$

14. The increasing order of stability of the following free radicals is [AIEEE-2006]

(1) $(\text{C}_6\text{H}_5)_3\dot{\text{C}} < (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{H} < (\text{CH}_3)_3\dot{\text{C}} < (\text{CH}_3)_2\dot{\text{C}}\text{H}$

(2) $(\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{H} < (\text{C}_6\text{H}_5)_3\dot{\text{C}} < (\text{CH}_3)_3\dot{\text{C}} < (\text{CH}_3)_2\dot{\text{C}}\text{H}$

(3) $(\text{CH}_3)_2\dot{\text{C}}\text{H} < (\text{CH}_3)_3\dot{\text{C}} < (\text{C}_6\text{H}_5)_3\dot{\text{C}} < (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{H}$

(4) $(\text{CH}_3)_2\dot{\text{C}}\text{H} < (\text{CH}_3)_3\dot{\text{C}} < (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{H} < (\text{C}_6\text{H}_5)_3\dot{\text{C}}$

15. $\text{CH}_3\text{Br} + \text{Nu}^- \longrightarrow \text{CH}_3 - \text{Nu} + \text{Br}^-$

The decreasing order of the rate of the above reaction with nucleophiles (Nu^-) A to D is [AIEEE-2006]

$[\text{Nu}^- = (\text{A}) \text{PhO}^-, (\text{B}) \text{AcO}^-, (\text{C}) \text{HO}^-, (\text{D}) \text{CH}_3\text{O}^-]$

(1) $\text{D} > \text{C} > \text{B} > \text{A}$

(2) $\text{A} > \text{B} > \text{C} > \text{D}$

(3) $\text{B} > \text{D} > \text{C} > \text{A}$

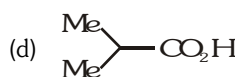
(4) $\text{D} > \text{C} > \text{A} > \text{B}$

16. The correct order of increasing acid strength of the compounds is [AIEEE-2006]

(a) $\text{CH}_3\text{CO}_2\text{H}$

(b) $\text{MeOCH}_2\text{CO}_2\text{H}$

(c) $\text{CF}_3\text{CO}_2\text{H}$

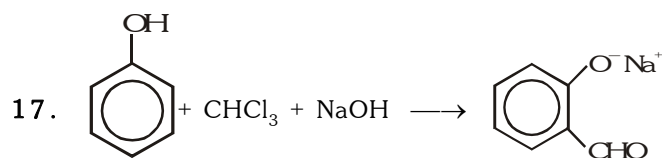


(1) $\text{d} < \text{a} < \text{c} < \text{b}$

(2) $\text{d} < \text{a} < \text{b} < \text{c}$

(3) $\text{a} < \text{d} < \text{c} < \text{b}$

(4) $\text{b} < \text{d} < \text{a} < \text{c}$



The electrophile involved in the above reaction is

[AIEEE-2006]

- (1) dichlorocarbene ($:\text{CCl}_2$)
- (2) trichloromethyl anion (CCl_3^-)
- (3) formyl cation (CHO^+)
- (4) dichloromethyl cation (CHCl_2^+)

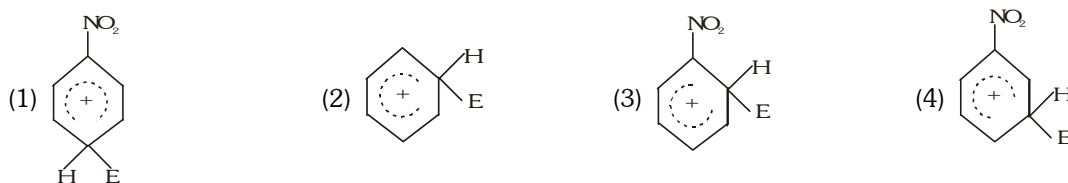
18. Which one of the following is the strongest base in aqueous solution ?

[AIEEE-2007]

- (1) Trimethylamine
- (2) Aniline
- (3) Dimethylamine
- (4) Methylamine

19. The electrophile, E^+ attacks the benzene ring to generate the intermediate σ -complex. Of the following, which σ -complex is of lowest energy?

