ACID AND BASES

EXERCISE # I

1. Write correct order of acidic strength of following compounds:

(i) (a) $NO_2–CH_2–\underset{\underset{O}{\|}}{C}–O–H$ (b) $F–CH_2–\underset{\underset{O}{\|}}{C}–O–H$

(c) $Ph_2–CH_2–\underset{\underset{O}{\|}}{C}–O–H$ (d) $CH_3–CH_2–\underset{\underset{O}{\|}}{C}–O–H$

(ii) (a) $CH_3–CH_2–\underset{\underset{F}{|}}{CH}–\underset{\underset{O}{\|}}{C}–O–H$ (b) $CH_3–\underset{\underset{F}{|}}{CH}–CH_2–\underset{\underset{O}{\|}}{C}–O–H$

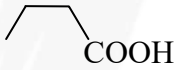
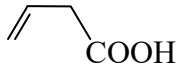
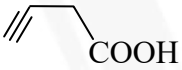
(c) $\underset{\underset{F}{|}}{CH_2}–CH_2–CH_2–\underset{\underset{O}{\|}}{C}–O–H$

(iii) (a) $Cl–CH_2–\underset{\underset{O}{\|}}{C}–O–H$ (b) $Cl–\underset{\underset{Cl}{|}}{CH}–\underset{\underset{O}{\|}}{C}–O–H$

(c) $Cl–\underset{\underset{Cl}{|}}{\overset{\overset{Cl}{|}}{C}}–\underset{\underset{O}{\|}}{C}–O–H$

(iv) (a) $CH_3–CH_2–O–H$ (b) $CH_3–\underset{\underset{CH_3}{|}}{CH}–O–H$

(c) $CH_3–\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}–O–H$

(v) (a)  (b)  (c) 

(vi) (a) $\underset{\underset{COOH}{|}}{COOH}$ (b) $CH_2\begin{matrix}COOH\\COOH\end{matrix}$ (c) $\underset{\underset{CH_2–COOH}{|}}{CH_2–COOH}$

(vii) (a) H–F (b) H–Cl (c) H–Br (d) H–I

(viii) (a) CH_4 (b) NH_3 (c) H_2O (d) H–F

(ix) (a) $F–CH_2–CH_2–O–H$ (b) $NO_2–CH_2–CH_2–O–H$

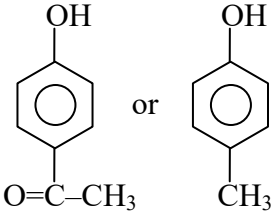
(c) $Br–CH_2–CH_2–O–H$ (d) $\overset{\oplus}{N}H_3–CH_2–CH_2–O–H$

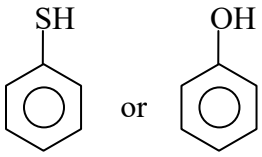
(x) (a) CH_3COOH (b) CH_3CH_2OH (c) C_6H_5OH (d) $C_6H_5SO_3H$

2. Among the following pairs, which compound is stronger acid?

(a) CH_3CH_3 or $BrCH_2NO_2$

(b) $CH_3–\overset{\overset{O}{\|}}{C}–CH_3$ or $CH_3–\overset{\overset{O}{\|}}{C}–CH_2CN$

(c)  or

(d)  or

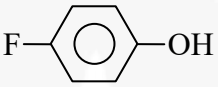
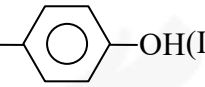
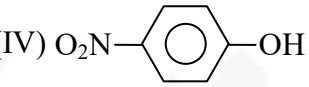
3. Which of the following would you predict to be the stronger acid?

(a) Benzoic acid or para-nitrobenzoic acid

(b) $CH_3–CH_2–CH_2–OH$ or $CH_3–CH=CH–OH$

(c) $CH_3–CH=CH–CH_2–OH$ or $CH_3–CH=CH–OH$

4. Arrange the given phenol & its derivative in their decreasing order of acidity:

(I) $C_6H_5–OH$ (II)  (III)  (IV) 

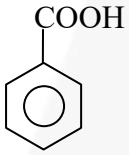
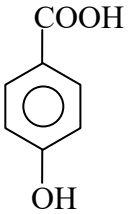
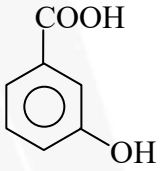
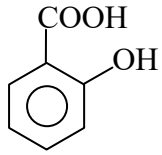
Select the correct answer from the given code:

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

5. Which one of the following is the most acidic?

(A)  (B)  (C)  (D) $CH_2=CH–CH_3$

6. Which of the following is weakest acid?

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

7. Arrange pH of the given compounds in decreasing order:

(1) Phenol (2) Ethyl alcohol (3) Formic acid (4) Benzoic acid

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

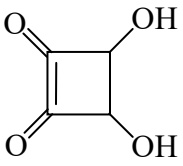
8. Arrange acidity of given compounds in decreasing order:

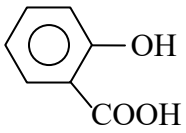
(I) $CH_3–NH–CH_2–CH_2–OH$ (II) $CH_3–NH–CH_2–CH_2–CH_2–OH$

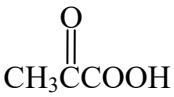
(III) $(CH_3)_3\overset{\oplus}{N}–CH_2–CH_2–OH$

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

9. Which of the following compounds on reaction with $NaHCO_3$ gives CO_2 gas?

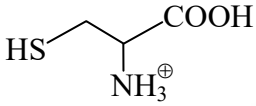

I

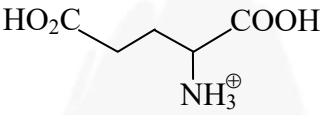

II


III

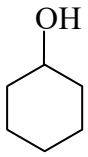
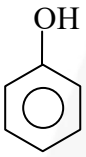
(A) I, II and III (B) I and III (C) II and III (D) I and II

10. Which pk_a belong to the given functional group in case of following amino acids :

(i) cysteine :  1.8, 8.3 & 10.8

(ii) glutamic acid :  : 2.19, 4.25, 9.67

11. Arrange the following sets of compounds according to increasing pK_a (= – log K_a)

(a)  ,  , cyclohexane carboxylic acid.

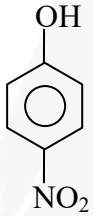
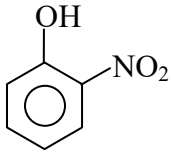
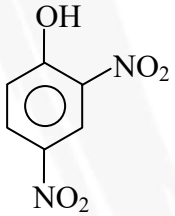
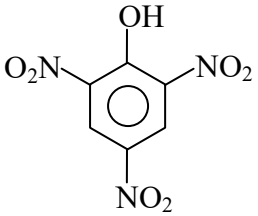
(b) 1-butyne, 1-butene, butane

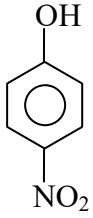
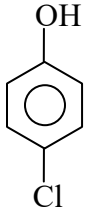
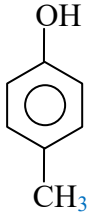
(c) Propanoic acid, 3-bromopropanoic acid, 2-nitropropanoic acid

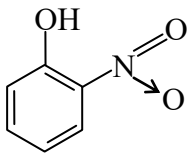
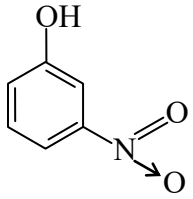
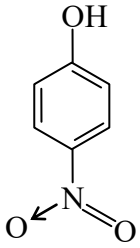
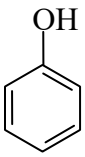
(d) Phenol, o-nitrophenol, o-cresol

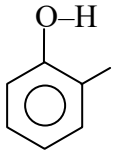
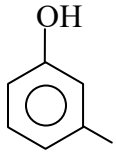
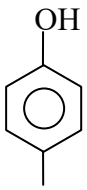
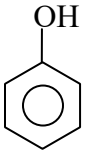
(e) Hexylamine, aniline, methylamine

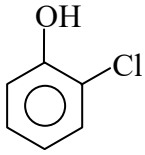
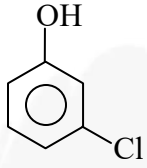
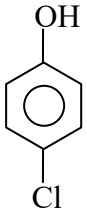
12. Write correct order of acidic strength of following compounds:

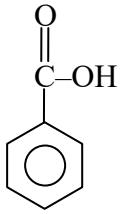
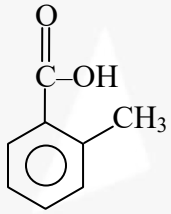
(i) (a)  (b)  (c)  (d) 

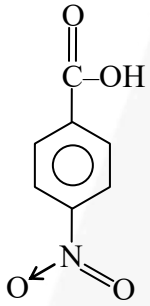
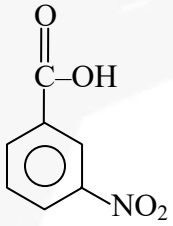
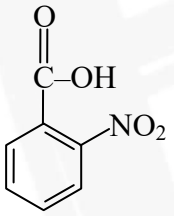
(ii) (a)  (b)  (c) 

(iii) (a)  (b)  (c)  (d) 

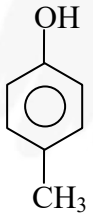
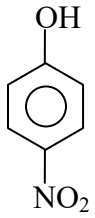
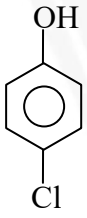
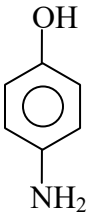
(iv) (a)  (b)  (c)  (d) 

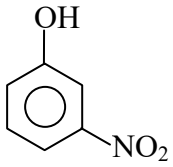
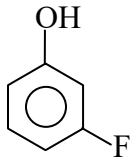
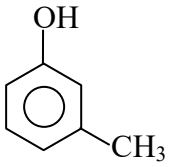
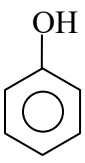
(v) (a)  (b)  (c) 

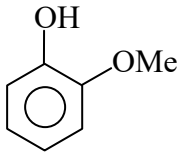
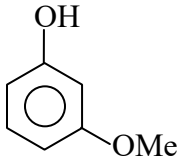
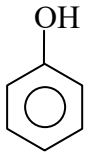
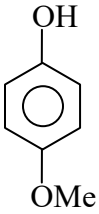
(vi) (a)  (b) 

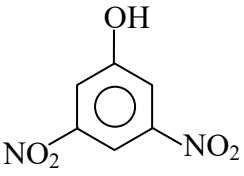
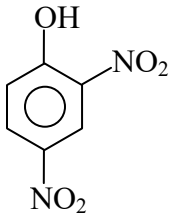
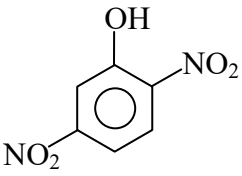
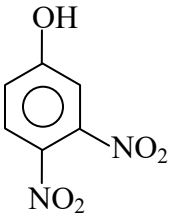
(vii) (a)  (b)  (c) 

13. Select the strongest acid in each of the following sets :

(i) (a)  (b)  (c)  (d) 

(ii) (a)  (b)  (c)  (d) 

(iii) (a)  (b)  (c)  (d) 

