



Additional Problems for Self Practice (APSP)

This Section is not meant for classroom discussion. It is being given to promote self-study and self testing amongst the Resonance students.

PART - I : PRACTICE TEST-1 (IIT-JEE (MAIN Pattern))

Max. Marks: 100
Max. Time : 1 Hour
Important Instructions:
A. General :

- The test paper is of 1 hour duration.
- The Test Paper consists of **25** questions and each questions carries **4** Marks. Test Paper consists of **Two** Sections.

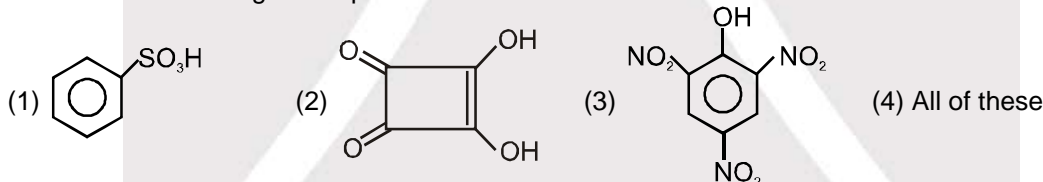
B. Test Paper Format and its Marking Scheme:

- Section-1 contains **20** multiple choice questions. Each question has four choices (1), (2), (3) and (4) out of which **ONE** is correct. For each question in Section-1, you will be awarded 4 marks if you give the corresponding to the correct answer and zero mark if no given answers. In all other cases, minus one (**-1**) mark will be awarded.
- Section-2 contains **5** questions. The answer to each of the question is a **Numerical Value**. For each question in Section-2, you will be awarded 4 marks if you give the corresponding to the correct answer and zero mark if no given answers. No negative marks will be answered for incorrect answer in this section. In this section answer to each question is **NUMERICAL VALUE** with two digit integer and decimal upto two digit. If the numerical value has more than two decimal places **truncate/round-off** the value to **TWO** decimal placed.

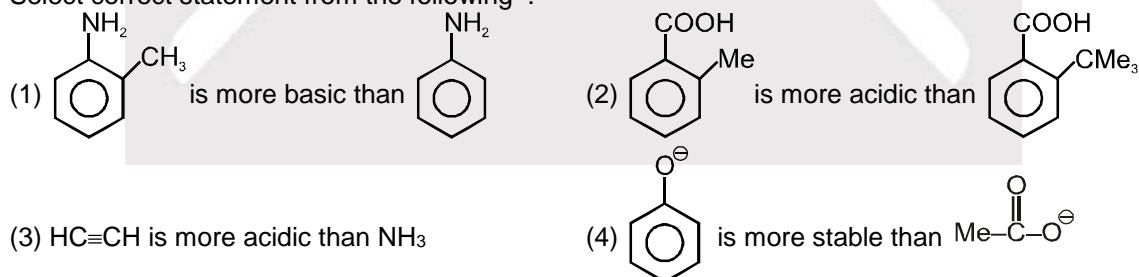
SECTION-1

This section contains **20** multiple choice questions. Each questions has four choices (1), (2), (3) and (4) out of which Only **ONE** option is correct.

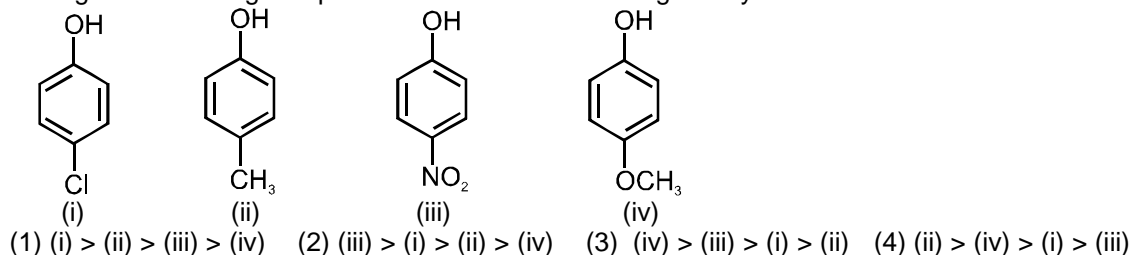
1. Which of the following would produce effervescence with sodium bicarbonate ?



2. Select correct statement from the following :



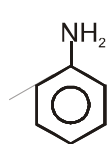
3. Arrange the following compounds in order of decreasing acidity.