[AIEEE-2008]



20. Arrange the carbanions, $(\text{CH}_3)_3\text{C}^-$, CCl_3^- , $(\text{CH}_3)_2\text{CH}^-$, $\text{C}_6\text{H}_5\text{CH}_2^-$, in order of their decreasing stability :-

[AIEEE-2009]

- (1) $\text{CCl}_3^- > \text{C}_6\text{H}_5\text{CH}_2^- > (\text{CH}_3)_2\text{CH}^- > (\text{CH}_3)_3\text{C}^-$
- (2) $(\text{CH}_3)_3\text{C}^- > (\text{CH}_3)_2\text{CH}^- > \text{C}_6\text{H}_5\text{CH}_2^- > \text{CCl}_3^-$
- (3) $\text{C}_6\text{H}_5\text{CH}_2^- > \text{CCl}_3^- > (\text{CH}_3)_3\text{C}^- > (\text{CH}_3)_2\text{CH}^-$
- (4) $(\text{CH}_3)_2\text{CH}^- > \text{CCl}_3^- > \text{C}_6\text{H}_5\text{CH}_2^- > (\text{CH}_3)_3\text{C}^-$

21. The correct order of increasing basicity of the given conjugate base ($\text{R}=\text{CH}_3$) is :-

[AIEEE-2010]

- (1) $\text{RCOO}^- < \text{HC} \equiv \text{C}^- < \text{NH}_2^- < \text{R}^-$
- (2) $\text{RCOO}^- < \text{HC} \equiv \text{C}^- < \text{R}^- < \text{NH}_2^-$
- (3) $\text{R}^- < \text{HC} \equiv \text{C}^- < \text{RCOO}^- < \text{NH}_2^-$
- (4) $\text{RCOO}^- < \text{NH}_2^- < \text{HC} \equiv \text{C}^- < \text{R}^-$

22. The strongest acid amongst the following compounds is ?







[AIEEE-2011]

- (1) $\text{CH}_3\text{CH}_2\text{CH}(\text{Cl})\text{CO}_2\text{H}$
- (2) $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{COOH}$
- (3) CH_3COOH
- (4) HCOOH

23. Ortho-Nitrophenol is less soluble in water than p- and m- Nitrophenols because :- [AIEEE-2012]

- (1) Melting point of o-Nitrophenol is lower than those of m- and p- isomers
- (2) o-Nitrophenol is more volatile in steam than those of m- and p- isomers
- (3) o-Nitrophenol shows Intramolecular H-bonding
- (4) o-Nitrophenol shows Intermolecular H-bonding

24. Which of the following compounds are antiaromatic :- [AIEEE-2012(Online)]

- (I)  (II)  (III) 
- (IV)  (V)  (VI) 
- (1) (III) and (VI) (2) (II) and (V)
(3) (I) and (V) (4) (V) and (VI)

25. In the following compounds : [AIEEE-2012(Online)]



the order of basicity is as follows :

- (1) IV > III > II > I (2) II > III > I > IV
(3) I > III > II > IV (4) III > I > II > IV

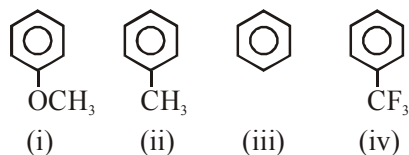
26. Dipole moment is shown by :- [AIEEE-2012(Online)]

- (1) trans-2, 3-dichloro- 2-butene (2) 1, 2-dichlorobenzene
(3) 1, 4-dichlorobenzene (4) trans-1, 2-dinitroethene

27. Among the following chloro-compound having the lowest dipole moment is :- [AIEEE-2012(Online)]



28. In the below mentioned compounds the decreasing order of reactivity towards electrophilic substitution is : [AIEEE-2012(Online)]



- (1) (iii) > (i) > (iv) > (ii) (2) (iv) > (i) > (ii) > (iii)
(3) (ii) > (iii) > (i) > (iv) (4) (i) > (ii) > (iii) > (iv)