(iv) (a)  (b)  (c)  (d) 

14. The strongest acid is:

(A) HF (B) CH_3CO_2H (C) HF + SbF_5 (D) H_2S

15. The weakest acid (does not show acidic character) is:

(A) HC ≡ CH (B) $CH_2 = CH_2$ (C) Me_3CH (D) Ph_3CH

16. Select correct order regarding acidic strength of given compounds :

(1) o-methylbenzoic acid (2) m-methylbenzoic acid

(3) p-methylbenzoic acid (4) benzoic acid

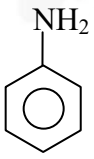
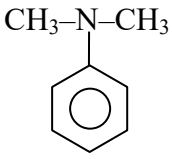
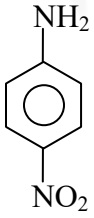
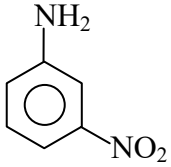
(A) 1 > 2 > 3 > 4 (B) 4 > 3 > 2 > 1 (C) 1 > 4 > 2 > 3 (D) 3 > 2 > 4 > 1

Paragraph for Question 17 to 18

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 planarity of atoms involved in resonance. This phenomenon is known as steric inhibition of resonance. Steric inhibition of resonance has profound effect on

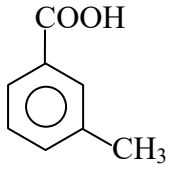
(1) Physical properties (2) Acidity and basicity (3) Reactivity of organic compounds

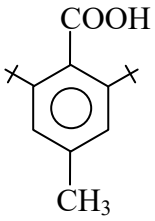
17. Arrange the following in the increasing order of basicity :

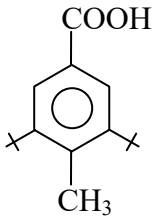
(I)  (II)  (III)  (IV) 

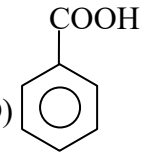
(A) I > II > III > IV (B) IV > III > II > I (C) II > I > IV > III (D) I > IV > III > II

18. Which of the following is most acidic :

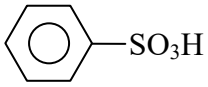
(A) 

(B) 

(C) 

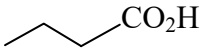
(D) 

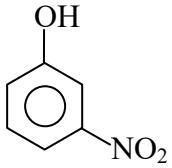
19. How many following compounds are more acidic than water ?

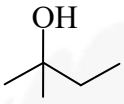
(a) 

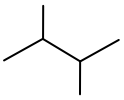
(b) HCl

(c) $CH_3–C\equiv CH$

(d) 

(e) 

(f) 

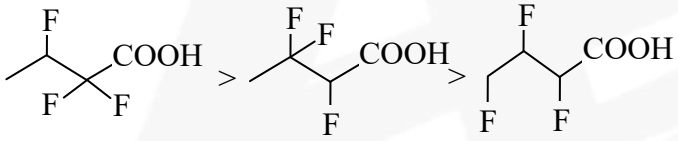
(g) 

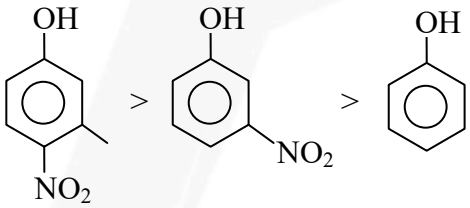
(h) 

(i) NaOH

20. How many of the following are incorrect order of pK_a.

(A) HF < HCl < HBr < HI

(B) 

(C) 

(D) HF < H_2O < CH ≡ CH < NH_3 < $CH_2 = CH_2$

EXERCISE # II

1. Write increasing order of basic strength of fo1lowing compounds/species :

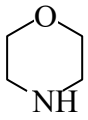
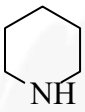
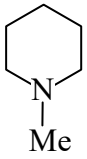
(i) (a) CH_3^- (b) NH_2^- (c) OH^- (d) F^-

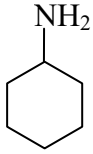
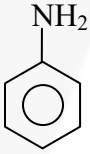
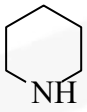
(ii) (a) F^- (b) Cl^- (c) Br^- (d) I^-

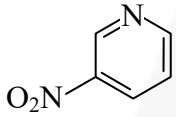
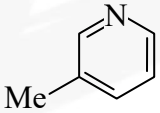
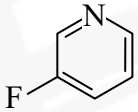
(iii) (a) NH_3 (b) $MeNH_2$ (c) Me_2NH (d) Me_3N (in H_2O)

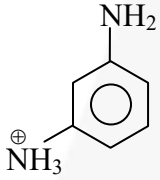
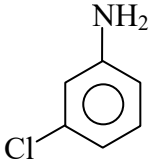
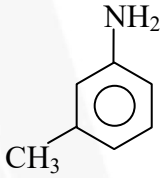
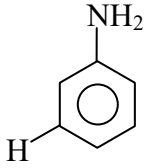
(iv) (a) NH_3 (b) $MeNH_2$ (c) Me_2NH (d) Me_3N (Gas phase)

(v) (a) $R–NH_2$ (b) $Ph\text{-}NH_2$ (c) $R–\underset{\underset{O}{\|}}{C}–NH_2$

(vi) (a)  (b)  (c) 

(vii) (a)  (b)  (c) 

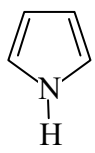
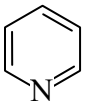
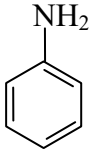
(viii) (a)  (b)  (c) 

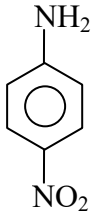
(ix) (a)  (b)  (c)  (d) 

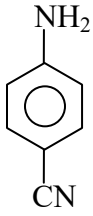
2. Write increasing order of basic strength of following:

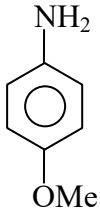
(i) (a) $CH_3–CH_2–NH_2$ (b) $CH_3–CH_2=NH$ (c) $CH_3–C\equiv N$

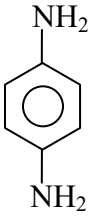
(ii) (a) $CH_3–\underset{\underset{O}{\|}}{C}–NH_2$ (b) $CH_3–CH_2–NH_2$ (c) $CH_3–\underset{\underset{NH}{\|}}{C}–NH_2$ (d) $NH_2–\underset{\underset{NH}{\|}}{C}–NH_2$

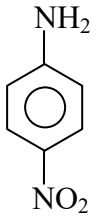
(iii) (a)  (b)  (c) 

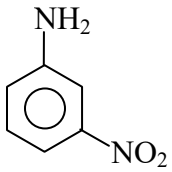
(iv) (a) 

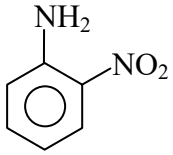
(b) 

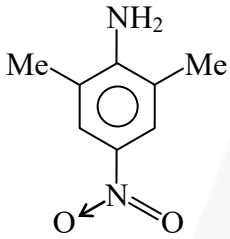
(c) 

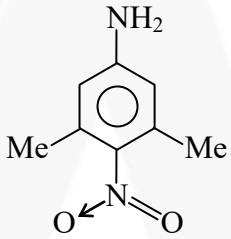
(d) 

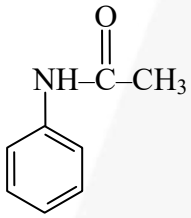
(v) (a) 

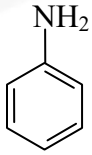
(b) 

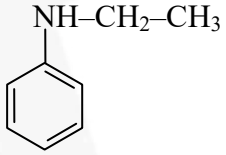
(c) 

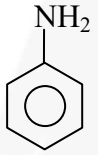
(vi) (a) 

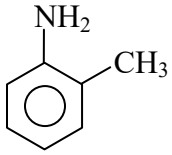
(b) 

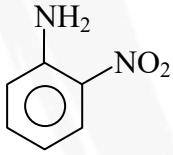
(vii) (a) 

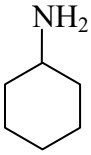
(b) 

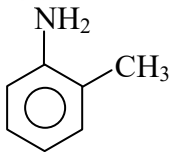
(c) 

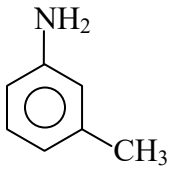
(viii) (a) 

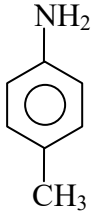
(b) 

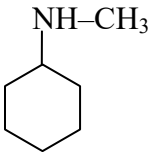
(c) 

(d) 

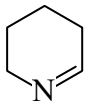
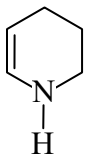
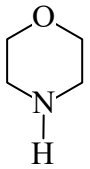
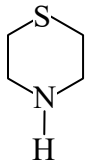
(ix) (a) 

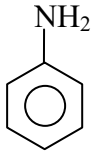
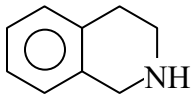
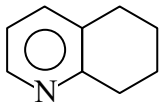
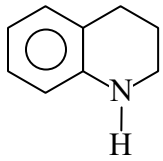
(b) 

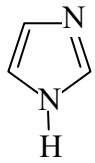
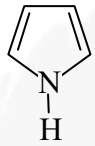
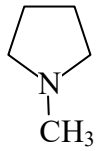
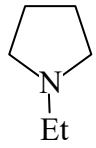
(c) 

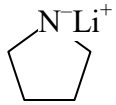
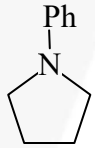
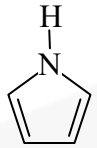
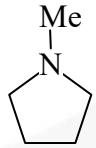
(d) 

3. Select the strongest base in following compound:

(i) (a)  (b)  (c)  (d) 

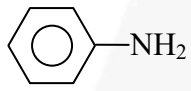
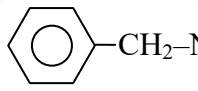
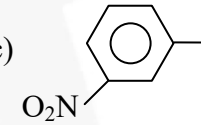
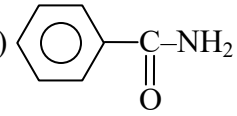
(ii) (a)  (b)  (c)  (d) 

(iii) (a)  (b)  (c)  (d) 

(iv) (a)  (b)  (c)  (d) 

4. Arrange the following compound in decreasing order of their basicity.

(i) (a) $H_2C = CHNa$ (b) CH_3CH_2Na (c) CH_3CH_2ONa (d) $HC \equiv CNa$

(ii) (a)  (b)  (c)  (d) 

(iii) (a) HO^- (b) NH_3 (c) H_2O (d) HSO_4^-

5. Consider the following bases:

(I) o-nitroaniline (II) m-nitroaniline (III) p-nitroaniline

The decreasing order of basicity is:

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

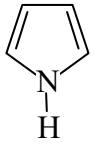
6. Consider the basicity of the following aromatic amines:

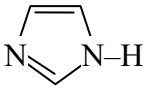
(I) aniline (II) p-nitroaniline (III) p-methoxyaniline (IV) p-methylaniline

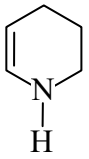
The correct order of decreasing basicity is:

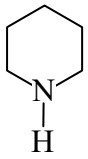
(A) III > IV > I > II (B) III > IV > II > I (C) I > II > III > IV (D) IV > III > II > I

7. Which one of the following is least basic in character?

(A) 

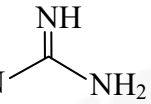
(B) 

(C) 

(D) 

8. In each of the following pair of compounds, which is more basic ?

(a) CH_3NH_2 or CF_3NH_2

(b) CH_3CONH_2 or 

(c) $CH_3CH_2CH_2NH_2$ or CH_3CN

(d) $C_6H_5N(CH_3)_2$ or 2,6-dimethyl-N-N-dimethylaniline

9. Choose the member of each of the following pairs of compounds that is likely to be the weaker base.

(a) H_2O or H_3O^+

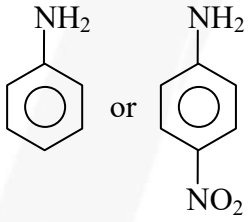
(b) Cl^-, SH^-

(c) F^-, OH^-, NH_2^-, CH_3^-

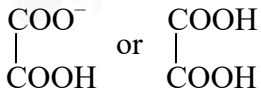
(d) HF, H_2O, NH_3

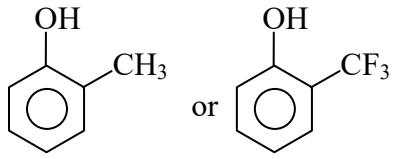
(e) OH^-, SH^-, SeH^-

10. Which compound in given pair is the weaker base?

(a) 

(b) CH_2–CH–CH=CH–CH_2^- or CH_2=CH–CH_2^-

(c) 

(d) 

11. Arrange the basic strength of the following compounds.

(a) OH^- CH_3COO^- Cl^-

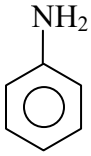
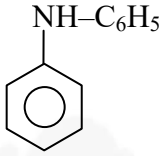
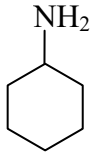
(i) (ii) (iii)

(b) $CH{\equiv}C^-$ $CH_2{=}CH^-$ $CH_3CH_2^-$

(i) (ii) (iii)

(c) $CH_2{=}CHCH_2NH_2$ $CH_3CH_2CH_2NH_2$ $CH{\equiv}C{-}CH_2NH_2$

(i) (ii) (iii)

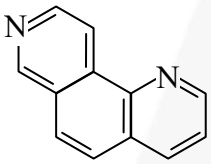
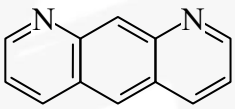
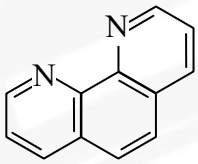
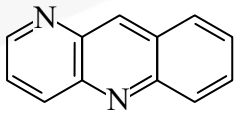
(d)   

(i) (ii) (iii)

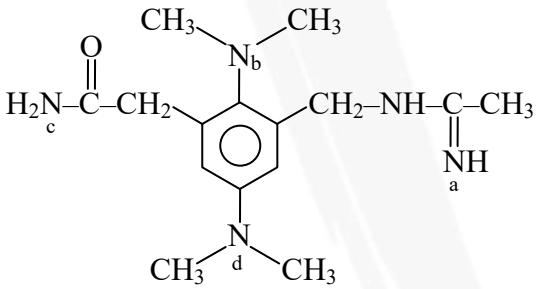
12. Arrange the following compounds in order of increasing basicity.

(a) CH_3NH_2, $CH_3NH_3^{\oplus}$, CH_3NH^- (b) CH_3O^-, CH_3NH^-, $CH_3CH_2^-$

13. Which of the following is most basic :

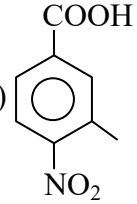
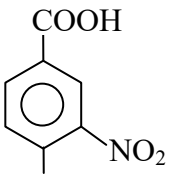
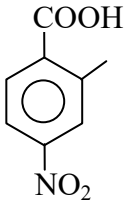
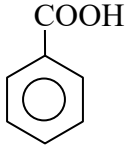
(A)  (B)  (C)  (D) 

14. Basicity order of N in following compound is :

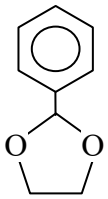


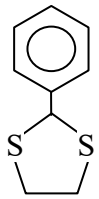
(A) b > d > a > c (B) a > b > d > c (C) a > b > c > d (D) a > c > b > d

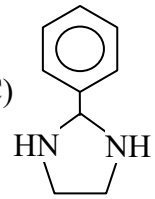
15. Which of the following possess highest basic conjugate base?

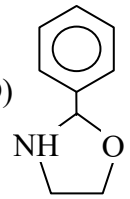
(A)  (B)  (C)  (D) 

16. Which of the following compound has least pK_b value :

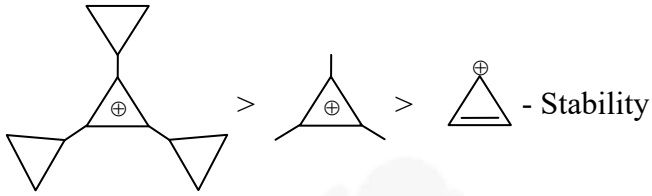
(1) 

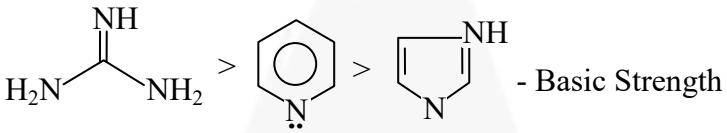
(B) 

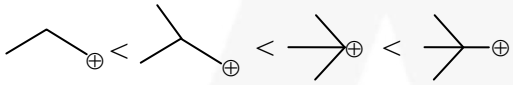
(C) 

(D) 

17. Which of the following order(s) is(are) correct.

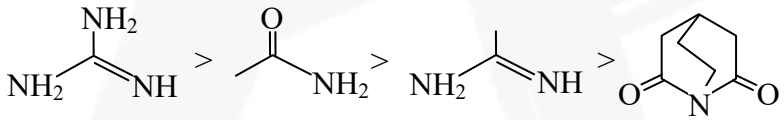
(A)  - Stability

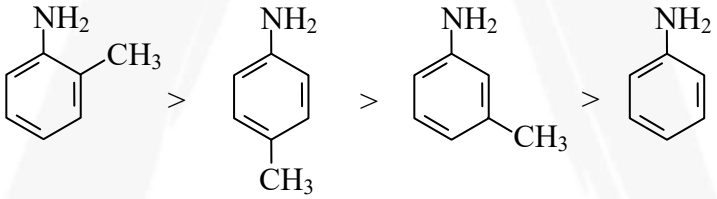
(B)  - Basic Strength

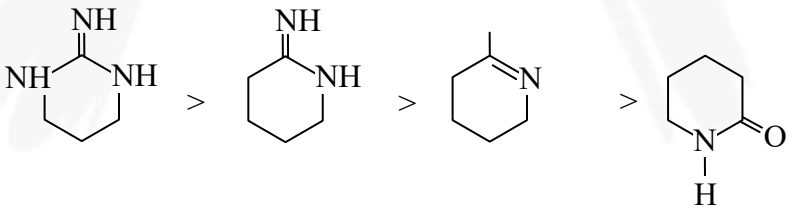
(C)  - Stability

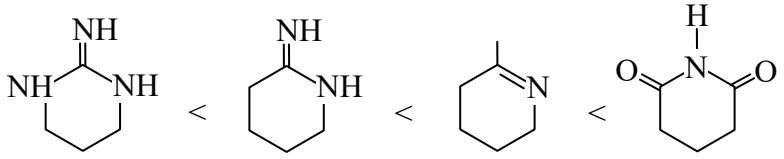
(D) $NaNH_2 > NaOH > NaSH$ - Basic Strength

18. Which one of the following option is correct regarding basic strength:

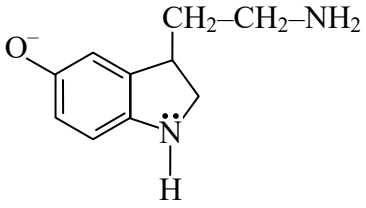
(A) 

(B) 

(C) 

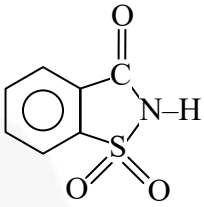
(D) 

19. The conjugate base of serotonin (used as tranquilisers) is given as follows:

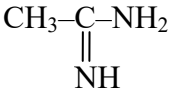


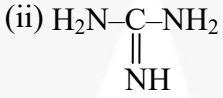
How many basic groups present in given compound?

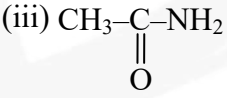
20. The structure of saccharin is given as follows :

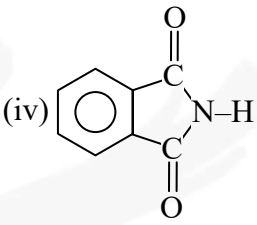


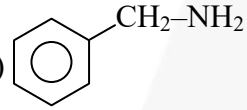
How many following compounds are more basic than saccharin ?

(i) 

(ii) 

(iii) 

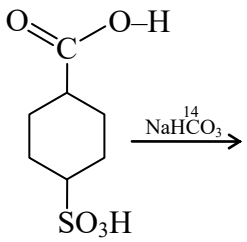
(iv) 

(v) 

(vi) 

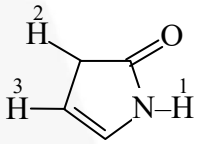
EXERCISE # III

1. In given reaction Gas liberated is/are



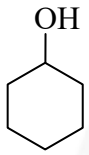
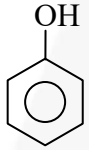
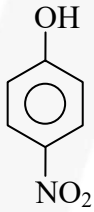
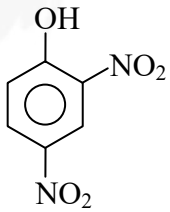
(A) CO_2 & SO_3 (B) SO_3 & $^{14}CO_2$ (C) $^{14}CO_2$ only (D) SO_2 only

2. Arrange marked atom in decreasing order of acidic strength :

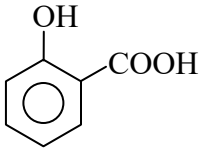


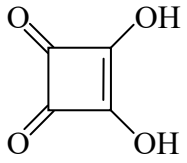
(A) 1 > 2 > 3 (B) 3 > 2 > 1 (C) 2 > 1 > 3 (D) 2 > 3 > 1

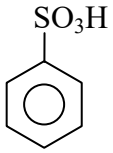
3.