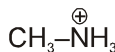


4. The order of decreasing basicity in the four halide ions is :
 (1) $I^- > Br^- > Cl^- > F^-$ (2) $Cl^- > Br^- > I^- > F^-$ (3) $F^- > Cl^- > Br^- > I^-$ (4) $Cl^- > F^- > Br^- > I^-$

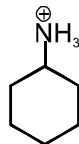
5. Correct order of acidic strength :



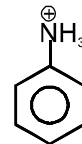
(i)



(ii)



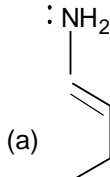
(iii)



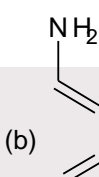
(iv)

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

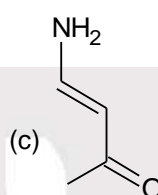
6. Which of the following is **incorrect** about the given molecules



(a)



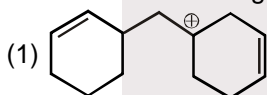
(b)



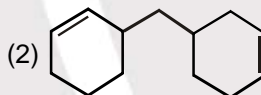
(c)

- (1) The correct order of basic strength (K_b) is : $a > b > c$
 (2) The correct order of C-N bond length is : $a > b > c$
 (3) The correct C=C bond length order is : $a > b > c$
 (4) The correct pK_b order is : $c > b > a$

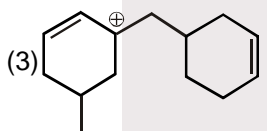
7. Which of the following is the most stabilized carbocation ?



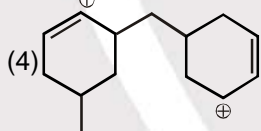
(1)



(2)



(3)



(4)

8. Which one among the following is the least basic:



(1)



(2)

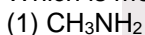


(3)

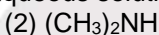


(4)

9. Which is most basic in aqueous solution ?



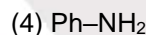
(1)



(2)

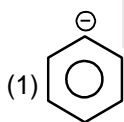


(3)

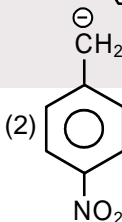


(4)

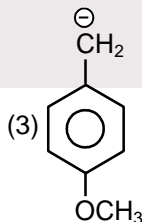
10. Which is less basic than benzyl $\text{C}_6\text{H}_5\text{CH}_2^-$ carbanion?



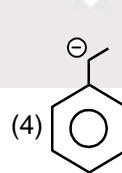
(1)



(2)

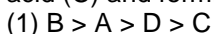


(3)



(4)

11. The correct order of decreasing acid strength of trichloroacetic acid (A), trifluoroacetic acid (B), acetic acid (C) and formic acid (D) is :



(1)



(2)

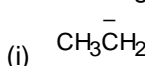


(3)

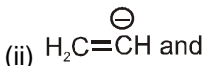


(4)

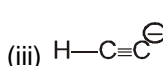
12. Base strength is in the order of



(i)



(ii)



(iii)

- (1) (ii) > (i) > (iii)

- (2) (iii) > (iii) > (i)

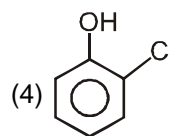
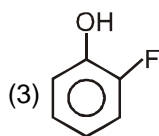
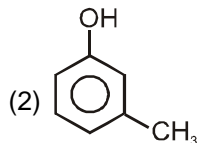
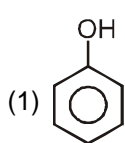
- (3) (i) > (iii) > (ii)

- (4) (i) > (ii) > (iii)

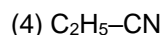
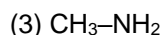
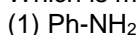


13. Pyridine is less basic than triethylamine because :
- (1) Pyridine has aromatic character
 - (2) Nitrogen in pyridine is sp^2 hybridised
 - (3) Pyridine is a cyclic system
 - (4) In pyridine, lone pair of nitrogen is delocalised

14. Which of the following phenol has lowest pK_a ?



15. Which is most basic among the followings ?

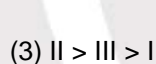
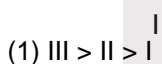
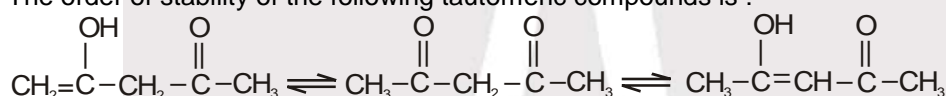


16. **Assertion :** The pK_a of acetic acid is lower than that of phenol.

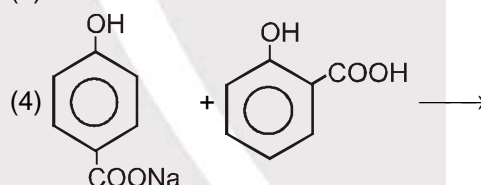
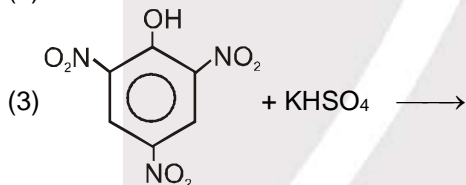
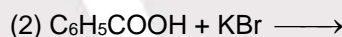
Reason : Phenoxide ion is more resonance stabilised.

- (1) If both assertion and reason are true and reason is a correct explanation of assertion.
- (2) If both assertion and reason are true but reason is not a correct explanation of assertion.
- (3) If assertion is true but reason is false.
- (4) If assertion and reason both are false.

