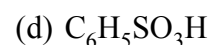
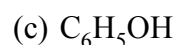
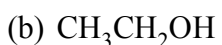
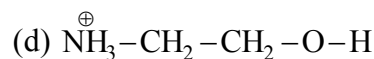
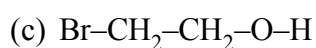
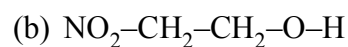
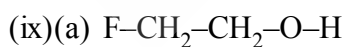
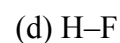
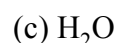
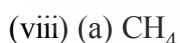
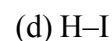
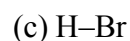
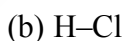
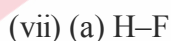
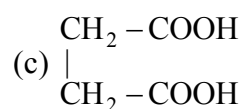
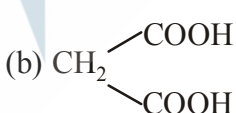
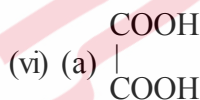
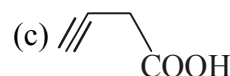
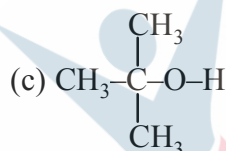
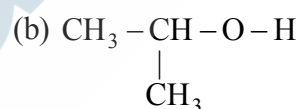
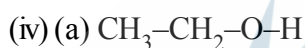
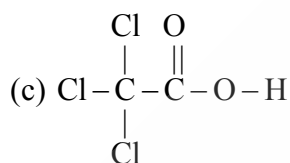
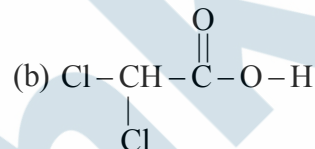
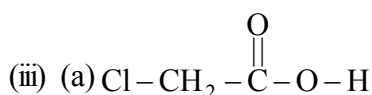
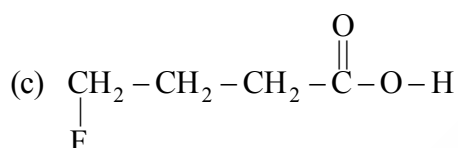
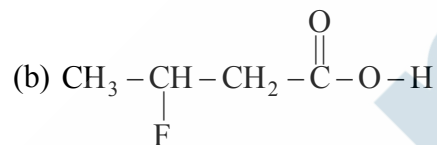
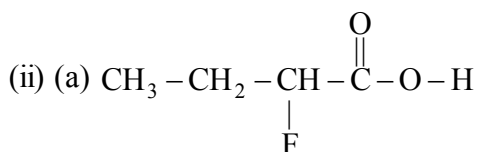
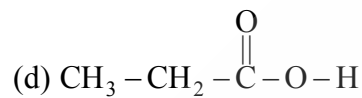
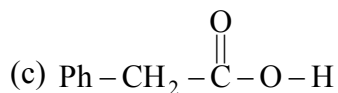
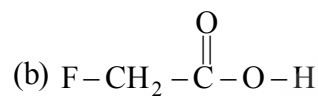
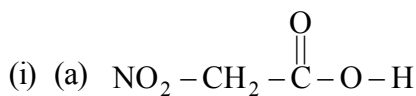
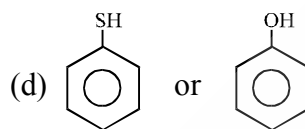
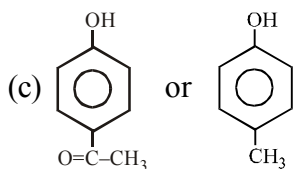
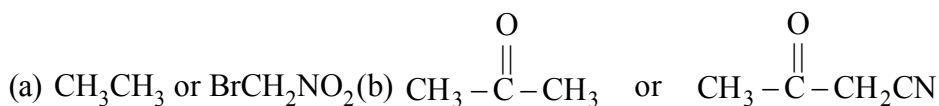


ACIDIC STRENGTH & BASIC STRENGTH
EXERCISE # I

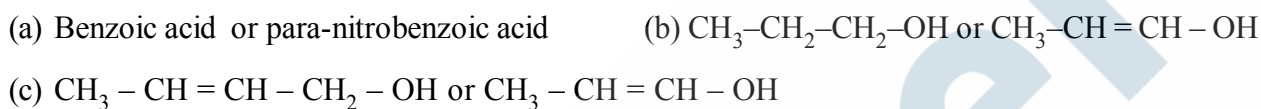
1. Write correct order of acidic strength of following compounds :



2. Explain which is a stronger acid.



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



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



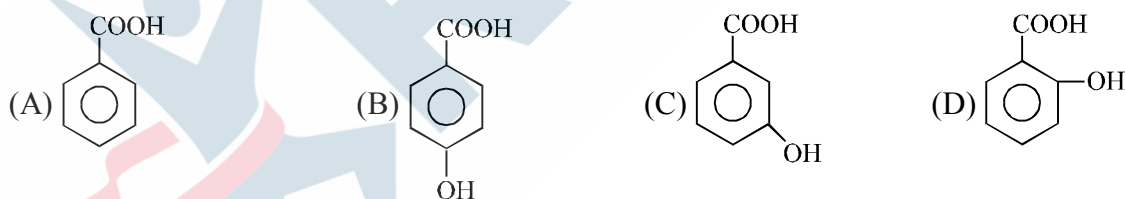
Select the correct answer from the given code:



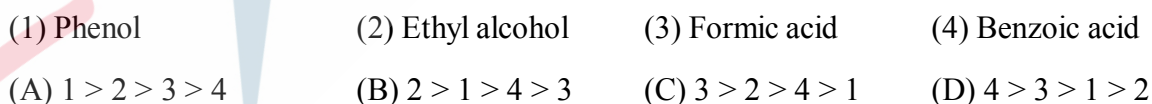
5. Which one of the following is the most acidic?



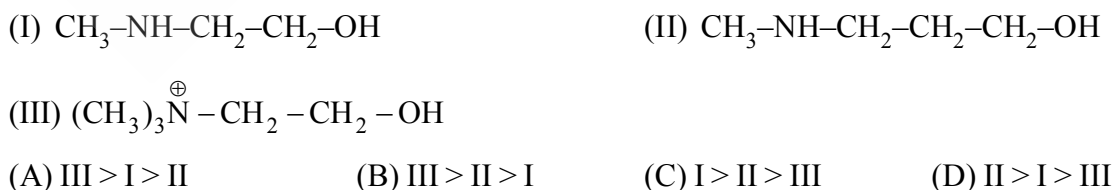
6. Which of the following is weakest acid?



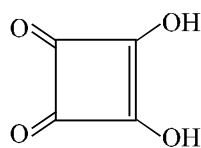
7. Arrange pH of the given compounds in decreasing order:



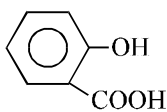
8. Arrange acidity of given compounds in decreasing order:



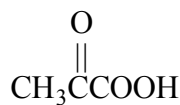
9. Consider the following compound



I



II

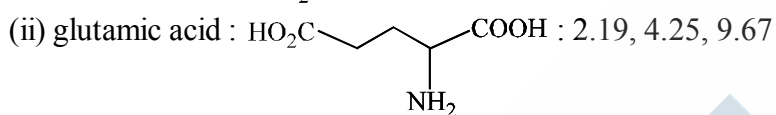
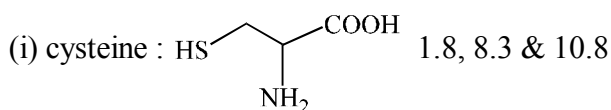


III

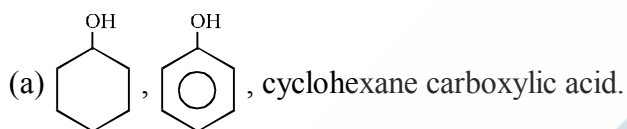
Which of the above compounds reacts with NaHCO_3 giving CO_2