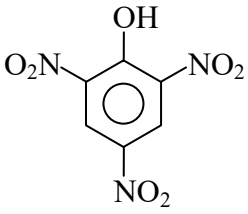
	Column-I		**Column-II**
(A)		(P)	React with NaOH
(B)		(Q)	React with $NaHCO_3$
(C)		(R)	React with NaH
(D)		(S)	React with Na
		(T)	React with $NaNH_2$

4. Compounds which can give effervescences with $NaHCO_3$ are :

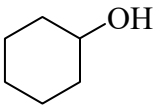
(i)  (Salicylic acid)

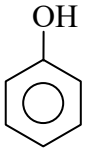
(ii)  (Squaric acid)

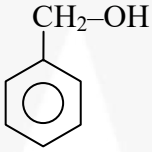
(iii)  (Benzene sulphonic acid)

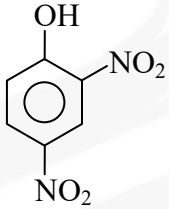
(iv)  (Picric acid)

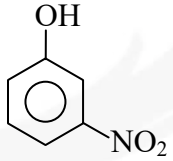
(v) Ph–CH=CH–COOH (cinnamic acid)

(vi) 

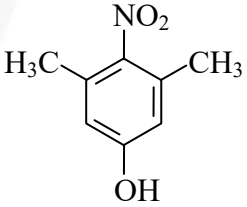
(vii) 

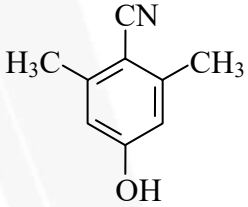
(viii) 

(ix) 

(x) 

5. **Statement-1 :** For the given two compounds-I is more acidic than compounds-II.


(I)


(II)

and

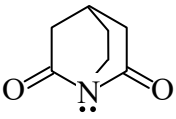
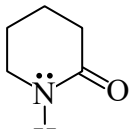
Statement-2 : Due to presence of $-CH_3$ group at ortho positions to $-NO_2$; the plane of $-NO_2$ deviates, w.r.t plane of ring.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.

(C) Statement-1 is True, Statement-2 is False.

(D) Statement-1 is False, Statement-2 is True.

6. **Statement 1 :**  is more basic than 

(I) (II)

and

Statement 2 : Lone pair electrons on nitrogen in compound (I) does not participate in resonance.

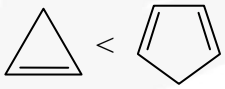
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.

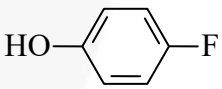
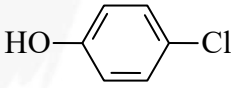
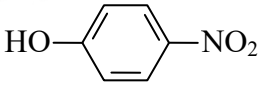
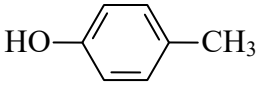
(C) Statement-1 is True, Statement-2 is False.

(D) Statement-1 is False, Statement-2 is True.

7. Match Column-I with Column-II.

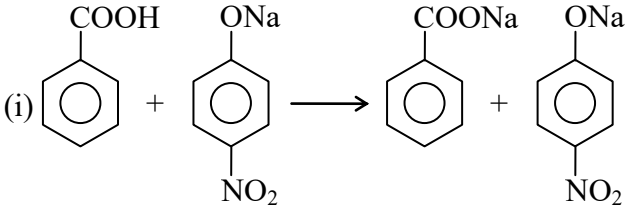
	Column-I (Facts)		**Column-II (Reasons)**
(A)	Guanidine is proton sponge	(P)	3 equivalent structures of conjugate acid
(B)	Carbanion stability $\overline{C}Cl_3 > \overline{C}F_3$	(Q)	Due to s-character of central atoms
(C)	Alkyne is more acidic than alkene	(R)	Due to d-orbital resonance
(D)	Acidity: 	(S)	Due to formation of aromatic anion
		(T)	Stability of conjugate base due to more number of equivalent resonating structure

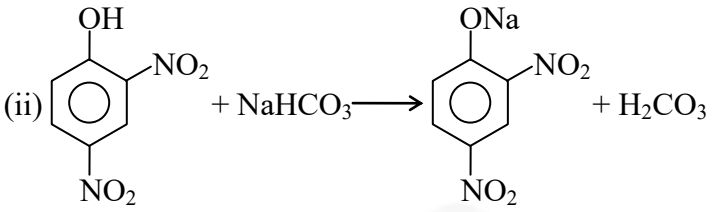
8. Match Column-I with Column-II.

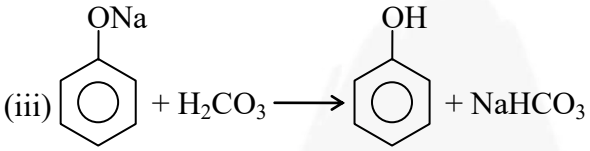
	Column-I (Compounds)		**Column-II (pK_a)**
(A)		(P)	7.15
(B)		(Q)	10.14
(C)		(R)	9.98
(D)		(S)	9.38
		(T)	pKa is more than phenol

(Comprehension) (Q.9 to Q.11)

Observe the following reaction which are feasible:

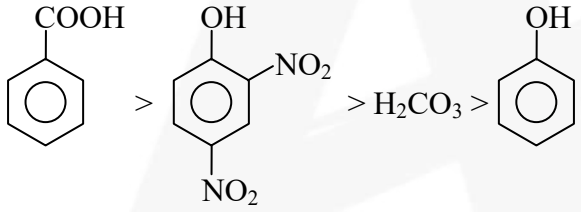
(i) 

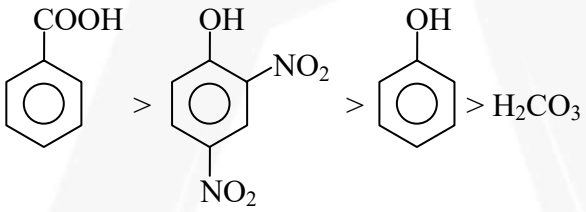
(ii) 

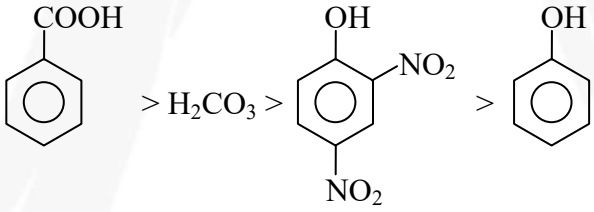
(iii) 

Answer the following question :

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

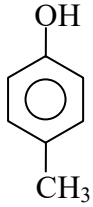
(A) 

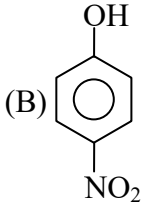
(B) 

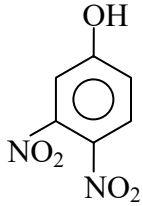
(C) 

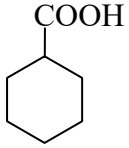
(D) None

10. Which of the following compound does not react with $NaHCO_3$

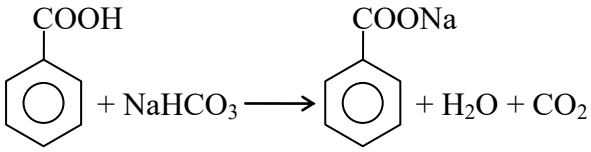
(A) 

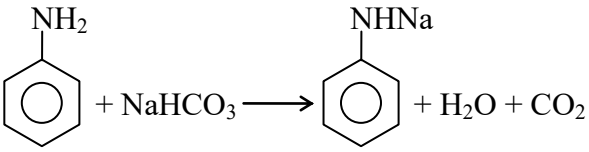
(B) 

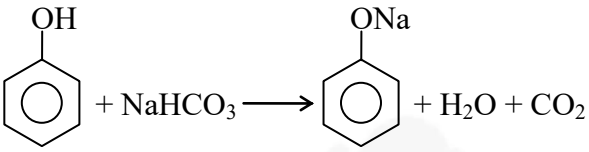
(C) 

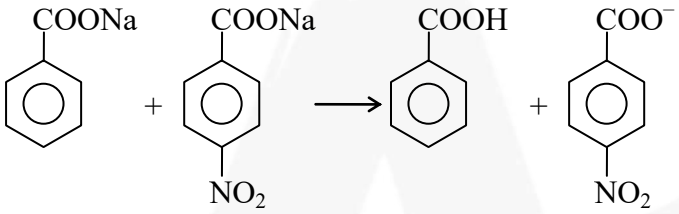
(D) 

11. Identify the feasible reactions

(A) 

(B) 

(C) 

(D) 

12. Identify the non-feasible reaction

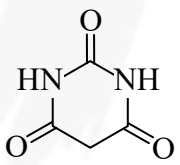
(A) $CH_3–C\equiv CH + NH_2^- \rightleftharpoons CH_3 - C \equiv \ddot{C}^- + NH_3$

(B) $CH_3CH_2–OH + NaH \rightleftharpoons CH_3CH_2ONa + H_2$

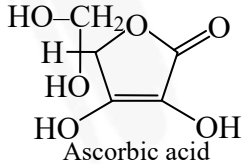
(C) $CH_3–OH + Na \rightleftharpoons CH_3ONa + 1/2H_2$

(D) $HC\equiv CH + NaOH \rightleftharpoons HC\equiv CNa + H_2OH$

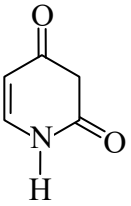
13. Select the number of compounds in which deprotonation gives aromatic anion :

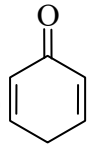
(A) 

Barbituric acid

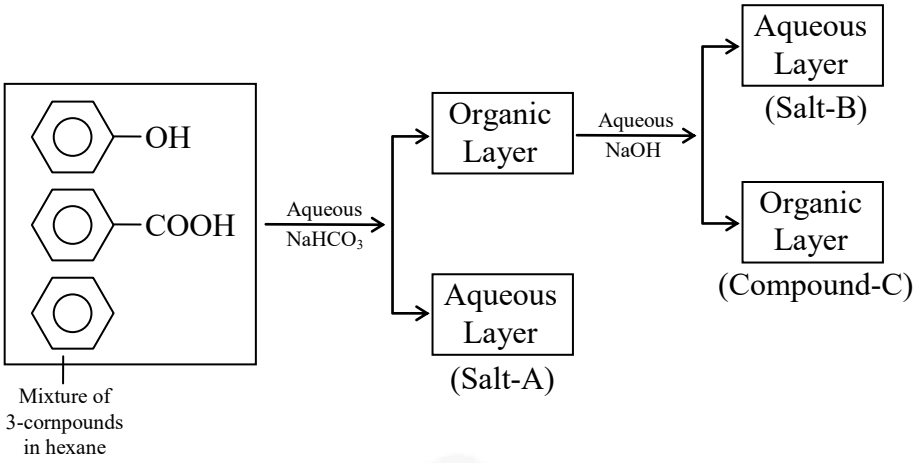
(B) 

Ascorbic acid
(Vitamin-C)

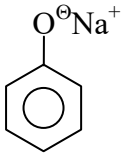
(C) 

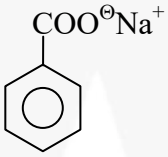
(D) 

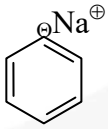
Paragraph for Questions 14 and 15



14. Identify salt 'A' ?

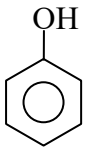
(A) 

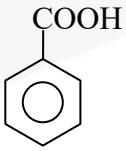
(B) 

(C) 

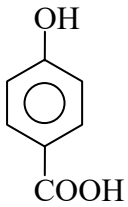
(D) All of these

15. Identify compound 'C' ?

(A) 

(B) 

(C) 

(D) 

16. Which of the following reactions is/are feasible in forward direction.

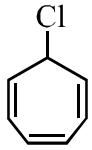
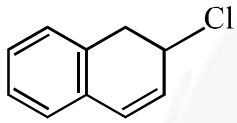
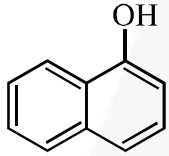
(A) $CH \equiv CH + Na \longrightarrow$

(B) Paranitrophenol + Caustic soda $\longrightarrow$

(C) Carbonic Acid + Carbolic acid $\longrightarrow$

(D) Ethyl alcohol + Carbonic acid $\longrightarrow$

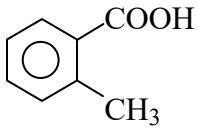
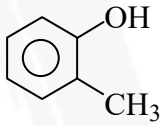
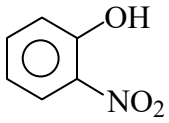
Answer Q.17, Q.18 and Q.19 by appropriately matching the information given in the three columns of the following table.
Column 1, 2 and 3 contain starting materials, reagents and resonating structure of product involving monoion only.