29. Among the following the molecule with the lowest dipole moment is :- [AIEEE-2012(Online)]

- (1) CHCl_3 (2) CH_2Cl_2
(3) CCl_4 (4) CH_3Cl

30. The most basic compound among the following is :- [AIEEE-2012(Online)]

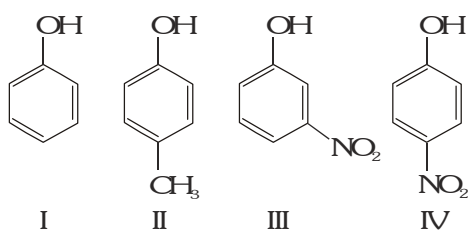
- (1) Acetanilide (2) Benzylamine
(3) p-Nitro aniline (4) Aniline

EXERCISE-05(B)**PREVIOUS YEARS QUESTIONS**

1. Which one of the following has the smallest heat of hydrogenation per mole ? [IIT-93]
- (A) 1-Butene (B) trans-2-Butene
(C) cis-2-Butene (D) 1, 3-Butadiene

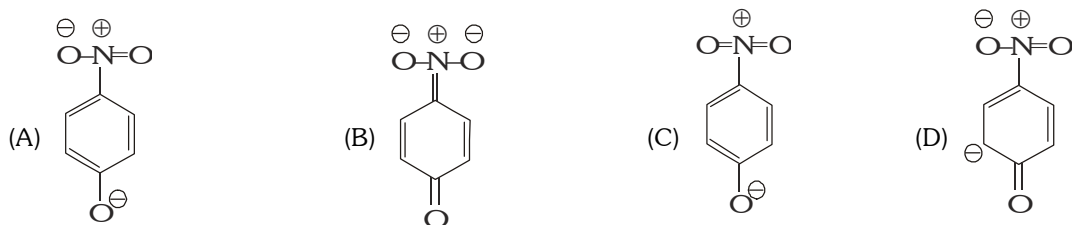
2. What is the decreasing order of strength of bases OH^\ominus , NH_2^\ominus , $\text{HC}\equiv\text{C}^\ominus$, $\text{CH}_3\text{-CH}_2^\ominus$ [IIT-93]
- (A) $\text{CH}_3\text{-CH}_2^\ominus > \text{NH}_2^\ominus > \text{HC}\equiv\text{C}^\ominus > \text{OH}^\ominus$ (B) $\text{HC}\equiv\text{C}^\ominus > \text{CH}_3\text{-CH}_2^\ominus > \text{NH}_2^\ominus > \text{OH}^\ominus$
(C) $\text{OH}^\ominus > \text{NH}_2^\ominus > \text{HC}\equiv\text{C}^\ominus > \text{CH}_3\text{-CH}_2^\ominus$ (D) $\text{NH}_2^\ominus > \text{HC}\equiv\text{C}^\ominus > \text{OH}^\ominus > \text{CH}_3\text{-CH}_2^\ominus$

3. In the following compounds [IIT-96]



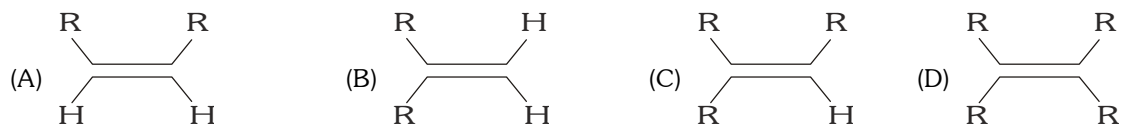
The order of acidity is -

- (A) III > IV > I > II (B) I > IV > III > II
(C) II > I > III > IV (D) IV > III > I > II
4. The formation of cyanohydrin from a ketone is an examples of - [IIT-98]
- (A) Electrophilic addition (B) Nucleophilic addition
(C) Nucleophilic substitution (D) Electrophilic substitution
5. The most unlikely representation of resonance structure of p-nitrophenoxide ion is - [IIT-99]