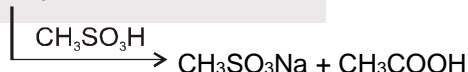
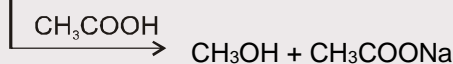
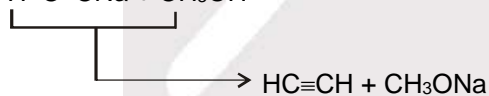
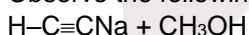
17. The order of stability of the following tautomeric compounds is :



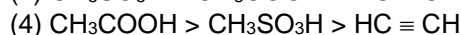
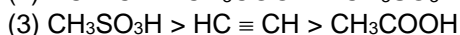
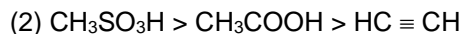
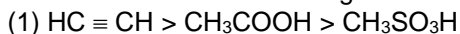
18. The feasible reaction is :



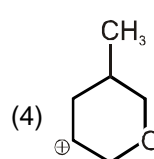
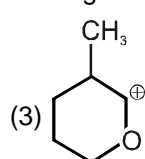
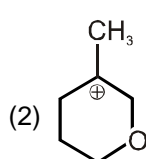
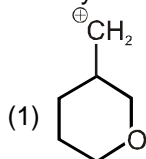
19. Observe the following reaction sequence.



Which is correct acidic strength order :



20. Identify the most stable carbocation among the following :

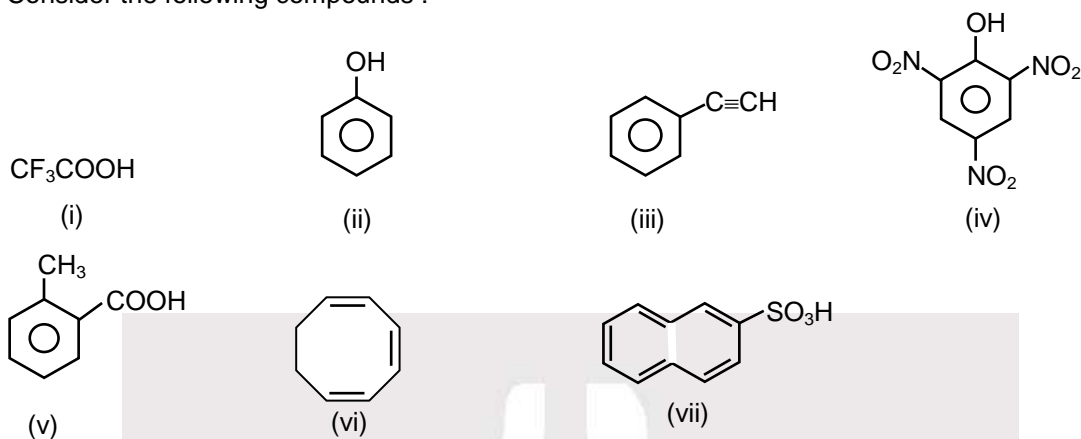




SECTION-2

This section contains 5 questions. Each question, when worked out will result in **Numerical Value**.

21. Consider the following compounds :



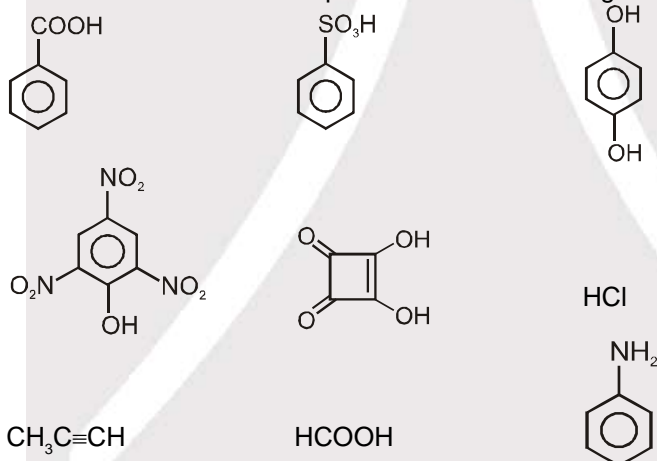
Give the value of $(b + c) - a$:

a = number of nonaromatic compounds

b = number of compounds which can evolve CO_2 gas on reaction with NaHCO_3

c = number of compounds which are more acidic than benzoic acid

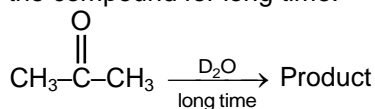
22. Find the total number of acidic compounds which are stronger acids than H_2CO_3 .



23. How many of the following is/are less acidic than formic acid ?
 (i) Ph-OH (ii) Ph-COOH (iii) $\text{CH}_3\text{-SO}_3\text{H}$ (iv) H_2CO_3
 (v) $\text{CH}_3\text{-OH}$ (vi) Picric acid (vii) $\text{Cl-CH}_2\text{CH}_2\text{COOH}$ (viii) Ph-NH_2

24. How many total enolic forms (only structural) are possible for c1ccccc1C(=O)CC(=O)CC?

25. How many hydrogen's will be replaced by deuterium of the given compound if D_2O is allowed to react with the compound for long time.





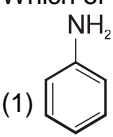
Practice Test-1 (IIT-JEE (Main Pattern))

OBJECTIVE RESPONSE SHEET (ORS)

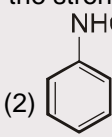
Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22	23	24	25					
Ans.										