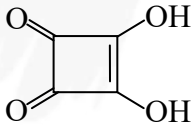
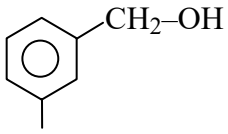
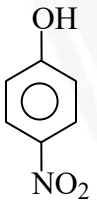
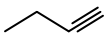
Column-I	Column-II	Column-II
(I) 	(i) Aq. NaOH	(P) 5
(II) 	(ii) $AlCl_3$	(Q) 7
(III) 	(iii) NaH	(R) 6
(IV) 	(iv) $SbCl_5$	(S) 10

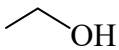
17. Which of the following represent CORRECT combination ?
(A) (III) (iv) (R) (B) (I) (ii) (P) (C) (II) (iii) (Q) (D) (IV) (iii) (S)

18. Which of the following CORRECT combination represent equivalent resonating structures ?
(A) (I) (ii) (R) (B) (III) (iv) (Q) (C) (II) (iii) (P) (D) (IV) (i) (S)

19. Which of the following represent INCORRECT combination ?
(A) (I) (iv) (R) (B) (III) (ii) (Q) (C) (IV) (i) (S) (D) (II) (iii) (P)

20. (a) $H_3C–SO_3H$ (b)  (c)  (d) 

(e)  (f)  (g)  (h) 

(i)  (j) 

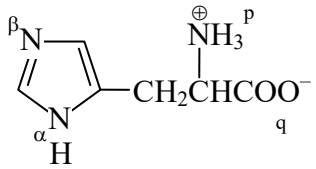
In above given compounds if
(i) Total number of compounds which gives $CO_2(\uparrow)$ on reacting with $NaHCO_3$ = A
(ii) Total number of compounds which are soluble in aq. NaOH are = B
Then what would be the value of B^A

EXERCISE-IV

1. Which of the following dipolar structure of the amino acid is considered more correct?

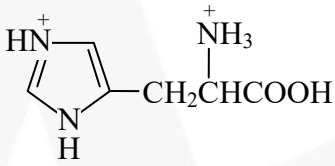
(A) $H_3\overset{+}{N}CH(CH_2COOH)COO^-$ (B) $H_3\overset{+}{N}CH(CH_2COO^-)COOH$ (C) Both (D) None

2. Which of the nitrogen of histidine is first protonated?

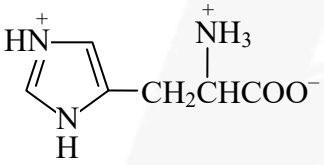


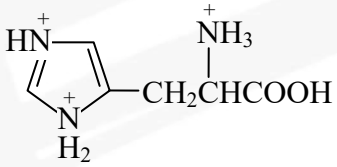
(A) α (B) β (C) p (D) q

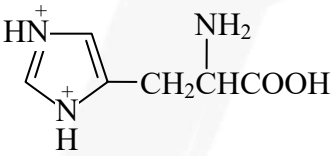
3. Histidine, a heterocyclic amino acid has following structure at pH < 1.82,

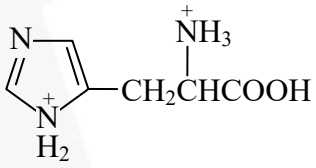


At pH > 1.82 it should have which structure?

(A) 

(B) 

(C) 

(D) 

4. Alanine forms Zwitter ion which exists as (pKa for two acids is 4.62 and 9.13) :

(A) $CH_3-\underset{\oplus NH_3}{\underset{|}{CH}}COO^{\ominus}$ in medium of pH = 7

(B) $CH_3-\underset{\oplus NH_3}{\underset{|}{CH}}COOH$ in medium of pH = 4

(C) $CH_3-\underset{NH_2}{\underset{|}{CH}}-COO^{\ominus}$ in a medium of pH = 13

(D) $CH_3-\underset{\oplus NH_3}{\underset{|}{CH}}COO^{\ominus}$ in a medium of pH = 2

5. In aqueous solution at pH =7, glycine is present as :

(A) $H_3N^+CH_2COO^-$ (B) $H_3N^+CH_2COOH$ (C) $H_2NCH_2COO^-$ (D) All of these

6. In aqueous solution, the basic character of amino acids is due to :

(A) $-NH_2$ group (B) $-\overset{+}{N}H_3$ group (C) –COOH group (D) $-COO^-$ group

7. $^-OOCCH(NH_2)CH_2COO^- \overset{H^+}{\rightleftharpoons}$ product

Product in the above reaction is :

(A) $HOOCCH(NH_2)CH_2COOH$ (B) $HOOCCH(NH_2)CH_2COO^-$

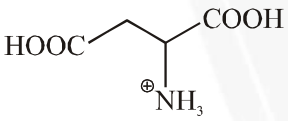
(C) $^-OOCCH(\overset{+}{N}H_3)CH_2COO^-$ (D) Any of the three

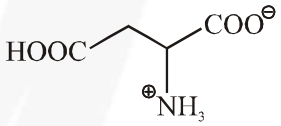
8. The principle species present in the solution of lysine $H_2N(CH_2)_4CH(NH_2)COOH$ at pH 9 is:
(Given pk_a are 4.2, 8.1, 9.8)

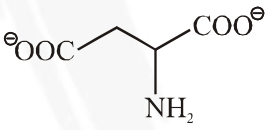
(A) $H_3\overset{+}{N}(CH_2)_4CH(\overset{+}{N}H_3)COOH$ (B) $H_3\overset{+}{N}(CH_2)_4CH(NH_2)COO^-$

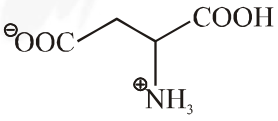
(C) $H_2N(CH_2)_4CH(\overset{+}{N}H_3)COO^-$ (D) $H_3\overset{+}{N}(CH_2)_4CH(\overset{+}{N}H_3)COO^-$

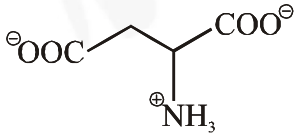
9. At, pH = 7, following amino acid predominantly exist as:
(Given pk_a are 2.2 ,4.3, 8.9)



(A) 

(C) 

(B) 

(D) 

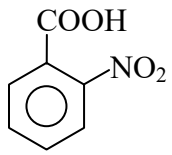
10. Which of the following compounds forms anion at pH=7 dominantly?

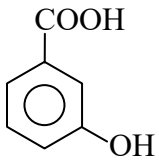
(A) Benzene sulphonic acid (B) Carbolic acid

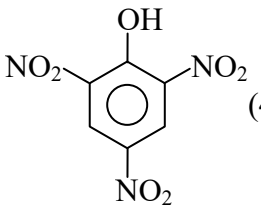
(C) Cinnamic acid (D) Picric acid

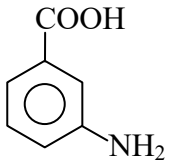
EXERCISE # V (JEE MAIN)

1. Picric acid is – **[AIEEE-2002]**

(1) 

(2) 

(3) 

(4) 

2. Which of the following speices acts both as bronsted acid & base - **[AIEEE-2002]**

(1) NH_3 (2) HO^- (3) HSO_4^{Θ} (4) 1 and 3 both

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) $(CH_3)_2NH_2 < NH_3 < CH_3NH_2$

(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]**

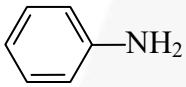
(i) PhCOOH (ii) o-$NO_2C_6H_4COOH$

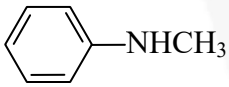
(iii) p-$NO_2C_6H_4COOH$ (iv) m-$NO_2C_6H_4COOH$

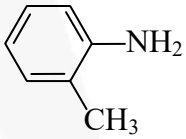
which of the following is the correct order of acidity-

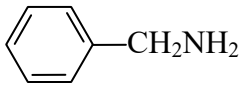
(1) i > ii > iii > iv (2) ii > iv > iii > i (3) ii > iv > i > iii (4) ii > iii > iv > i

5. Which of the following is the strongest base – **[AIEEE-2004]**

(1) 

(2) 

(3) 

(4) 

6. Among the following acids which has the lowest pk_a value- **[AIEEE-2005]**

(1) CH_3CH_2COOH (2) $(CH_3)_2$ CHCOOH (3) HCOOH (4) CH_3COOH

7. Amongest the following the most basic compound is- **[AIEEE-2005]**

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

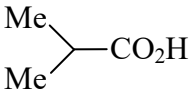
8. What is the conjugate base of OH^-? **[AIEEE-2005]**

(1) H_2O (3) O_2 (3) O^{2-} (4) O^-

9. Among the following acids which has the lowest pK_a value? **[AIEEE-2005]**

(1) HCOOH (2) CH_3COOH (3) CH_3CH_2COOH (4) $(CH_3)_2CH–COOH$

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

(a) CH_3CO_2H (b) $MeOCH_2CO_2H$ (c) CF_3CO_2H (d) 

(1) d < a < c < b (2) d < a < b < c (3) a < d < c < b (4) b < d < a < c

11. Which one of the following is strongest base in aqueous solution? **[AIEEE-2010]**

(1) Trimehylamine (2) Aniline (3) Dimethylamine (4) Methylamine

12. The correct order of increasing basicity of the given conjugated base (R=CH_3) is : **[AIEEE-2010]**

(1) $RCO\bar{O} < HC\equiv\bar{C} < \bar{N}H_2 < \bar{R}$ (2) $RCO\bar{O} < HC\equiv\bar{C} < \bar{R} < \bar{N}H_2$

(3) $\bar{R} < HC\equiv\bar{C} < RCO\bar{O} < \bar{N}H_2$ (4) $RCO\bar{O} < \bar{N}H_2 < HC\equiv\bar{C} < \bar{R}$