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

10. Say which pK_a belong to which functional group in case of following amino acids :



11. Record the following sets of compounds according to increasing pK_a ($= -\log K_a$)



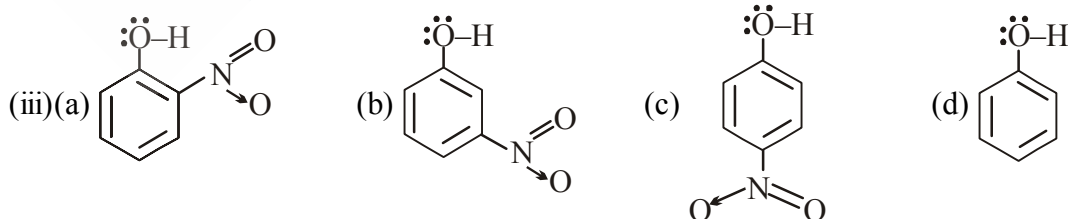
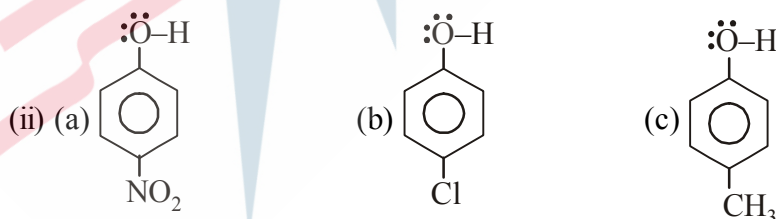
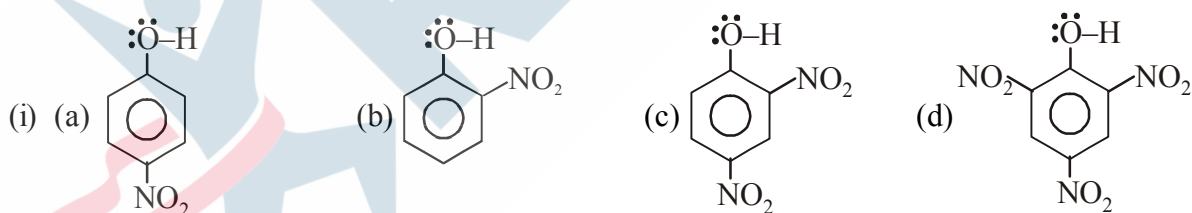
(b) 1-butyne, 1-butene, butane

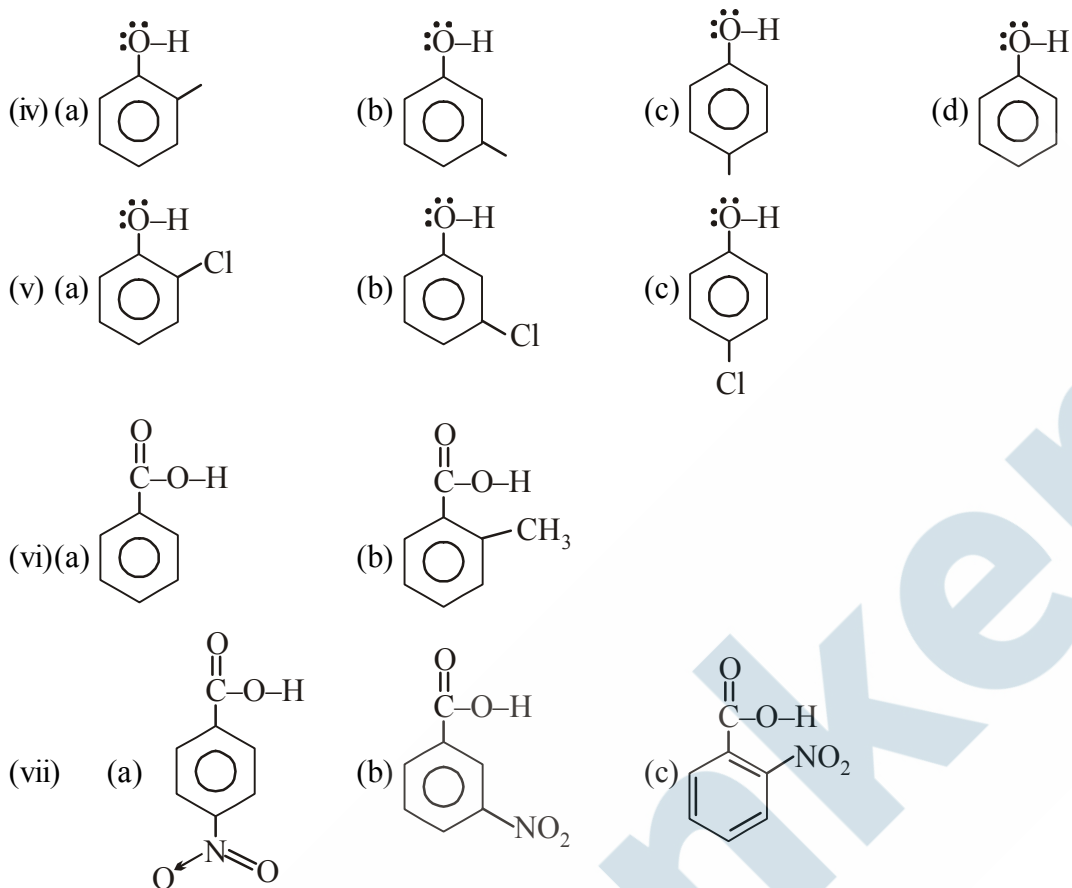
(c) Propanoic acid, 3-bromopropanoic acid, 2-nitropropanoic acid

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

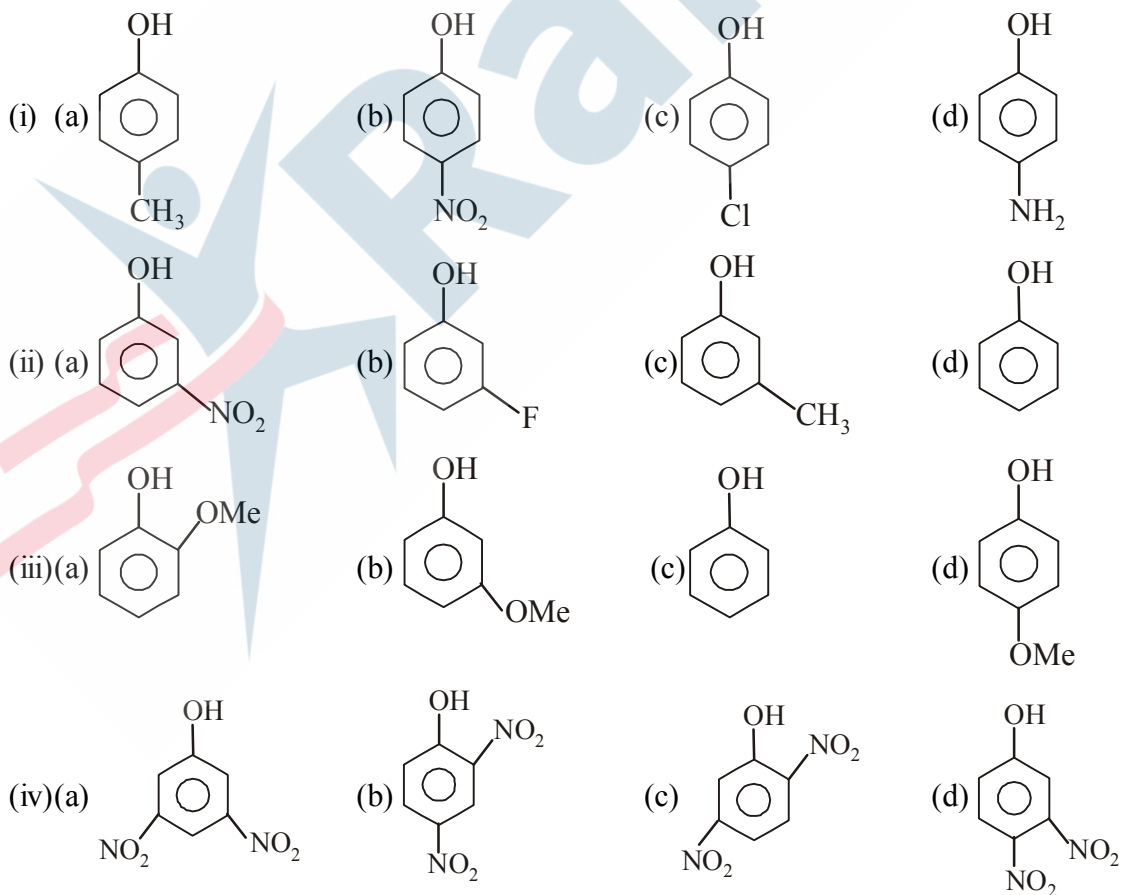
(e) Hexylamine, aniline, methylamine

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

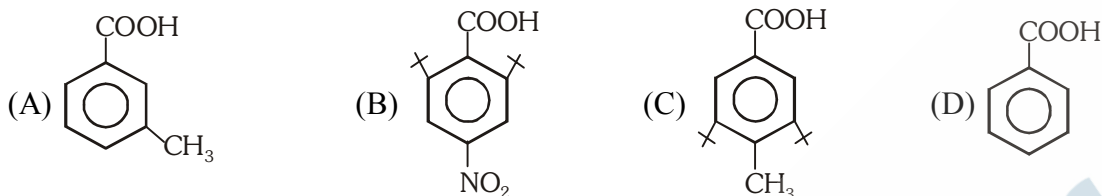




13. Select the strongest acid in each of the following sets :



14. The strongest acid is :
 (A) HF (B) $\text{CH}_3\text{CO}_2\text{H}$ (C) $\text{HF} + \text{SbF}_5$ (D) H_2S
15. The weakest acid (does not show acidic character) is :
 (A) $\text{HC} \equiv \text{CH}$ (B) $\text{CH}_2 = \text{CH}_2$ (C) Me_3CH (D) Ph_3CH
16. Which of the following is most acidic :