PART - II : JEE (MAIN) / AIEEE OFFLINE PROBLEMS (PREVIOUS YEARS)

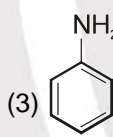
- The correct order of increasing basic nature for the bases NH_3 , CH_3NH_2 and $(\text{CH}_3)_2\text{NH}$ is: [AIEEE-2003, 3/225]
 - $\text{CH}_3\text{NH}_2 < \text{NH}_3 < (\text{CH}_3)_2\text{NH}$
 - $(\text{CH}_3)_2\text{NH} < \text{NH}_3 < \text{CH}_3\text{NH}_2$
 - $\text{NH}_3 < \text{CH}_3\text{NH}_2 < (\text{CH}_3)_2\text{NH}$
 - $\text{CH}_3\text{NH}_2 < (\text{CH}_3)_2\text{NH} < \text{NH}_3$
- Which of the following is the strongest base? [AIEEE-2004, 3/225]



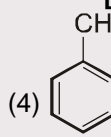
(1)



(2)



(3)



(4)
- Consider the acidity of the carboxylic acids: [AIEEE-2004, 3/225]

(i) PhCOOH
 (1) $i > ii > iii > iv$

(ii) $o\text{-NO}_2\text{C}_6\text{H}_4\text{COOH}$
 (2) $ii > iii > iv > i$

(iii) $p\text{-NO}_2\text{C}_6\text{H}_4\text{COOH}$
 (3) $iii > ii > iv > i$

(iv) $m\text{-NO}_2\text{C}_6\text{H}_4\text{COOH}$
 (4) $ii > iv > iii > i$
- Among the following acid which has the lowest pK_a value? [AIEEE-2005, 3/225]

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

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

(3) HCOOH

(4) CH_3COOH
- Amongst the following the most basic compound is [AIEEE-2005, 3/225]

(1) p-Nitroaniline

(2) Acetanilide

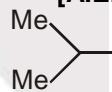
(3) Aniline

(4) Benzylamine
- The correct order of increasing acid strength of the compounds. [AIEEE-2006, 3/165]

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

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

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

(d)  CO_2H is

 - $b < d < a < c$
 - $d < a < c < b$
 - $d < a < b < c$
 - $a < d < c < b$
- Which one of the following is the strongest base in aqueous solution? [AIEEE-2007, 3/120]

(1) Dimethylamine

(2) Methylamine

(3) Trimethylamine

(4) Aniline
- The correct order of increasing basicity of the given conjugate bases ($\text{R} = \text{CH}_3$) is: [AIEEE-2010, 4/144]

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

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

 - $\text{RCOO}^- < \text{NH}_2^- < \text{HC} \equiv \text{C}^- < \text{R}^-$
 - $\text{RCOO}^- < \text{HC} \equiv \text{C}^- < \text{NH}_2^- < \text{R}^-$
- The strongest acid amongst the following compounds is : [AIEEE-2011, 4/120]

(1) CH_3COOH

(2) HCOOH

 - $\text{CH}_3\text{CH}_2\text{CH}(\text{Cl})\text{CO}_2\text{H}$
 - $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{COOH}$
- Identify the compound that exhibits tautomerism. [AIEEE-2011, 4/120]

(1) 2-Butene

(2) Lactic acid

(3) 2-Pentanone

(4) Phenol
- The correct order of acid strength of the following compounds: [AIEEE-2011, 4/120]

(A) Phenol

(B) p-Cresol

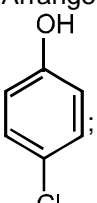
(C) m-Nitrophenol

(D) p-Nitrophenol

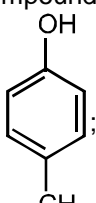
is :

 - $\text{D} > \text{C} > \text{A} > \text{B}$
 - $\text{B} > \text{D} > \text{A} > \text{C}$
 - $\text{A} > \text{B} > \text{D} > \text{C}$
 - $\text{C} > \text{B} > \text{A} > \text{D}$

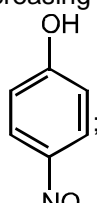


12. Arrange the following compounds in order of decreasing acidity : [JEE(Main)-2013, 4/120]
- 

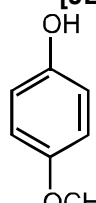
(I)

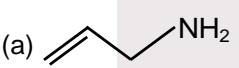


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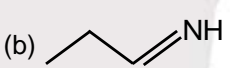


(III)

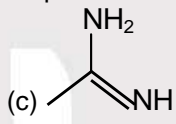


(IV)
- (1) II > IV > I > III (2) I > II > III > IV (3) III > I > II > IV (4) IV > III > I > II
13. Considering the basic strength of amines in aqueous solution, which one has the smallest pK_b value? [JEE(Main)-2014, 4/120]
- (1) $(CH_3)_2NH$ (2) CH_3NH_2 (3) $(CH_3)_3N$ (4) $C_6H_5NH_2$
14. The increasing order of basicity of the following compounds is : [JEE(Main)-2018, 4/120]
- 