13. The strongest acid amongst the following compounds is ? **[AIEEE-2011]**

(1) $CH_3CH_2CH(Cl)CO_2H$ (2) $ClCH_2CH_2CH_2CCOOH$

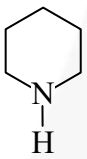
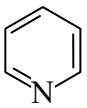
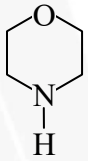
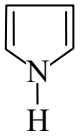
(3) CH_3COOH (4) HCOOH

14. The correct order of acid strength of the following compounds: **[AIEEE-2011]**

A. Phenol B. p-Cresol C. m-Nitrophenol D. p-Nitrophenol

(1) C > B > A > D (B) D > C > A > B (C) B > D > A > C (D) A > B > D > C

15. In the following compounds: **[JEE(Main)-2012]**

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

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

16. The most basic compound among the following is : **[JEE(Main)-2012]**

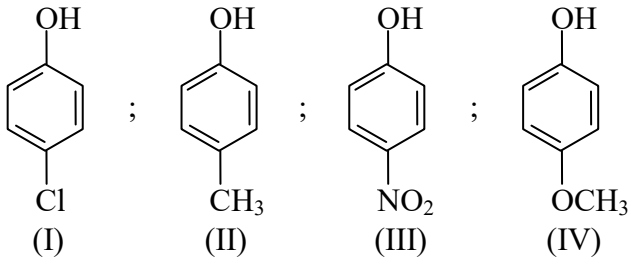
(1) Acetanilide (2) Benzylamine (3) p-Nitro aniline (4) Aniline

17. The order of basicity of amines in gaseous state is : **[JEE(Main)-2013]**

(1) 3° > 2° > NH_3 > 1° (2) 1° > 2° > 3° > NH_3

(3) NH_3 > 1° > 2° > 3° (4) 3° > 2° > 1° > NH_3

18. Arrange the following compounds in order of decreasing acidity : **[JEE(Main)-2013]**



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

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

19. The conjugate base of hydrazoic acid is : **[JEE(Main)-2014]**

(1) NH_3^- (2) N_3^- (3) N_2^- (4) N^{-3}

20. Which of the following compounds will not be soluble is sodium bicarbonate ?

[JEE(Main)-2014]

(1) Benzene sulphonic acid (2) Benzoic acid

(3) o-Nitrophenol (4) 2, 4, 6-Trinitrophenol

21. Considering the basic strength of amines in aqueous solution, which one has the smallest pK_b value? **[JEE(Main)-2014]**

(1) $(CH_3)_3N$ (2) $C_6H_5NH_2$ (3) $(CH_3)_2NH$ (4) CH_3NH_2

22. Among the following oxoacids, the correct deceasing order of acid strength is : **[JEE(Main)-2014]**

(1) $HClO_4 > HClO_3 > HClO_2 > HOCl$

(2) $HClO_2 > HClO_4 > HClO_3 > HOCl$

(3) $HOCl > HClO_2 > HClO_3 > HClO_4$

(4) $HClO_4 > HOCl > HClO_2 > HClO_3$

23. The correct decreasing order for acid strength is **[JEE(Main)-2019]**

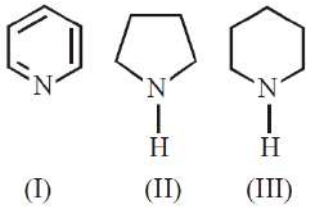
(1) $NO_2CH_2COOH > NCCH_2COOH > FCH_2COOH > ClCH_2COOH$

(2) $FCH_2COOH > NCCH_2COOH > NO_2CHCOOH > ClCH_2COOH$

(3) $NO_2CH_2COOH > FCH_2COOH > CNCH_2COOH > ClCH_2COOH$

(4) $CNCH_2COOH > O_2NCH_2COOH > FCH_2COOH > ClCH_2COOH$

24. Arrange the following amines in the decreasing order of basicity: **[JEE(Main)-2019]**



(I) (II) (III)

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

25. Which amongst the following is the strongest acid ? **[JEE(Main)-2019]**

(1) CHI_3 (2) $CHCl_3$ (3) $CHBr_3$ (4) $CH(CN)_3$

26. The increasing basicity order of the following compounds is : **[JEE(Main)-2019]**

(A) $CH_3CH_2NH_2$

(B) $CH_3CH_2\underset{\displaystyle CH_2CH_3}{\underset{|}{N}}H$

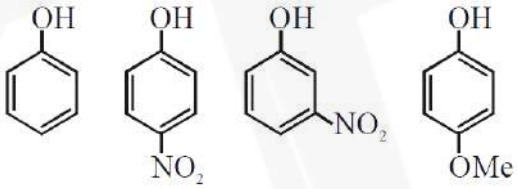
(C) $H_3C-\underset{\displaystyle CH_3}{\underset{|}{N}}-CH_3$

(D) $Ph-\underset{\displaystyle CH_3}{\underset{|}{N}}-H$

(1) (D) < (C) < (B) < (A) (2) (A) < (B) < (D) < (C)

(3) (A) < (B) < (C) < (D) (4) (D) < (C) < (A) < (B)

27. The increasing order of the pKa values of the following compounds is : **[JEE(Main)-2019]**

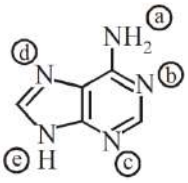


A B C D

(1) B < C < D < A (2) C < B < A < D

(3) D < A < C < B (4) B < C < A < D

28. In the following compound, **[JEE(Main)-2019]**



the favourable site/s for protonation is/are :-

(1) (a) (2) (a) and (d) (3) (a) and (e) (4) (b), (c) and (d)

29. The correct order for acid strength of compounds **[JEE(Main)-2019]**

CH≡CH, CH_3–C≡CH and CH_2=CH_2

is as follows :

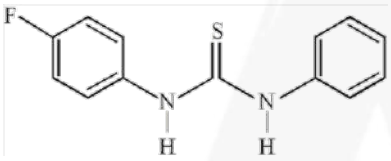
(1) CH ≡ CH > CH_2 = CH_2 > CH_3–C ≡ CH

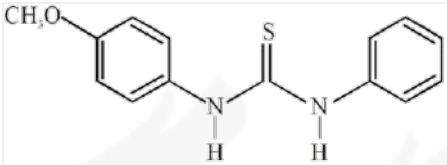
(2) HC ≡ CH > CH_3–C ≡ CH > CH_2 = CH_2

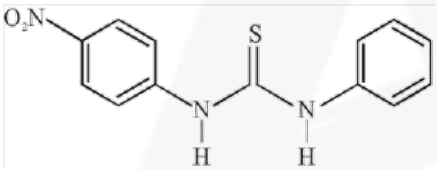
(3) CH_3–C ≡ CH > CH_2 = CH_2 > HC ≡ CH

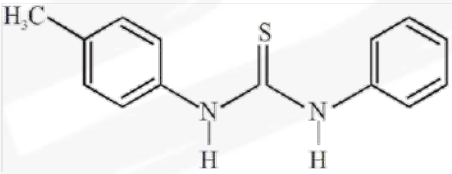
(4) CH_3–C ≡ CH > CH ≡ CH > CH_2 = CH_2

30. The increasing order of the pK_b of the following compound is: **[JEE(Main)-2019]**

(A) 

(B) 

(C) 

(D) 

(1) (A) < (C) < (D) < (B)

(2) (C) < (A) < (D) < (B)

(3) (B) < (D) < (A) < (C)

(4) (B) < (D) < (C) < (A)

31. In the following compounds, the decreasing order of basic strength will be : **[JEE(Main)-2019]**

(1) $(C_2H_5)_2NH > C_2H_5NH_2 > NH_3$

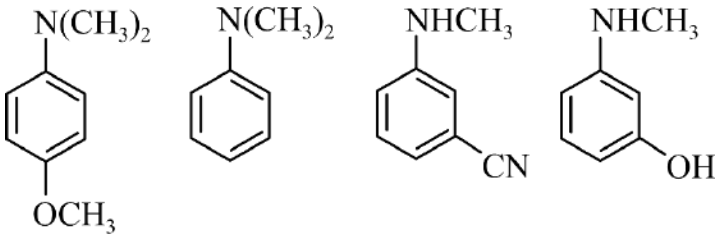
(2) $NH_3 > C_2H_5NH_2 > (C_2H_5)_2NH$

(3) $(C_2H_5)_2NH > NH_3 > C_2H_5NH_2$

(4) $C_2H_5NH_2 > NH_3 > (C_2H_5)_2NH$

32. The increasing order of pK_b values of the following compounds is.

[JEE(Main)-2020]

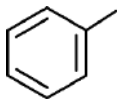


I II III IV

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

33. Which among the following is the strongest acid? **[JEE(Main)-2021]**

(A) $CH_3CH_2CH_2CH_3$

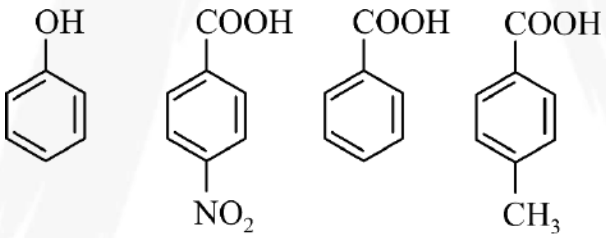
(B) 

(C) 

(D) 

34. The correct order of acid character of the following compounds is:

[JEE(Main)-2021]

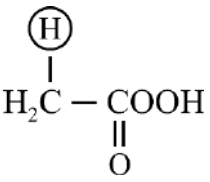


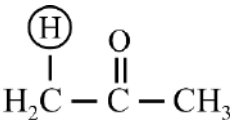
I II III IV

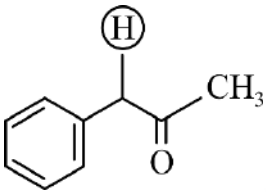
(A) II > III > IV > I
(B) III > II > I > IV
(C) IV > III > II > I
(D) I > II > III > IV

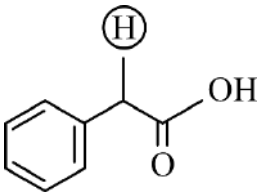
35. Among the following marked proton of which compound shows lowest pK_a value?