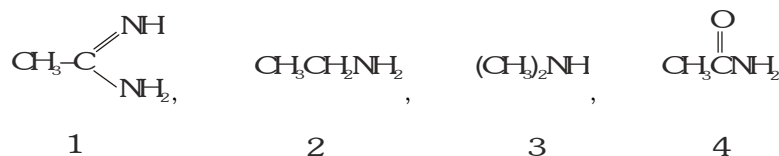


6. An aromatic molecule will not [IIT-99]
- (A) have $4n$ π electrons (B) have $(4n + 2)\pi$ electrons
(C) be planar (D) be cyclic
7. Amongst the following, the most basic compound is - [IIT-2000]
- (A) $\text{C}_6\text{H}_5\text{NH}_2$ (B) $\text{p-NO}_2\text{-C}_6\text{H}_4\text{NH}_2$
(C) $\text{m-NO}_2\text{-C}_6\text{H}_4\text{NH}_2$ (D) $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$

8. Which of the following alkenes will react fastest with H_2 under catalytic hydrogenation conditions [IIT-2001]



9. The correct order of basicities of the following compounds is : [IIT-2001]

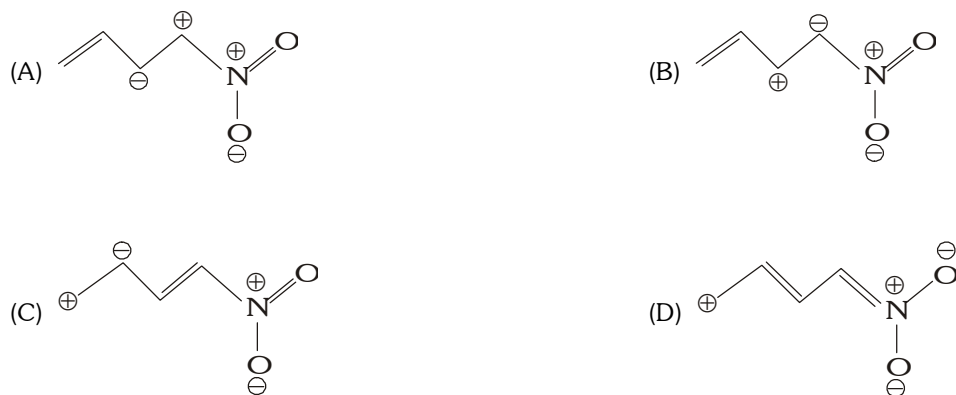


- (A) $2 > 1 > 3 > 4$ (B) $1 > 3 > 2 > 4$ (C) $3 > 1 > 2 > 4$ (D) $1 > 2 > 3 > 4$ [IIT-2005]

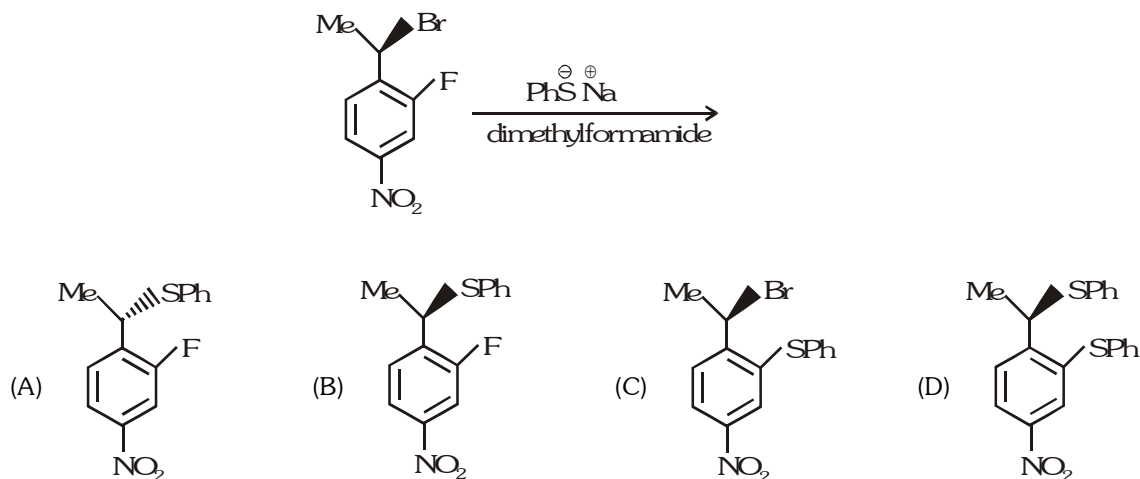
10. Which of the following is least stable :