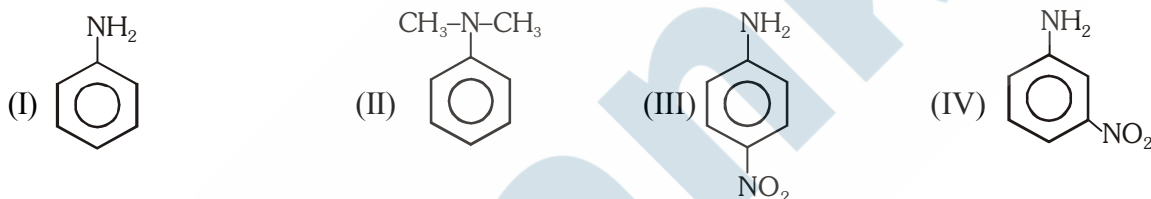


Paragraph for Question 17 to 18

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

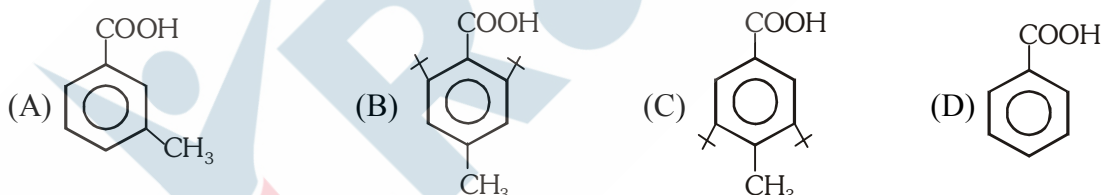
- (1) Physical properties (2) Acidity and basicity (3) Reactivity of organic compounds

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

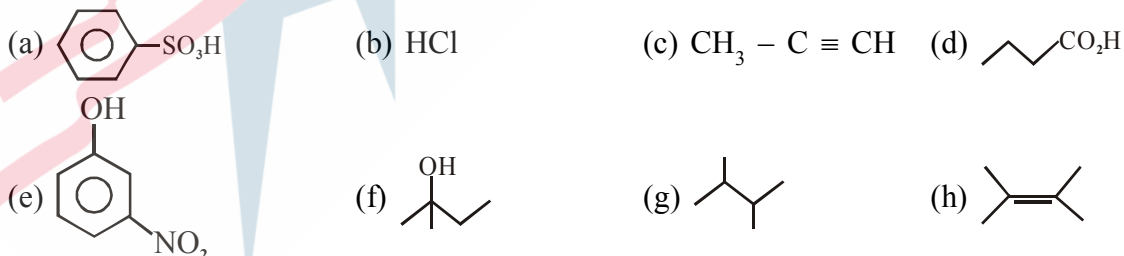


- (A) $\text{I} > \text{II} > \text{III} > \text{IV}$ (B) $\text{IV} > \text{III} > \text{II} > \text{I}$ (C) $\text{II} > \text{I} > \text{IV} > \text{III}$ (D) $\text{I} > \text{IV} > \text{III} > \text{II}$

18. Which of the following is most acidic :



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



- (i) NaOH

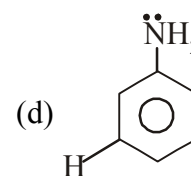
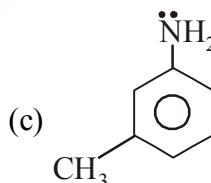
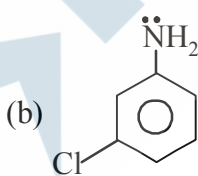
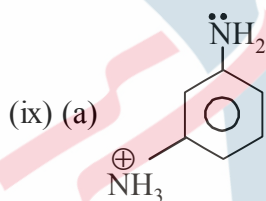
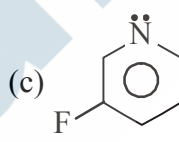
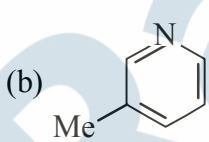
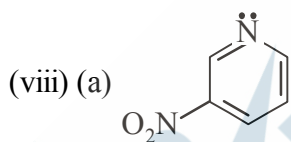
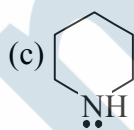
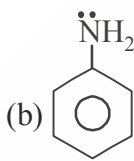
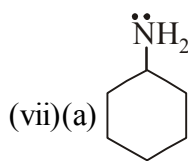
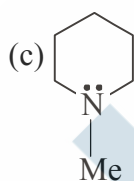
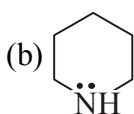
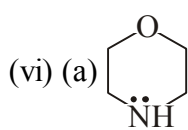
20. Select correct order regarding acidic strength of given compounds :

- (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) $3 > 2 > 4 > 1$

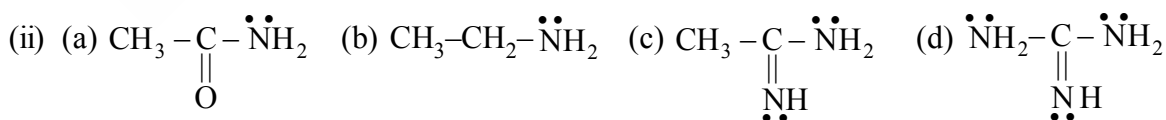
EXERCISE # II

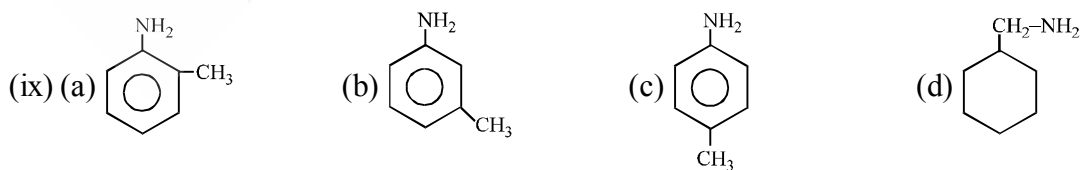
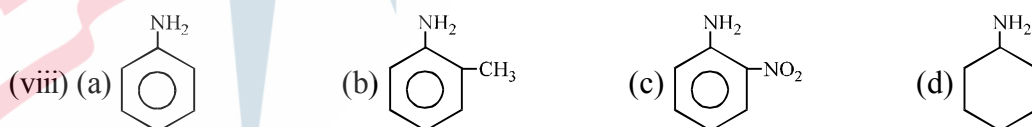
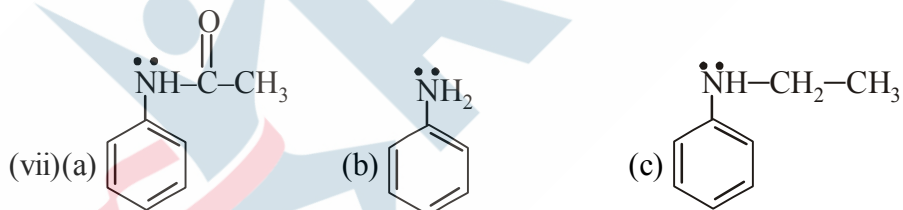
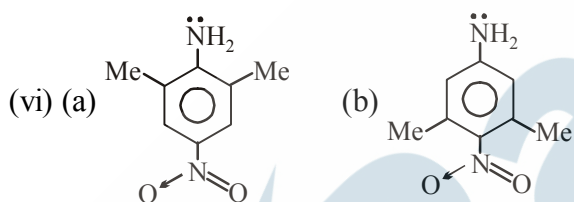
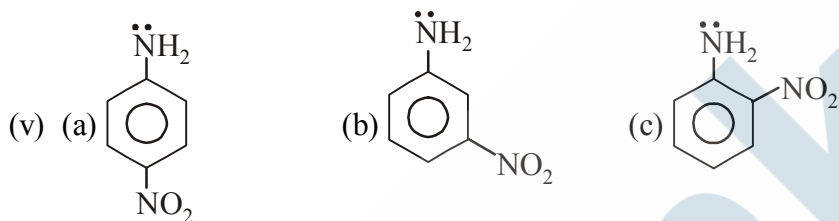
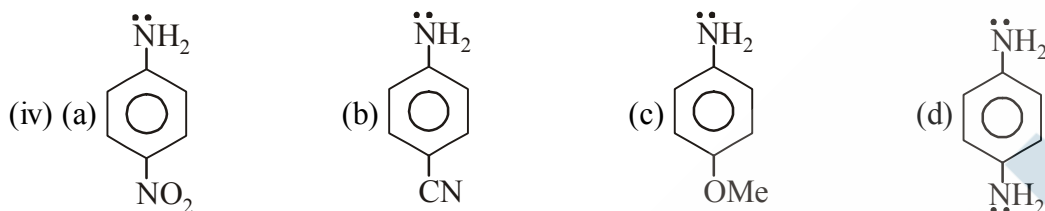
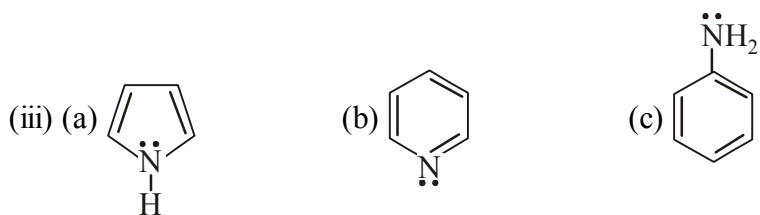
1. Write decreasing order of basic strength of following :