[JEE(Main)-2022]

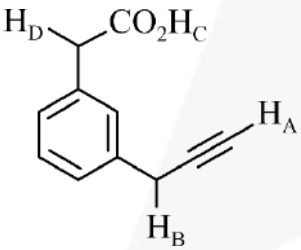
(A) 

(B) 

(C) 

(D) 

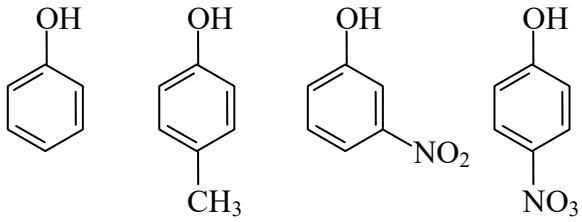
36. What is the correct order of acidity of the protons marked A – D in the given compounds? **[JEE(Main)-2023]**



(A) $H_C > H_D > H_B > H_A$
(B) $H_C > H_D > H_A > H_B$
(C) $H_D > H_C > H_B > H_A$
(D) $H_C > H_A > H_D > H_B$

EXERCISE # VI (JEE ADVANCE)

1. In the following compounds **[IIT-JEE-1996]**



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

The order of acidity is-

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

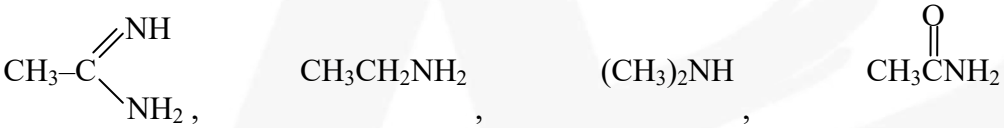
2. Although phenoxide ion has more number of resonating structures than benzonate ion, benzoic acid is a stronger acid than phenol. Why ? **[IIT-JEE-1997]**

3. Amongst the following, the most basic compound is: **[IIT-JEE-2000]**

(A) $C_6H_5NH_2$ (B) p–NO_2–$C_6H_4NH_2$

(C) m–NO_2–$C_6H_4NH_2$ (D) $C_6H_5CH_2NH_2$

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



1 2 3 4

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

5. **Statement–I :** p-Hydroxybenzoic acid has a lower boiling point that o–hydroxybenzoic acid.

Because

Statement–II : o-Hydroxybenzoic acid has intramolecular hydrogen bonding. **[IIT-JEE-2003]**

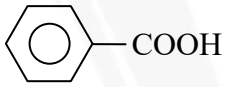
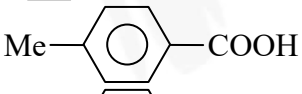
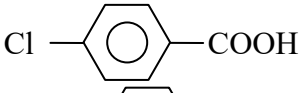
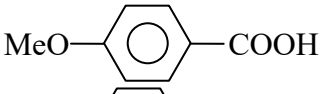
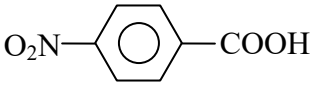
(A) Statement-I is True, Statement-II is True; Statement-II is a correct explanation for Statement-I

(B) Statement-I is True, Statement-II is True; Statement-II is NOT a correct explanation for Statement-I

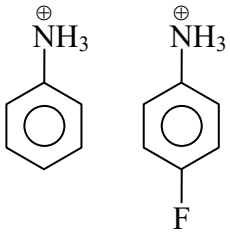
(C) Statement-I is True, Statement-II is False.

(D) Statement-I is False, Statement-II is True.

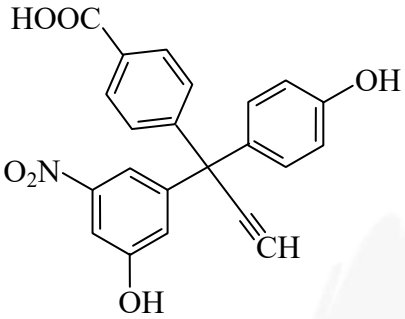
6. Match K_a values with suitable acid : **[IIT-JEE-2003]**

	K_a		**Acid**
(A)	3.3×10^{-5}	(P)	
(B)	4.2×10^{-5}	(Q)	
(C)	6.3×10^{-5}	(R)	
(D)	6.4×10^{-5}	(S)	
(E)	30.6×10^{-5}	(T)	

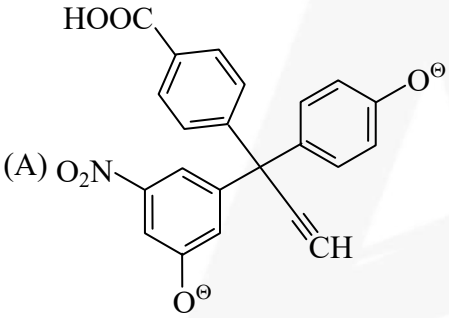
7. (a) Which of the following is more acidic and why ? **[IIT-JEE-2004]**

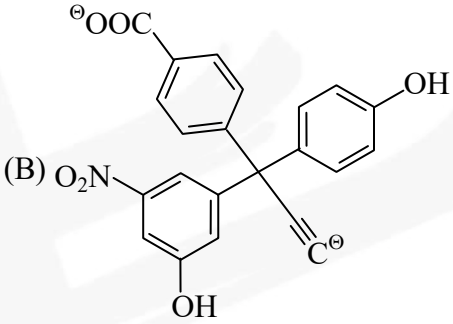


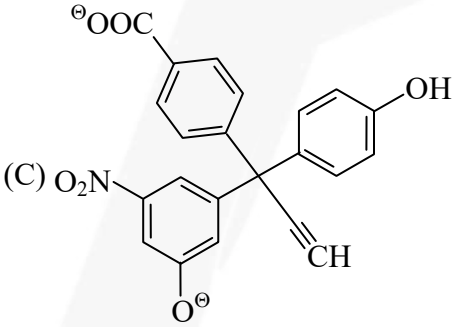
(I) (II)

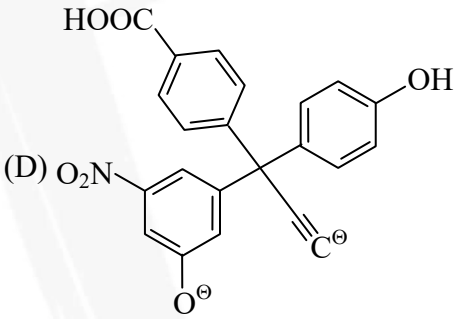
8. 

2Moles $NaNH_2$ → A. The product (A) will be: **[IIT-JEE-2007]**

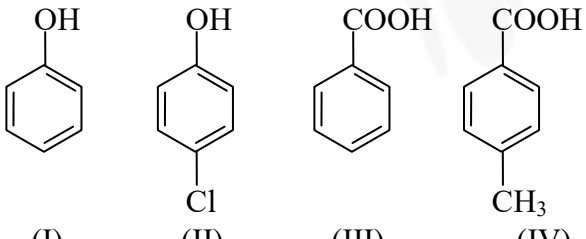
(A) 

(B) 

(C) 

(D) 

9. The correct acidity order of the following is :



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

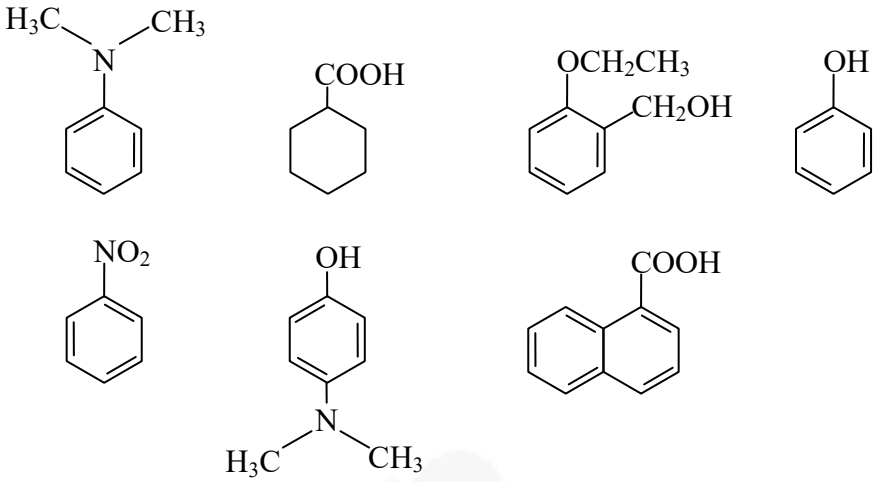
(A) (III) > (IV) > (II) > (I)

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

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

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

10. Amongst the following, the number of compounds soluble in aqueous NaOH is: **[IIT-JEE-2010]**



11. Among the following compounds, the most acidic is: **[IIT-JEE-2011]**

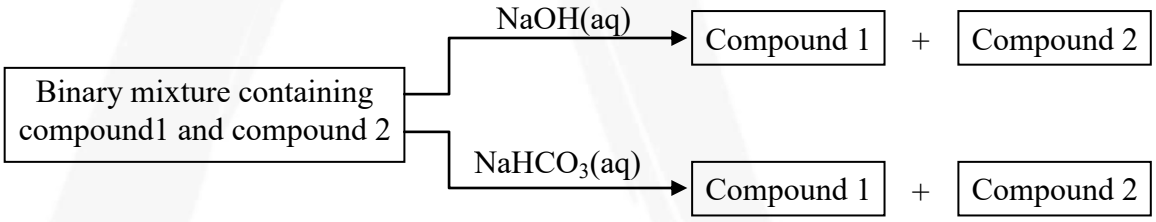
(A) p-nitrophenol (B) p-hydroxybenzoic acid

(C) o-hydroxybenzoic acid (D) p–toluic acid

12. The carboxyl functional group (–COOH) is present in – **[IIT-JEE-2012]**

(A) piric acid (B) barbituric acid (C) ascorbic acid (D) aspirin

13. Identify the binary mixtures(s) that can be separated into the individual compounds, by differential extraction, as shown in the given scheme – **[IIT-JEE-2012]**



(A) C_6H_5OH and C_6H_5COOH (B) C_6H_5COOH and $C_6H_5CH_2OH$

(C) $C_6H_5CH_2$ and C_6H_5OH (D) $C_6H_5CH_2$ and $C_6H_5CH_2COOH$

14. The compound that does NOT liberate CO_2, on treatment with aqueous sodium bicarbonate solution, is – **[JEE-ADVANCE-2013]**

(A) Benzoic acid (B) Benzenesulphonic acid

(C) Salicylic acid (D) Cabolic acid (phenol)

15. Hydrogen boiling plays a central role in the following phenomena **[JEE-ADVANCE-2013]**

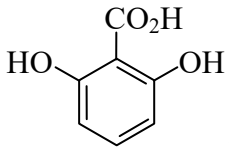
(A) Ice floats in water

(B) Higher Lewis basicity of primary amines that tertiary amines in aqueous solution

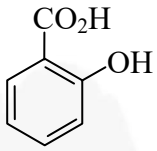
(C) Formic acid is more acidic than acetic acid

(D) Dimerisation of acetic acid in benzene

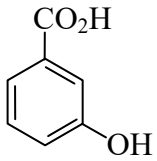
16. The correct order of acidity for the following compounds is : **[JEE-ADVANCED-2016]**



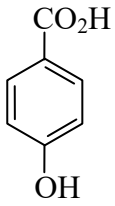
I



II



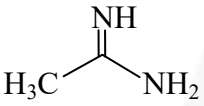
III



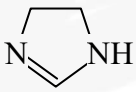
IV

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

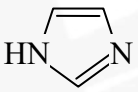
17. The order of basicity among the following compounds is **[JEE-ADVANCED-2017]**



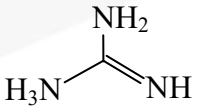
I



II



III

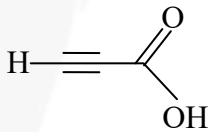


IV

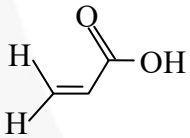
(A) II > I > IV > III (B) IV > I > II > III (C) I > IV > III > II (D) IV > II > III > I

18. The correct order of acid strength of the following carboxylic acids is:**[JEE-ADVANCED-2019]**

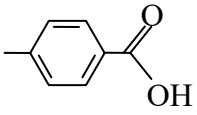
(I)



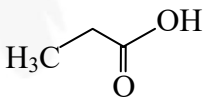
(II)



(III)



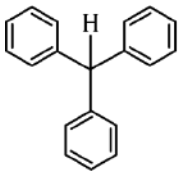
(IV)



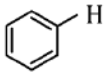
(A) I > II > III > IV (B) I > III > II > IV (C) II > I > IV > III (D) III > II > I > IV

19. With respect to the compounds I-V, choose the correct statement(s).

[JEE ADVANCE-2020]

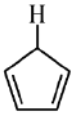


I

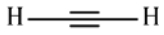


II

III



IV



V

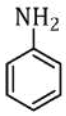
(A) The acidity of compound I is due to delocalization in the conjugate base.