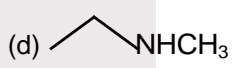
(a)

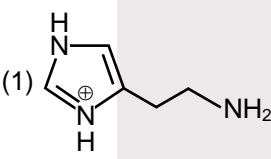


(b)

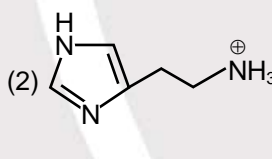


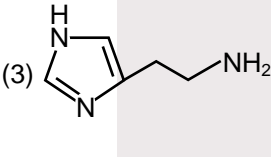
(c)



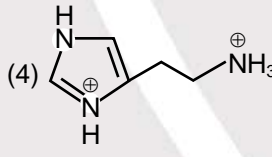
(d)
- (1) (b) < (a) < (d) < (c) (2) (d) < (b) < (a) < (c)
 (3) (a) < (b) < (c) < (d) (4) (b) < (a) < (c) < (d)
15. The predominant form of histamine present in human blood is (pK_a , Histidine = 6.0) [JEE(Main)-2018, 4/120]
- 

(1)



(2)
- 

(3)


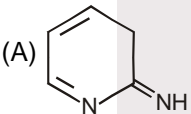
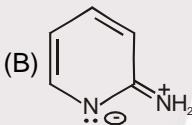
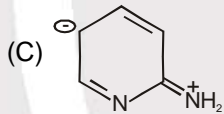
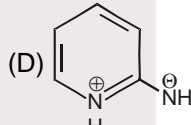
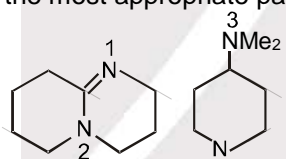
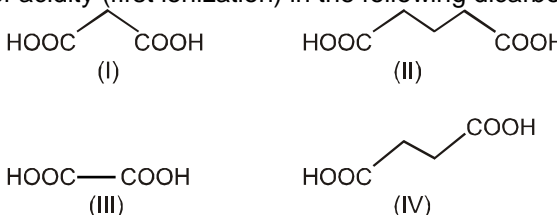


(4)

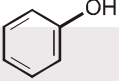
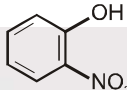
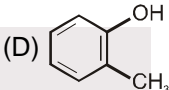

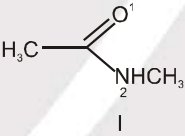
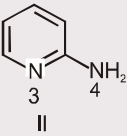
PART- III : NATIONAL STANDARD EXAMINATION IN CHEMISTRY (NSEC) STAGE-I

1. Which of the following is the strongest acid ? [NSEC-2000]
 (A) 3,5-dinitrophenol (B) 2,4-dinitrophenol (C) phenol (D) 2,4,6-trinitrophenol
2. Which of the following is the strongest base ? [NSEC-2000]
 (A) $HC \equiv C^-$ (B) $CH_2 = CH^-$ (C) $CH_3CH_2^-$ (D) NH_2^-
3. Which of the following orders is true regarding the acidic nature of phenol ? [NSEC-2001]
 (A) phenol > o-cresol < o-nitrophenol (B) phenol < o-cresol < o-nitrophenol
 (C) phenol > o-cresol > o-nitrophenol (D) phenol < o-cresol > o-nitrophenol
4. Which of the following order is expected to be correct ? [NSEC-2001]
 (A) $pK_a(ClCH_2COOH) > pK_a(CH_3COOH) < pK_a(CH_3CH_2COOH)$
 (B) $pK_a(ClCH_2COOH) < pK_a(CH_3COOH) < pK_a(CH_3CH_2COOH)$
 (C) $pK_a(ClCH_2COOH) > pK_a(CH_3COOH) > pK_a(CH_3CH_2COOH)$
 (D) $pK_a(ClCH_2COOH) < pK_a(CH_3COOH) > pK_a(CH_3CH_2COOH)$
5. Which of the following compounds is the most acidic ? [NSEC-2002]
 (A) HCO_2H (B) CH_3CO_2H (C) $CH_3CH_2CO_2H$ (D) CCl_3CO_2H
6. Out of the four pK_a values 3.75, 9.89, 15.54 and 19.30, the highest pK_a value corresponds to [NSEC-2003]
 (A) acetone (B) formic acid (C) phenol (D) methanol.