- (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-NH_2 (c) $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2$

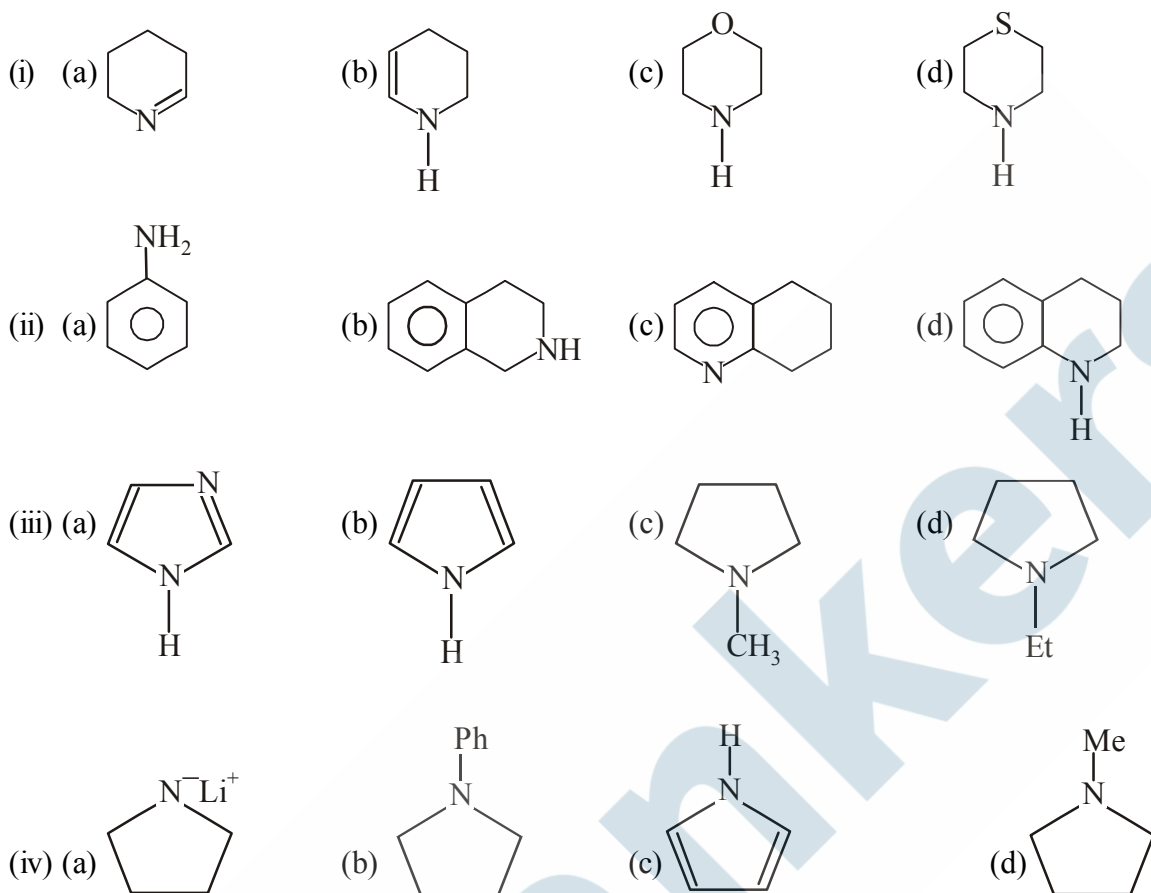


2. Write decreasing order of basic strength of following :

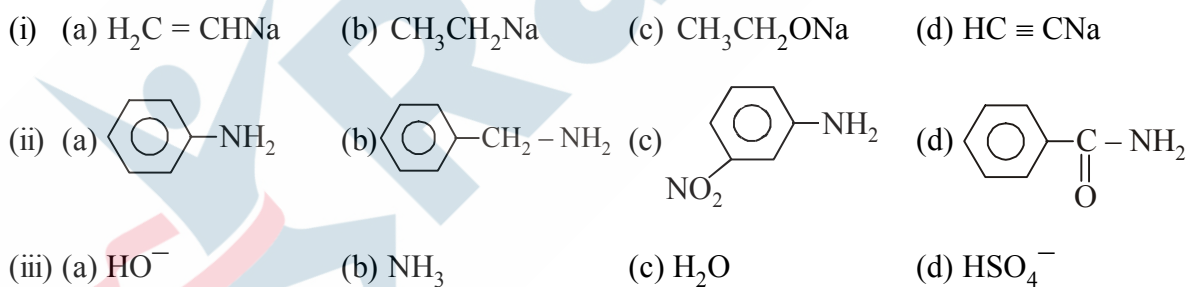




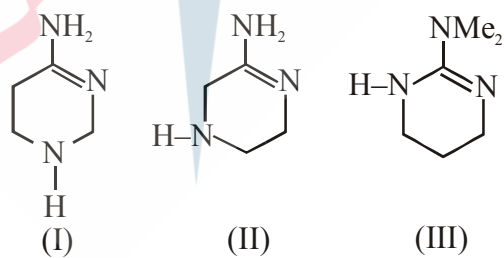
3. Select the strongest base in following compound :



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



5. Correct decreasing order of basic strength -



Of following compound -

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

6. 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

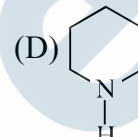
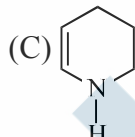
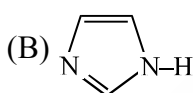
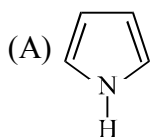
7. Consider the basicity of the following aromatic amines:

(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

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



9. In each of the following pair of compounds, which is more basic in aqueous solution?

Give an explanation for your choice:

(a) CH_3NH_2 or CF_3NH_2

(b) CH_3CONH_2 or $\text{H}_2\text{N}-\text{C}(=\text{NH})-\text{NH}_2$

(c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ or CH_3CN

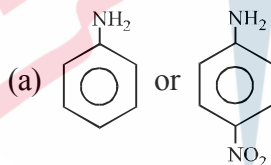
(d) $\text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$ or 2,6-dimethyl-N,N-dimethylaniline

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

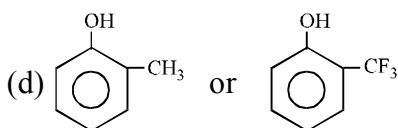
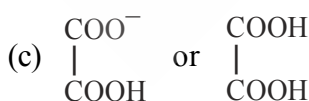
(a) H_2O or H_3O^+ (b) Cl^- , SH^- (c) F^- , OH^- , NH_2^- , CH_3^- (d) HF , H_2O , NH_3