(B) The conjugate base of compound IV is aromatic.

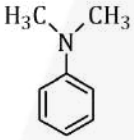
(C) Compound II becomes more acidic, when it has a $-NO_2$ substituent.

(D) The acidity of compounds follows the order I > IV > V > II > III.

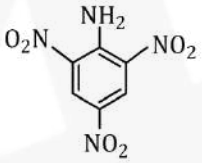
20. Consider the following four compounds I, II, III, and IV. **[JEE ADVANCE-2020]**



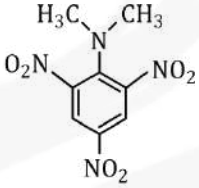
I



II



III



IV

Choose the correct statement(s).

(A) The order of basicity is II >I >III >IV.

(B) The magnitude of pK_b difference between I and II is more than that between III and IV.

(C) Resonance effect is more in III than in IV.

(D) Steric effect makes compound IV more basic than III.

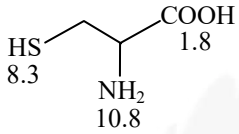
ANSWER KEY

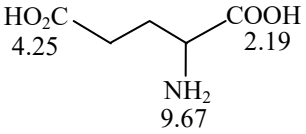
EXERCISE # I

1. (i) a > b > c > d, (ii) a > b > c, (iii) c > b > a, (iv) a > b > c,
(v) c > b > a, (vi) a > b > c, (viii) d > c > b > a, (viii) d > c > b > a
(ix) d > b > a > c (x) d > a > c > b

2. (a) 2; (b) 2; (c) 1; (d) 1 **3.** (a) 2; (b) 2; (c) 2 **4.** (C) **5.** (B)

6. (B) **7.** (B) **8.** (A) **9.** (A)

10. (i) cysteine : 

(ii) glutamic acid : 

11. (a) 3 < 2 < 1; (b) 1 < 2 < 3 ; (c) 3 < 2 < 1; (d) 2 < 1 < 3; (e) 2 < 3 < 1

12. (i) d > c > a > b, (ii) a > b > c, (iii) c > a > b > d, (iv) d > b > c > a,
(v) a > b > c, (vi) b > a (vii) c > a > b

13. (i) b, (ii) a, (iii) b, (iv) b **14.** (C) **15.** (C) **16.** (C)

17. (C) **18.** (B) **19.** (4) **20.** (C)

EXERCISE # II

1. (i) a > b > c > d, (ii) a > b > c > d, (iii) c > b > d > a, (iv) a < b < c < d,
(v) a > b > c, (vi) a > b > c, (vii) c > a > b, (viii) b > c > a,
(ix) c > d > b > a

2. (i) a > b > c, (ii) d > c > b > a, (iii) b > c > a, (iv) d > c > b > a,
(v) b > a > c, (vi) b < a, (vii) c > b > a, (viii) c < b < a < d
(ix) a < b < c < d

3. (i) d, (ii) b, (iii) a, (iv) a

4. (i) b > a > d > c, (ii) b > a > c > d, (iii) a > b > c > d

5. (A) **6.** (A) **7.** (A)

8. (a) i, (b) ii, (c) i, (d) ii **9.** (a) 2 ; (b) 1 ; (c) 1 ; (d) 1 ; (e) 3

10. (a) 2; (b) 1; (c) 2; (d) 2 **11.** (a) 1 > 2 > 3 ; (b) 1 < 2 < 3 ; (c) 3 < 1 < 2 ; (d) 2 < 1 < 3

12. (a) 2 < 1 < 3 ; (b) 1 < 2 < 3 **13.** (C) **14.** (B) **15.** (D) **16.** (C)

17. (A,D) **18.** (C) **19.** (3) **20.** (6)

EXERCISE # III

1. (C) **2.** (C)

3. (A)→R, S, T; (B)→P, R, S, T; (C)→P, Q, R, S, T; (D)→P, Q, R, S, T

4. (i), (ii) (iii) (iv), (v) (ix) **5.** (D) **6.** (A)

7. (A)→P; (B)→R; (C)→Q; (D)→S,T **8.** (A)→R ; (B)→S; (C)→P ; (D)→Q,T

9. (A) **10.** (A) **11.** (A, D) **12.** (D)

13. (A, B, C, D) **14.** (B) **15.** (C) **16.** (A,B) **17.** (D)

18. (C) **19.** (A) **20.** (2401)

EXERCISE # IV

1. (A) **2.** (B) **3.** (A) **4.** (A,B,C) **5.** (A)

6. (D) **7.** (C) **8.** (B) **9.** (D) **10.** (A,C,D)

EXERCISE # V (JEE-MAIN)

1. (3) **2.** (4) **3.** (3) **4.** (4) **5.** (4) **6.** (3) **7.** (4)

8. (3) **9.** (1) **10.** (2) **11.** (3) **12.** (1) **13.** (1) **14.** (2)

15. (3) **16.** (2) **17.** (4) **18.** (3) **19.** (2) **20.** (3) **21.** (3)

22. (1) **23.** (1) **24.** (4) **25.** (4) **26.** (4) **27.** (3) **28.** (4)

29. (4) **30.** (3) **31.** (1) **32.** (A) **33.** (D) **34.** (A) **35.** (C)

36. (B)

EXERCISE # VI (JEE-ADVANCE)

1. (D) **2.** Benzoate has equivalent resonating structures **3.** (D)

4. (B) **5.** (D) **6.** A→(S); B→(Q); C→(P); D→(R); E→(T)

7. (II is most acidic) **8.** (C) **9.** (A) **10.** (4) **11.** (C)

12. (D) **13.** (B, D) **14.** (D) **15.** (A, B, D)

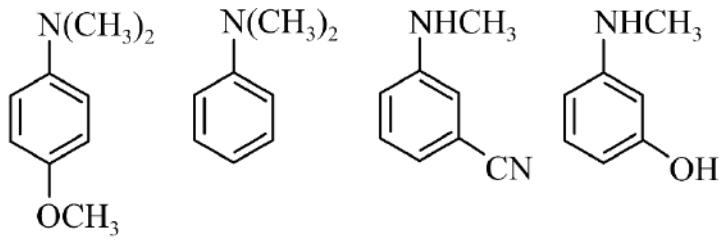
16. (A) **17.** (B) **18.** (A) **19.** (A, B, C)

20. (C,D)

SOLUTION

EXERCISE # V (JEE-MAIN)

32.



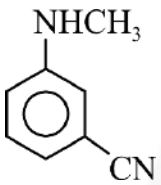
I II III IV

+ R effect and −I effect of OCH_3

(− I effect of −CN group)

(− I effect of −CN group)

$-OCH_3$ group increases electron density of ring at O and P position making (I) most basic.



is least basic due to -I effect of $-CN$ group at meta position.
since -I effect of $-CN$ > $-I$ effect of $-OH$ group

Hence correct basic strength will follow the order I > II > IV > III

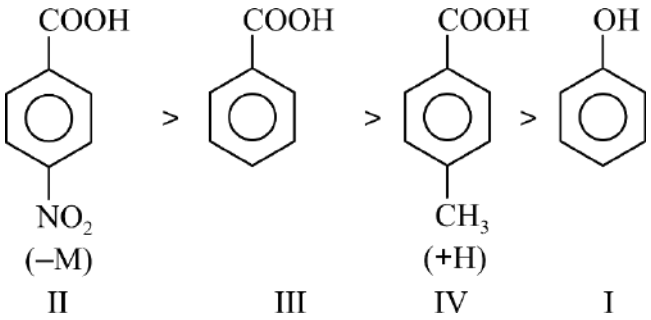
Basic strength $\propto \frac{1}{pK_b \text{ value}}$ Order of K_b value I < II < IV < III

33.  ; Strongest acid

because its conjugate base is aromatic

(−)

34. Acidity of carboxylic acid $\propto -R > -H > -I \propto \frac{1}{+R>+H>+I}$



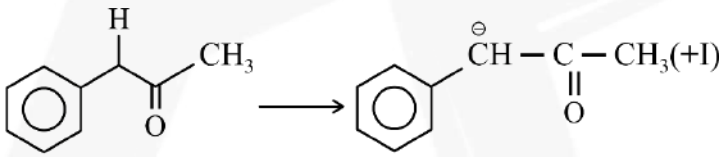
35. (A) $CH_2(H)-C(=O)-OH \longrightarrow \overset{\ominus}{C}H_2-C(=O)-OH(+R)$

Less stable
(Cross resonace)

(B) $CH_2(H)-C(=O)-OH_3 \longrightarrow \overset{\ominus}{C}H_2-C(=O)-CH_3(+I\ effect)$

Less stable
(Cross resonace)

(C)

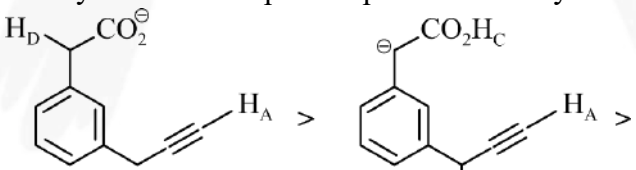


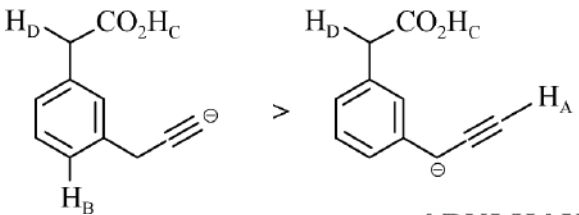
(most acidic)

Resonance through benzene ring
(most stable)

So it has least pK_a value.

36. acidity of an acid depends upon the stability of its conjugate base





EXERCISE # VI (JEE-ADVANCE)

19. (A) is a conjugate base of compound I Which is stabilized by delocalization or resonance.

(B) is a conjugate base of, which is an aromatic compound.

(C) $-NO_2$ group is a strong electron-withdrawing group, which increases the acidic strength of compound II.

(D) The order of acidic strength.

20. (A)Correct basic strength order of given compound is (IV) > (II) > (I) > (III)

(B) Compound IV is a stronger base than III due to SIR effect, which basic strength difference between I & II is very less.

(C) In compound IV due to SIR (steric inhibition due to resonance) effect both $-NO_2$ and $N(CH_3)_2$ group will be out of plane hence resonance effect in compound IV is less.