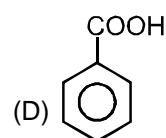
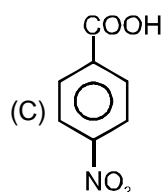
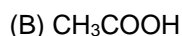
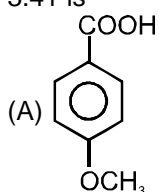
7.  The correct order of acidic character in the above compounds is
 (A) $a > b > c > d$ (B) $c > a > d > b$ (C) $b > c > a > d$ (D) $a > c > b > d$. [NSEC-2003]
8. The weakest base among the following is
 (A) $\text{C}_6\text{H}_5\text{SO}_3^-$ (B) $\text{C}_2\text{H}_5\text{O}^-$ (C) $\text{C}_6\text{H}_5\text{O}^-$ (D) $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}_2-\text{O}^-$ [NSEC-2004]
9. CH_3COOH (i) HCOOH (ii) CH_2ClCOOH (iii) PhCOOH (iv)
 The order of acidity in the given series of compounds is
 (A) (iv) < (ii) < (i) < (iii) (B) (i) < (ii) < (iii) < (iv)
 (C) (i) < (ii) < (iv) < (iii) (D) (i) < (iv) < (ii) < (iii) [NSEC-2004]
10. The proper tautomeric structure for 2-aminopyridine (X) is
 (A)  (B)  (C)  (D)  [NSEC-2004]
11. The correct order of acidity for the following compound is
 (1) Benzoic acid > phenol > p-nitrobenzoic acid > m-nitrobenzoic acid.
 (2) phenol > p-nitrobenzoic acid > m-nitrobenzoic acid > benzoic acid.
 (3) p-nitrobenzoic acid > m-nitrobenzoic acid > benzoic acid > phenol.
 (4) m-nitrobenzoic acid > p-nitrobenzoic acid > benzoic acid > phenol. [NSEC-2005]
12. Identify the group in which the order of basicity is not correct ?
 (A) $\text{OH}^- > \text{H}_2\text{O} > \text{H}_3\text{O}^+$ (B) $\text{S}^{2-} > \text{HS}^- > \text{H}_2\text{S}$
 (C) $\text{NH}_3 > \text{OH}^- > \text{H}_2\text{O}$ (D) $\text{Cl}^- > \text{Br}^- > \text{I}^-$ [NSEC-2005]
13. Choose the most appropriate pair of nitrogens that gets protonated in the following structures.

 (A) 1 and 3 (B) 2 and 4 (C) 1 and 4 (D) 2 and 3. [NSEC-2006]
14. As the base changes from RNH_2 to R_2NH , to R_3N the basicity
 (A) $\text{R}_2\text{NH} > \text{R}_3\text{N} > \text{RNH}_2$ (B) $\text{RNH}_2 > \text{R}_3\text{N} > \text{R}_2\text{NH}$
 (C) $\text{RNH}_2 > \text{R}_2\text{NH} > \text{R}_3\text{N}$ (D) $\text{R}_3\text{N} > \text{RNH}_2 > \text{R}_2\text{NH}$. [NSEC-2006]
15. The most acidic of the following substances is
 (A) aniline (B) p-nitrophenol (C) phenol (D) acetaldehyde. [NSEC-2006]
16. Indicate the correct of acidity (first ionization) in the following dicarboxylic acids :

 (A) I > II > III > IV (B) II > IV > I > III (C) III > I > IV > II (D) IV > II > I > III [NSEC-2007]



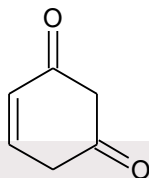
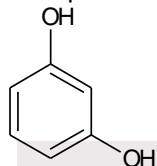
17. The correct order of acidity of the C-H proton is – [NSEC-2007]
 (A) acetylene > ethylene > ethane (B) ethylene > ethylene > ethane
 (C) ethane > ethylene > acetylene (D) acetylene > ethane > ethylene
18. Salicylic acid is a stronger acid than p-hydroxybenzoic acid due to [NSEC-2008]
 (A) Steric hindrance (B) Hydrogen bonding
 (C) Mesomeric effect (D) Solvation energy
19. Which one of the following compounds can be deprotonated by OH⁻ fastest ? [NSEC-2008]
 (A) HCOOH, pK_a = 3.8 (B) H₂S, pK_a = 7.0
 (C) Toluene, pK_a = 41 (D) CH₃NH₂, pK_a = 40
20. The most acidic among the following compound is : [NSEC-2009]
 (A) Cl-CH₂-CH₂-OH (B)  (C)  (D) 
21. Keto and enol forms of a compound are related to each other as [NSEC-2010]
 (A) Resonance structures (B) Conformations
 (C) Configurational isomers (D) Constitutional isomers
22. The correct order of acidity of the following compounds is : [NSEC-2010]
 (I) CH₃COOH (II) ClCH₂COOH (III) O₂NCH₂COOH (IV) HOCH₂COOH
 (A) IV > II > III > I (B) I > IV > II > III (C) II > III > I > IV (D) III > II > IV > I
23. The order of acidities of the H-atoms underlined in the following compounds is in the order – [NSEC-2011]
 (I) Ph-CH₂-CH₃ (II) Ph-C≡CH (III) Ph-CH=CH₂ (IV) 
 (A) IV > II > I > III (B) II > IV > III > I (C) III > IV > I > II (D) I > III > II > IV
24. The preferred sites of protonation in the following compounds are [NSEC-2012]
 I:  II: 
 (A) 1 and 3 (B) 2 and 4 (C) 1 and 4 (D) 2 and 3
25. Acetone and propen-2-ol are [NSEC-2013]
 (A) enantiomers (B) keto-enol tautomers
 (C) diastereoisomers (D) meso compounds
26. Which of the following does not have an active methylene group ? [NSEC-2013]
 (A) CH₃CH₂NO₂ (B) CH₃COCH₂COCH₃
 (C) PhCOCH₂CN (D) CH₃CH₂NH₂
27. Which of the following phenols is most soluble in aqueous sodium bicarbonate ? [NSEC-2013]
 (A) 2,4-dihydroxyacetophenone (B) p-cyanophenol
 (C) 3,4-dicyanophenol (D) 2,4,6-tricyanophenol
28. The order of basicity is [NSEC-2014]
 (I) Ph-CONH₂ (II) Ph-NH₂
 (III) Ph-CH₂-NH₂ (IV) p-OCH₃Ph-NH₂
 (A) II > IV > I > III (B) III > II > IV > I (C) III > IV > II > I (D) I > II > IV > III