11. Among the following, the least stable resonance structure is - [IIT-2007]

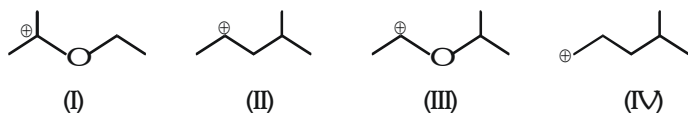


12. The major product of the following reaction is : [IIT-2008]



13. The correct stability order for the following species is :

[IIT-2008]



- (A) II > IV > I > III (B) I > II > III > IV (C) II > I > IV > III (D) I > III > II > IV

14. **Statement-I** : p-Hydroxybenzoic acid has a lower boiling point than o-hydroxybenzoic acid.

Because

Statement-II : o-Hydroxybenzoic acid has intramolecular hydrogen bonding.

[IIT 2003]

- (A) Statement-I is True, Statement-II is True ; Statement-II is a correct explanation for Statement-I
 (B) Statement-I is True, Statement-II is True ; Statement-II is NOT a correct explanation for Statement-I
 (C) Statement-I is True, Statement-II is False.
 (D) Statement-I is False, Statement-II is True.

15. **Statement-I** : Bromobenzene upon reaction with Br_2/Fe gives 1, 4-dibromobenzene as the major product.

Because

Statement-II : In bromobenzene, the inductive effect of the bromo group is more dominant than the mesomeric effect in directing the incoming electrophile.

[IIT 2008]

- (A) Statement-I is True, Statement-II is True ; Statement-II is a correct explanation for Statement-I
 (B) Statement-I is True, Statement-II is True ; Statement-II is NOT a correct explanation for Statement-I
 (C) Statement-I is True, Statement-II is False.
 (D) Statement-I is False, Statement-II is True.

16. Out of anhydrous AlCl_3 and hydrous AlCl_3 which is more soluble in diethyl ether ? Explain with reason.

[IIT 2003]

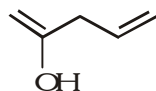
17. Match K_a values with suitable acid :

[IIT 2003]

K_a	Acid
(A) 3.3 $\times 10^5$	(p)
(B) 4.2 $\times 10^{-5}$	(q)
(C) 6.3 $\times 10^{-5}$	(r)
(D) 6.4 $\times 10^{-5}$	(s)
(E) 30.6 $\times 10^{-5}$	(t)

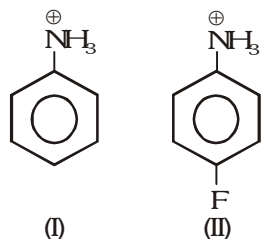
18. Give resonating structures of following compound.

[IIT 2003]



19. Which of the following is more acidic and why ?

[IIT 2004]



20. The compound that does NOT liberate CO_2 , on treatment with aqueous sodium bicarbonate solution, is - [JEE ADVANCED 2013]

- (A) Benzoic acid (B) Benzenesulphonic acid
(C) Salicylic acid (D) Carbolic acid (phenol)

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

[JEE ADVANCED 2013]

- (A) $\sigma \rightarrow p$ (empty) and $\sigma \rightarrow \pi^*$ electron delocalisations
(B) $\sigma \rightarrow \sigma^*$ and $\sigma \rightarrow \pi$ electron delocalisations
(C) $\sigma \rightarrow p$ (filled) and $\sigma \rightarrow \pi$ electron delocalisations
(D) p (filled) $\rightarrow \sigma^*$ and $\sigma \rightarrow \pi^*$ electron delocalisations

22. The total number of lone-pairs of electrons in melamine is

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PREVIOUS YEARS QUESTIONS				ANSWER KEY			EXERCISE -5(B)
1. (D)	2. (A)	3. (D)	4.(B)	5. (C)	6. (A)	7.(D)	8. (A)
9. (B)	10. (D)	11. (A)	12. (A)	13. (D)	14. (D)	15. (C)	
16. Anhydrous AlCl_3 is more soluble.							
17. A-(s) ; B-(q) ; C-(p) ; D-(r) ; E-(t) ;							
19. II is more acidic.		20. (D)		21. (A)		22. (6)	