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

11. Explain which compound is the weaker base.

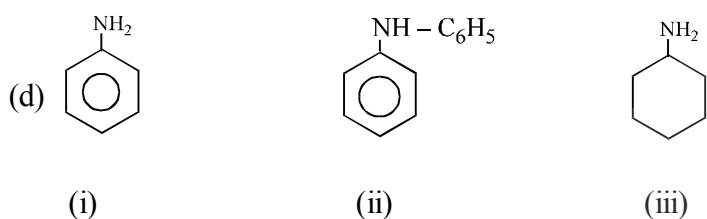


(b) $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH} - \text{CH}_2^-$ or $\text{CH}_2 = \text{CH} - \text{CH}_2^-$



12. Arrange the basic strength of the following compounds.

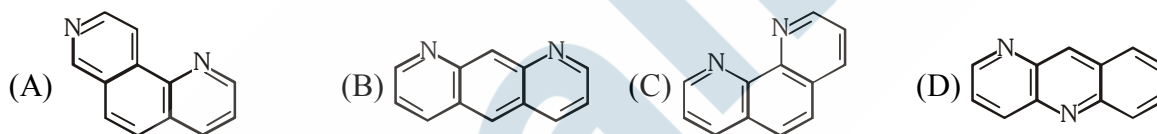
- | | | |
|--|--|--|
| (a) OH^- | CH_3COO^- | Cl^- |
| (i) | (ii) | (iii) |
| (b) $\text{CH} \equiv \text{C}^-$ | $\text{CH}_2 = \text{CH}^-$ | CH_3CH_2^- |
| (i) | (ii) | (iii) |
| (c) $\text{CH}_2 = \text{CHCH}_2\text{NH}_2$ | $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ | $\text{CH} \equiv \text{C} - \text{CH}_2\text{NH}_2$ |
| (i) | (ii) | (iii) |



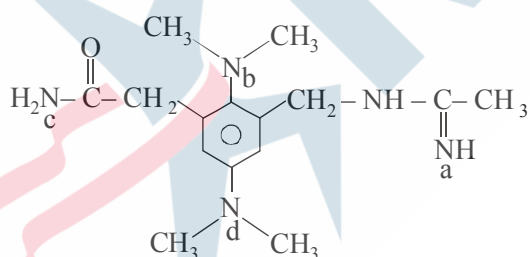
13. Arrange the following compounds in order of increasing basicity.

- | | |
|--|---|
| (a) CH_3NH_2 , CH_3NH_3^+ , CH_3NH^- | (b) CH_3O^- , CH_3NH^- , CH_3CH_2^- |
|--|---|

14. Which of the following is most basic :

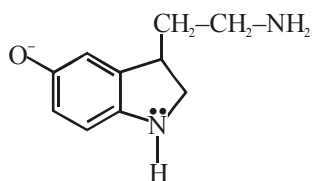


15. Basicity order of N in following compound is :



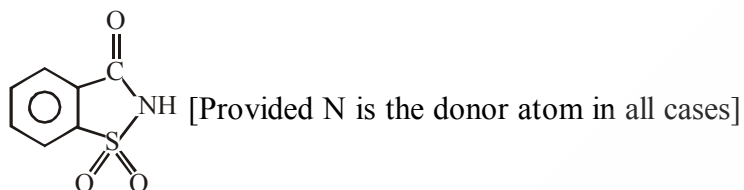
- | | | | |
|---------------------|---------------------|---------------------|---------------------|
| (A) $b > d > a > c$ | (B) $a > b > d > c$ | (C) $a > b > c > d$ | (D) $a > c > b > d$ |
|---------------------|---------------------|---------------------|---------------------|

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

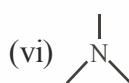
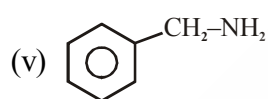
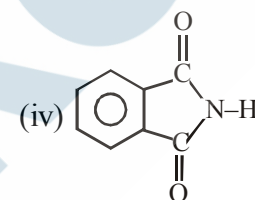
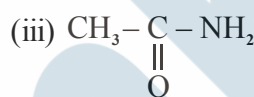
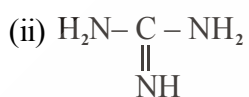
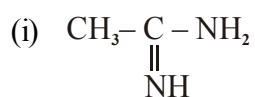


How many basic groups present in following compound ?

17. The structure of saccharin is given as follows :

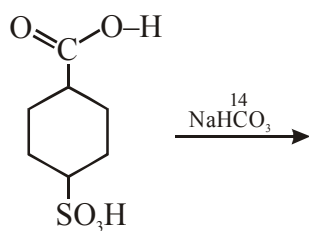


How many following compounds are more basic than saccharin ?



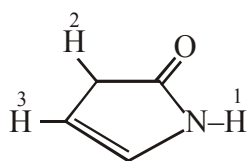
EXERCISE # III

1. In given reaction Gas liberated is/are



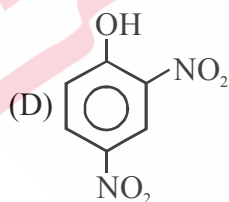
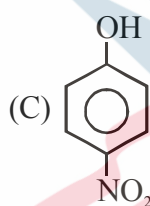
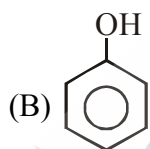
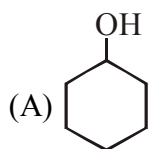
- (A) CO_2 & SO_3 (B) SO_3 & $^{14}\text{CO}_2$ (C) $^{14}\text{CO}_2$ only (D) SO_2 only

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-I

(P) React with NaOH

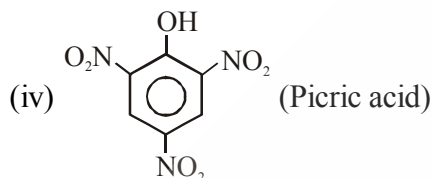
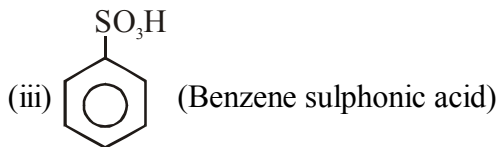
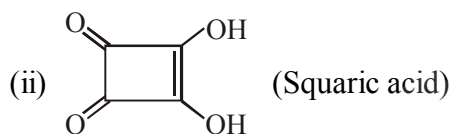
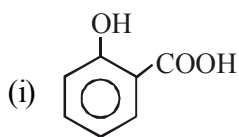
(Q) React with NaHCO_3

(R) React with NaH

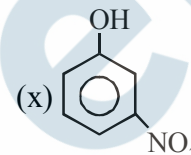
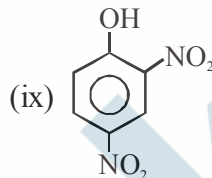
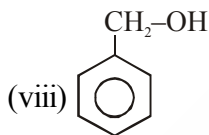
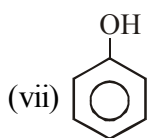
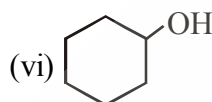
(S) React with Na

(T) React with NaNH_2

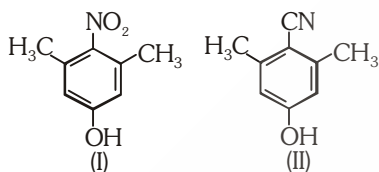
4. Compound which can give effevescences with NaHCO_3



(v) Ph-CH=CH-COOH (cinnamic acid)



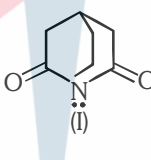
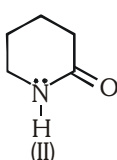
5. **Statement-1** : For the given two compounds-I is more acidic than compounds-II.



and

Statement-2 : Due to presence of $-\text{CH}_3$ group at ortho positions to $-\text{NO}_2$; the plane of $-\text{NO}_2$ 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 

and

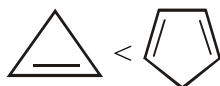
Statement 2 : Lone pair electrons on nitrogen in compound (I) does not participate in resonance.