29. The pK_a values of the acids A to D are found to be 4.19, 3.41, 4.46 and 4.76. The acid having pK_a of 3.41 is [NSEC-2014]



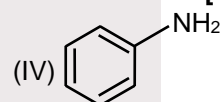
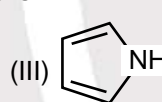
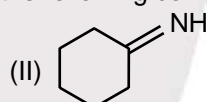
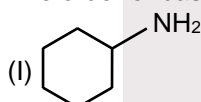
30. At normal temperature, X and Y are [NSEC-2014]



- (A) resonance structures
(C) functional isomers

- (B) tautomers
(D) positional isomers

31. The order of basicity of the following compounds is [NSEC-2015]



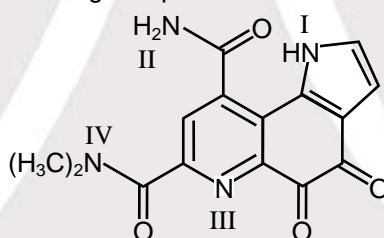
- (A) I > II > IV > III

- (B) IV > II > I > III

- (C) III > II > I > IV

- (D) I > II > III > IV

32. The most basic nitrogen in the following compound is [NSEC-2017]



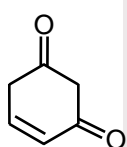
- (A) I

- (B) II

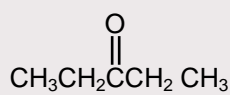
- (C) III

- (D) IV

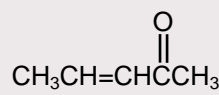
33. The order of enol content in the following molecules is [NSEC-2017]



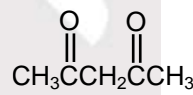
(a)



(b)



(c)



(d)

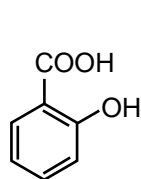
- (A) a > d > c > b

- (B) a > c > d > b

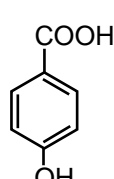
- (C) a > c > b > d

- (D) a > b > c > d

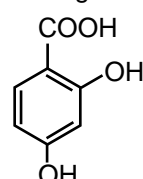
34. The order of pK_a values of the following acids is [NSEC-2018]



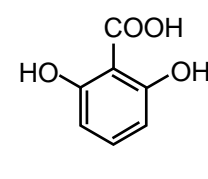
(I)



(II)



(III)



(IV)

- (A) IV > I > III > II

- (B) III > IV > I > II

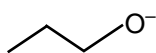
- (C) II > I > III > IV

- (D) II > III > I > IV

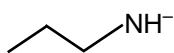


35. The correct order of basicity of the following species is

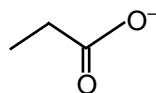
[NSEC-2018]



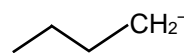
I



II



III



IV

(A) III < IV < II < I

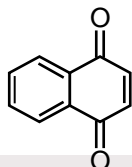
(B) III < I < II < IV

(C) III < II < I < IV

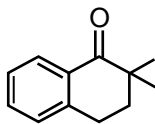
(D) IV < I < II < III

36. The molecules that can exhibit tautomerism are

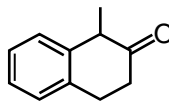
[NSEC-2018]



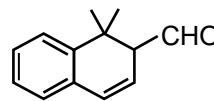
(I)



(II)



(III)



(IV)

(A) I, IV

(B) II, III

(C) III, IV

(D) I, II

PART - III : PRACTICE TEST-2 (IIT-JEE (ADVANCED Pattern))

Max. Time : 1 Hr.

Max. Marks : 45

Important Instructions :

A. General :

- The test is of 1 hour duration.
- The Test Booklet consists of 15 questions. The maximum marks are 45.

B. Question Paper Format :

- Each part consists of five sections.
- Section-1 contains 6 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE is correct.
- Section-2 contains 5 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE OR MORE THAN ONE are correct.
- Section-3 contains 3 questions. The answer to each of the questions is a numerical value, ranging from 0 to 9 (both inclusive).
- Section-4 contains 1 multiple choice questions. Question has two lists (list-1 : P, Q, R and S; List-2 : 1, 2, 3 and 4). The options for the correct match are provided as (A), (B), (C) and (D) out of which ONLY ONE is correct.