- (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)

- (A) Guanidine $\text{H}_2\text{N}-\overset{\text{||}}{\text{C}}-\text{NH}_2$ is example of strong base
- (B) Carbanion stability $\bar{\text{C}}\text{Cl}_3 > \bar{\text{C}}\text{F}_3$
- (C) Alkyne is more acidic than alkene
- (D) Acidity :

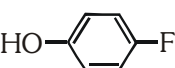
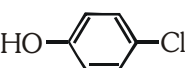
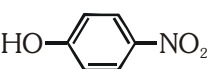



Column - II (Reasons)

- (P) Resonance stabilisation of conjugate acid of strong base.
- (Q) Due to s-character of central atoms
- (R) Due to d-orbital resonance
- (S) Due to formation of aromatic anion
- (T) Stability of conjugate base due to more number of identical resonating structure

8. Match Column-I with Column-II.

Column - I (Compounds)

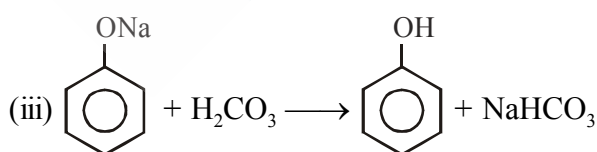
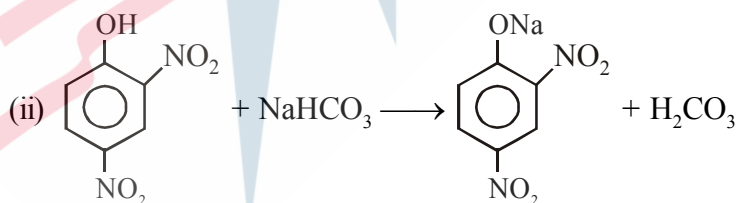
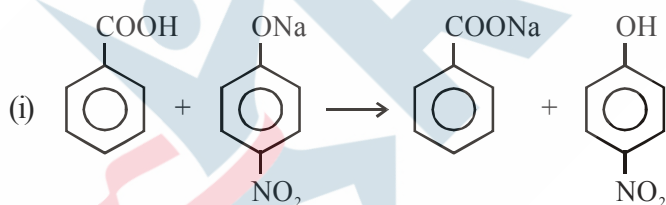
- (A) 
- (B) 
- (C) 
- (D) 

Column - II (pKa)

- (P) 7.15
- (Q) 10.14
- (R) 9.98
- (S) 9.38
- (T) pKa is more than phenol

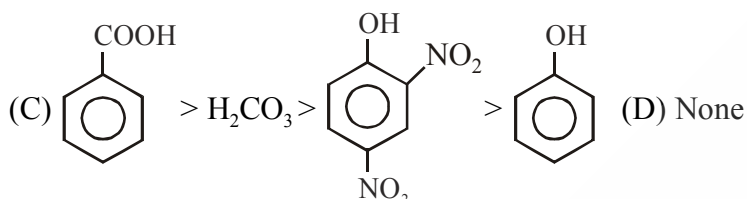
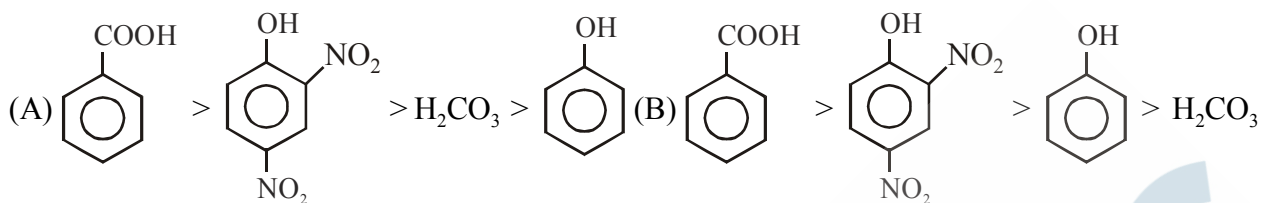
(Comprehension) (Q.9 to Q.11)

Observe the following feasible reactions :

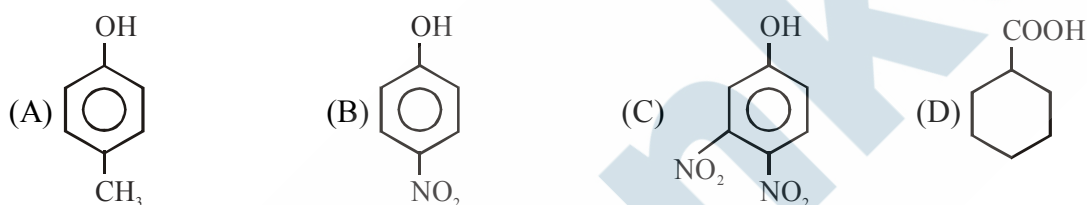


Answer the following question :

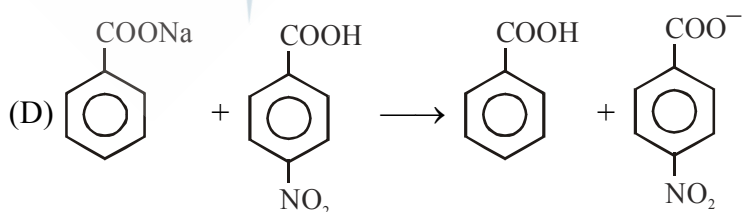
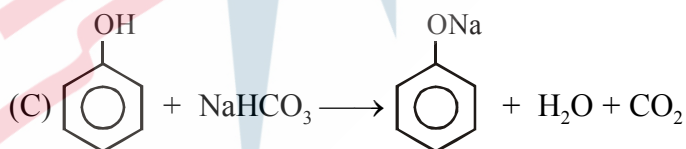
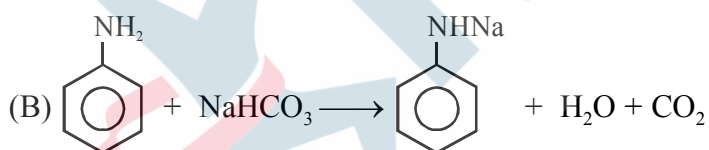
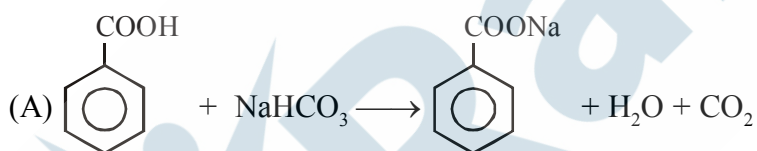
9. Which of the following is the correct order of acidic strength.



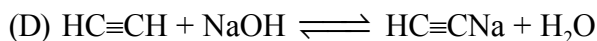
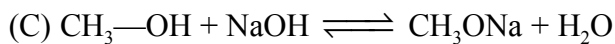
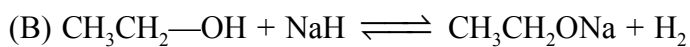
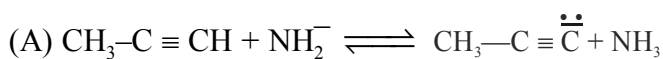
10. Which of the following compound does not react with NaHCO_3



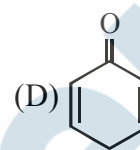
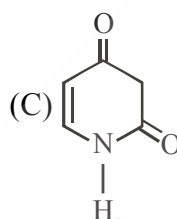
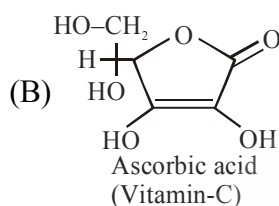
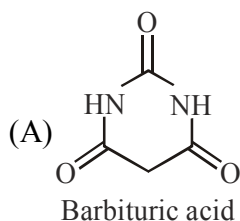
11. Identify the feasible reactions



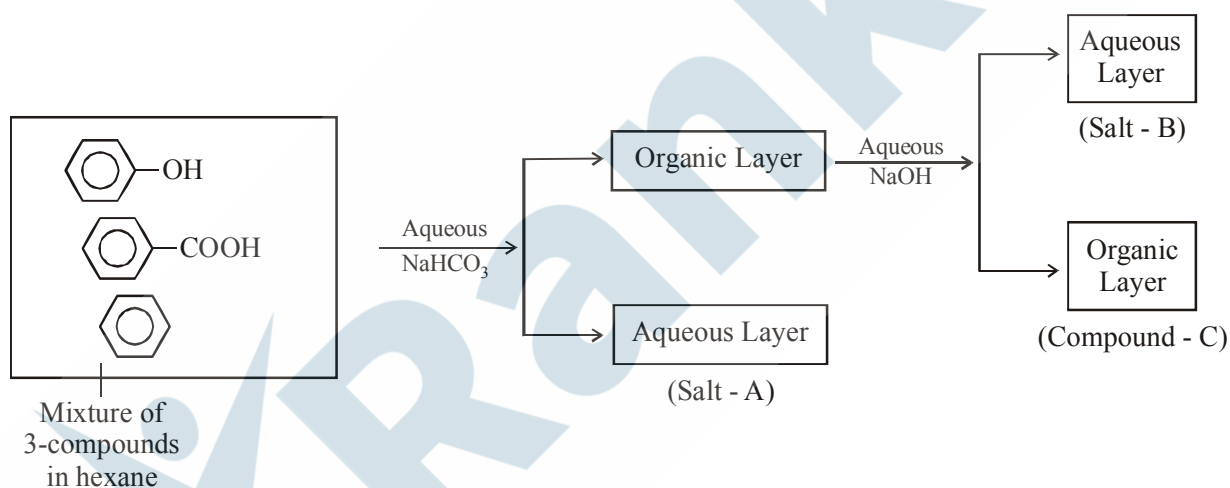
12. Identify the non-feasible reaction



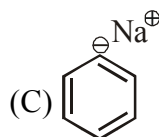
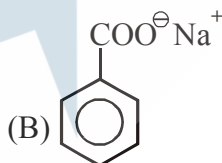
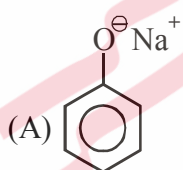
13. Select the number of compounds in which deprotonation gives aromatic anion :



Paragraph for Questions 14 and 15

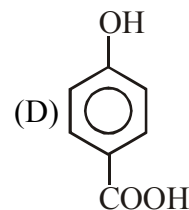
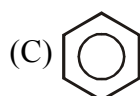
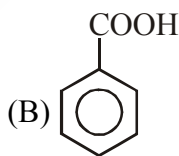
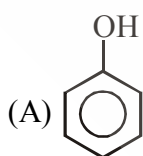


14. Identify salt 'A' ?



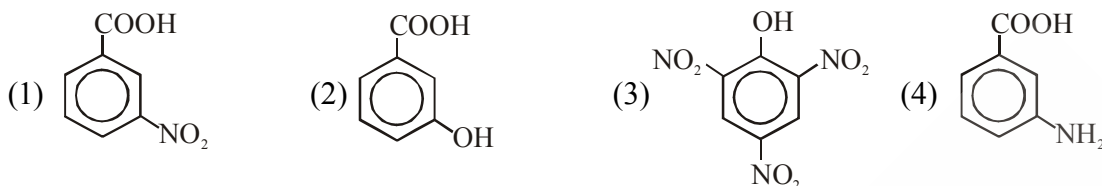
(D) All of these

15. Identify compound 'C' ?



EXERCISE # IV (JEE-MAIN)

1. Picric acid is - [AIEEE-2002]



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



3. The correct order of increasing basic nature for the bases NH_3 , CH_3NH_2 and $(\text{CH}_3)_2\text{NH}$ is-

[AIEEE-2003]

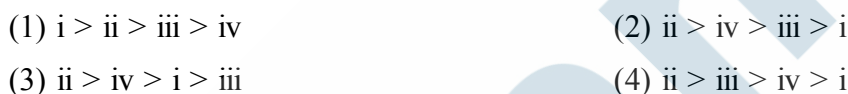


4. Consider the acidity of the carboxylic acids-

[AIEEE-2004]



which of the following is the correct order of acidity-



5. Which of the following is the strongest base -

[AIEEE-2004]



6. Among the following acids which has the lowest pK_a value-

[AIEEE-2005]



7. Amongst the following the most basic compound is-

[AIEEE-2005]



8. What is the conjugate base of OH^- ?

[AIEEE-2005]



9. Among the following acids which has the lowest pK_a value?

[AIEEE-2005]



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



(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 the strongest base in aqueous solution ? [AIEEE-2007]

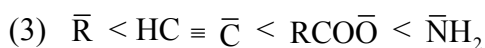
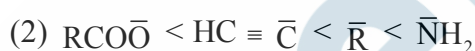
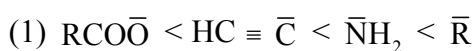
(1) Trimethylamine

(2) Aniline

(3) Dimethylamine

(4) Methylamine

12. The correct order of increasing basicity of the given conjugate base ($\text{R}=\text{CH}_3$) is :- [AIEEE-2010]



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



14. The correct order of acid strength of the following compounds :-

A. Phenol

B. p-Cresol

C. m-Nitrophenol

D. p-Nitrophenol

is :-

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

(2) $D > C > A > B$

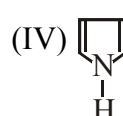
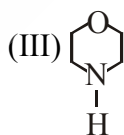
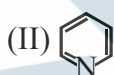
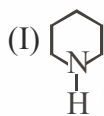
(3) $B > D > A > C$

(4) $A > B > D > C$

[AIEEE-2011]

15. In the following compounds :

[JEE(Main)-2012]



the order of basicity is as follows :

(1) $\text{IV} > \text{III} > \text{II} > \text{I}$

(2) $\text{II} > \text{III} > \text{I} > \text{IV}$

(3) $\text{I} > \text{III} > \text{II} > \text{IV}$

(4) $\text{III} > \text{I} > \text{II} > \text{IV}$

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]

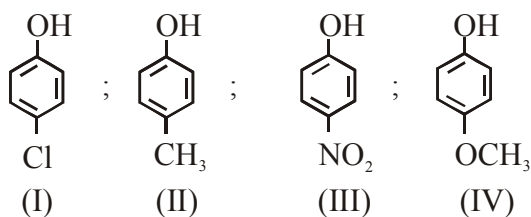
(1) $3^\circ > 2^\circ > \text{NH}_3 > 1^\circ$

(2) $1^\circ > 2^\circ > 3^\circ > \text{NH}_3$

(3) $\text{NH}_3 > 1^\circ > 2^\circ > 3^\circ$

(4) $3^\circ > 2^\circ > 1^\circ > \text{NH}_3$

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



- (1) II > IV > I > III (2) I > II > III > IV
 (3) III > I > II > IV (4) IV > III > I > II
19. The conjugate base of hydrazoic acid is :- [JEE(Main)-2014]



20. Which one of the following compounds will not be soluble in sodium bicarbonate ? [JEE(Main)-2014]



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



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

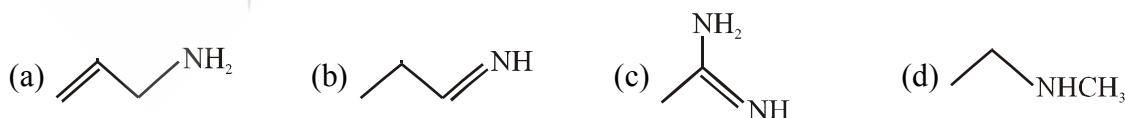


23. Among the following compounds, the increasing order of their basic strength is:-



- (1) (II) < (I) < (III) < (IV) (2) (I) < (II) < (IV) < (III) [JEE(Main)-On-Line 2017]
 (3) (II) < (I) < (IV) < (III) (4) (I) < (II) < (III) < (IV)

24. The increasing order of basicity of the following compounds is : [JEE(Main)-2018]

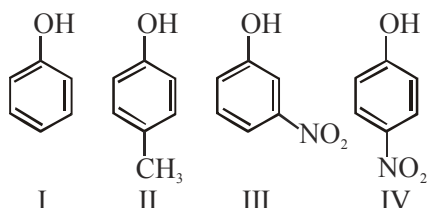


- (1) (b) < (a) < (c) < (d) (2) (b) < (a) < (d) < (c)
 (3) (d) < (b) < (a) < (c) (4) (a) < (b) < (c) < (d)

EXERCISE # V (J-ADVANCED)

1. In the following compounds

[IIT-JEE-1996]



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 benzoate 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) $p\text{-NO}_2\text{-C}_6\text{H}_4\text{NH}_2$ (C) $m\text{-NO}_2\text{-C}_6\text{H}_4\text{NH}_2$ (D) $C_6H_5CH_2NH_2$

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



- (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 than o-hydroxybenzoic acid.

Because

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

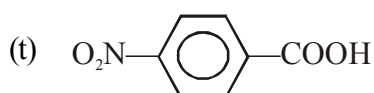
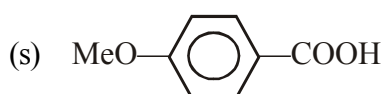
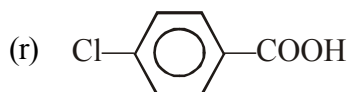
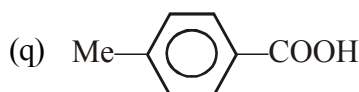
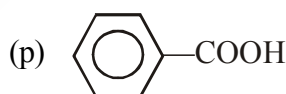
- (A) Statement-I is True, Statement-II is True ; Statement-II is a correct explanation for Statement-I
 (B) Statement-I is True, Statement-II is True; Statement-II is NOT a correct explanation for Statement-I
 (C) Statement-I is True, Statement-II is False.
 (D) Statement-I is False, Statement-II is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

6. Match K_a values with suitable acid :

[IIT-JEE-2003]

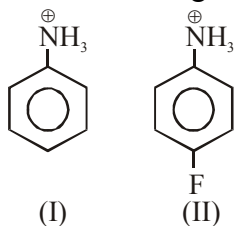
- K_a
- (A) 3.3×10^{-5}
- (B) 4.2×10^{-5}
- (C) 6.3×10^{-5}
- (D) 6.4×10^{-5}
- (E) 30.6×10^{-5}

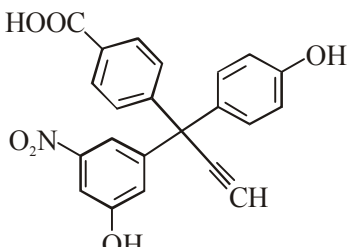
Acid



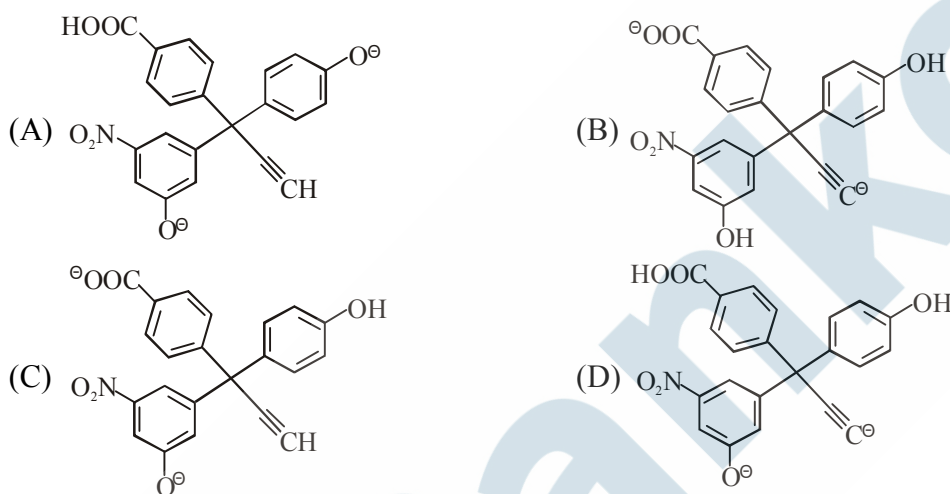
7. (a) Which of the following is more acidic and why ?

[IIT-JEE-2004]



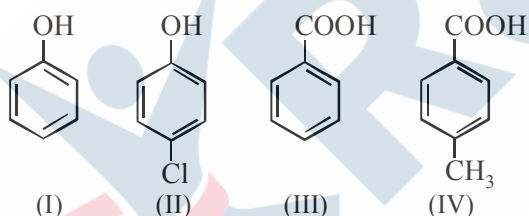
8.  $\xrightarrow{2\text{Moles NaNH}_2}$ A. The product (A) will be :

[IIT-JEE-2007]



9. The correct acidity order of the following is :

[IIT-JEE-2009]



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

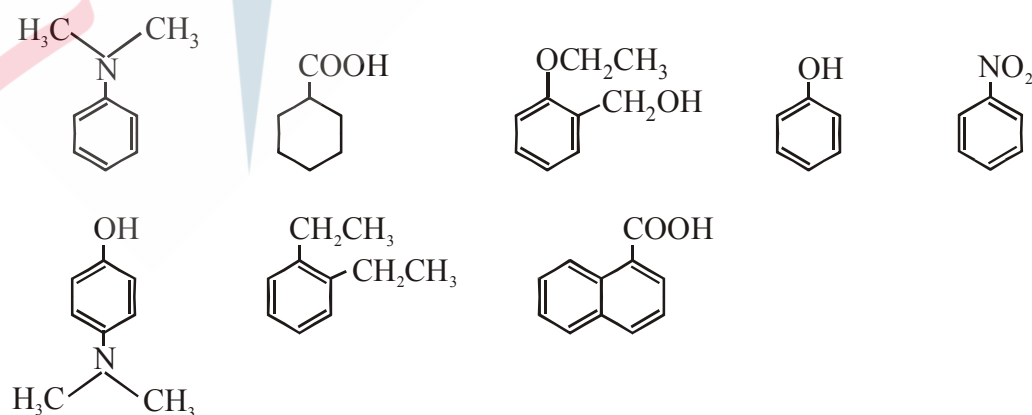
(B) (IV) > (III) > (I) > (II)

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

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

10. Amongst the following, the total number of compounds soluble in aqueous NaOH is:

[IIT-JEE-2010]



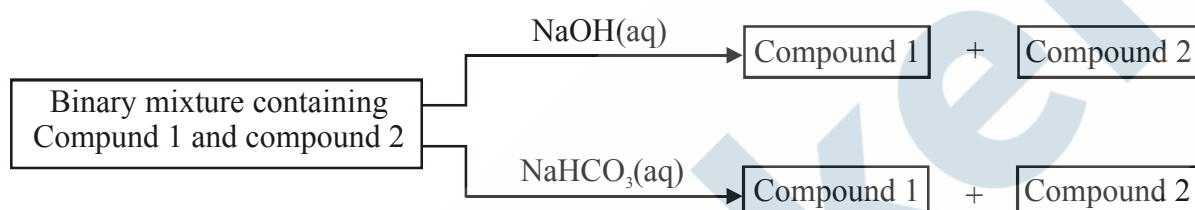
11. Among the following compounds, the most acidic is [IIT-JEE-2011]

- (A) p-nitrophenol (B) p-hydroxybenzoic acid
(C) o-hydroxybenzoic acid (D) p-toluic acid

12. The carboxyl functional group ($-\text{COOH}$) is present in - [IIT-JEE-2012]

- (A) picric 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) $\text{C}_6\text{H}_5\text{OH}$ and $\text{C}_6\text{H}_5\text{COOH}$ (B) $\text{C}_6\text{H}_5\text{COOH}$ and $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$
(C) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ and $\text{C}_6\text{H}_5\text{OH}$ (D) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ and $\text{C}_6\text{H}_5\text{CH}_2\text{COOH}$

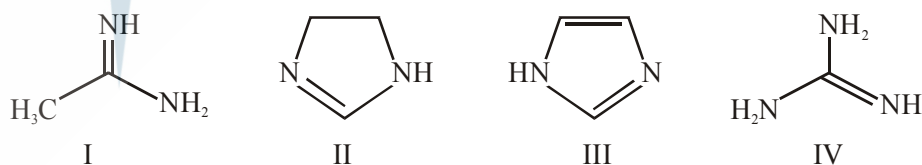
14. The compound that does NOT liberate CO_2 , on treatment with aqueous sodium bicarbonate solution, is - [JEE-ADVANCED-2013]

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

15. Hydrogen bonding plays a central role in the following phenomena [JEE-ADVANCED-2014]

- (A) Ice floats in water
(B) Higher Lewis basicity of primary amines than tertiary amines in aqueous solutions
(C) Formic acid is more acidic than acetic acid
(D) Dimerisation of acetic acid in benzene

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



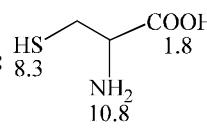
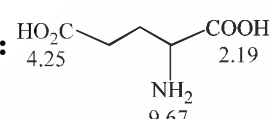
- (A) $\text{II} > \text{I} > \text{IV} > \text{III}$ (B) $\text{IV} > \text{II} > \text{III} > \text{I}$
(C) $\text{I} > \text{IV} > \text{III} > \text{II}$ (D) $\text{IV} > \text{I} > \text{II} > \text{III}$

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) $a > b > c$, (vii) $d > c > b > a$, (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. (B)
 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) $d > c > b > a$
 (v) $a > b > c$, (vi) $c > b > a$, (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) $d > a > b > c$
 (ix) $d > c > b > a$

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)

9. (a) i, (b) ii, (c) i, (d) ii 10. (a) 2; (b) 1; (c) 1; (d) 1; (e) 3

11. (a) 2; (b) 1; (c) 2; (d) 2 12. (a) $1 > 2 > 3$; (b) $1 < 2 < 3$; (c) $3 < 1 < 2$; (d) $2 < 1 < 3$

13. (a) $2 < 1 < 3$; (b) $1 < 2 < 3$ 14. (C) 15. (B)

16. 3, 3 basic groups are $\ddot{\text{N}}\text{H}_2$; $-\text{NH}-$; O^- 17. (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, T ; (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)

EXERCISE # IV (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. (3) 24. (2)

EXERCISE # V (J-ADVANCED)

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. (D)