C. Marking Scheme :

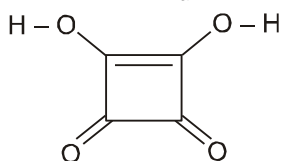
- For each question in Section 1, 4 and 5 you will be awarded 3 marks if you darken the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, minus one (-1) mark will be awarded.
- For each question in Section 2, you will be awarded 3 marks. If you darken all the bubble(s) corresponding to the correct answer(s) and zero mark. If no bubbles are darkened. No negative marks will be answered for incorrect answer in this section.
- For each question in Section 3, you will be awarded 3 marks if you darken only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. No negative marks will be awarded for incorrect answer in this section.



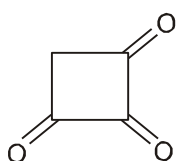
SECTION-1 : (Only One option correct Type)

This section contains 6 multiple choice questions. Each questions has four choices (A), (B), (C) and (D) out of which Only ONE option is correct.

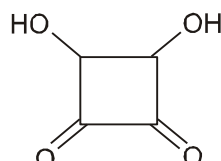
1. The correct pK_a order of the following acids is :



I



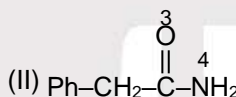
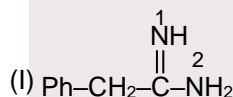
II



III

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

2. The preferred sites of protonation in the following compounds are

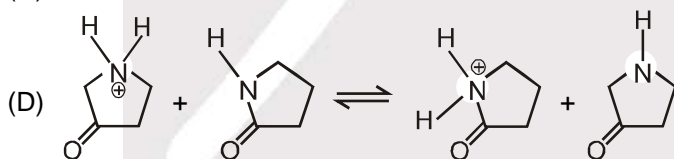
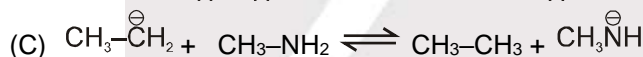
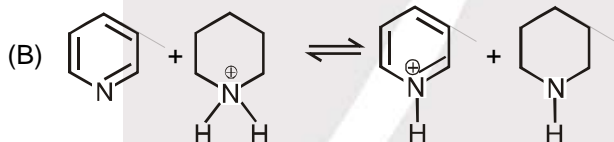
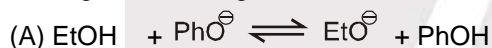


- (A) 1 and 3 (B) 2 and 4 (C) 1 and 4 (D) 2 and 3

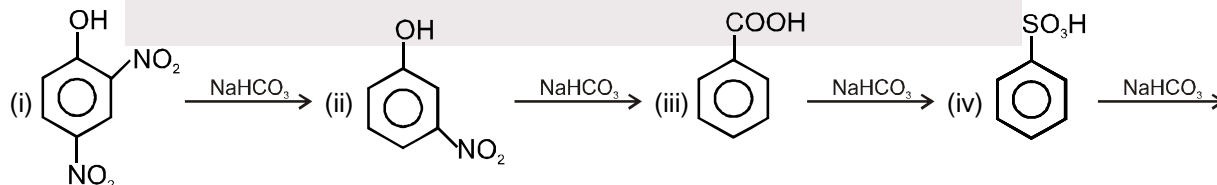
3. In which pairs first compound is stronger acid than the second ?

- (A) Adipic acid, succinic acid (B) Fumaric acid, maleic acid
(C) Pthalic acid, terephthalic acid (D) Benzoic acid, Picric acid

4. Among the following reaction which favours forward reaction ?

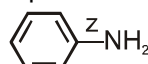
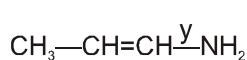
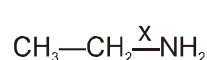


5. Which of the following reactions is/are feasible :



- (A) (i) & (ii) (B) (ii), (iii) & (iv) (C) (i), (ii) & (iv) (D) (i), (iii) & (iv)

6. Compare the bond lengths and select the correct option :



- (A) $x = y = z$

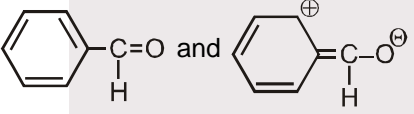
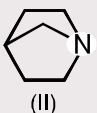
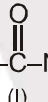
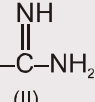
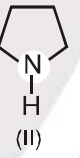
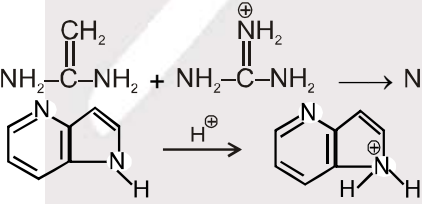
- (B) $x > y > z$

- (C) $x < y < z$

- (D) $x > y = z$


Section-2 : (One or More than one options correct Type)

This section contains 6 multipole choice questions. Each questions has four choices (A), (B), (C) and (D) out of which ONE or MORE THAN ONE are correct.

7. Which of the following compounds will show tautomerism ?
 (A) 2,2- Dimethylpropanal (B) 2,2-Dimethyl-1 nitropropane
 (C) Acetyl Acetone (D) Benzophenone
8. Which of the following is/are correct statement/statements ?
 (A) Guanidine $\left[\text{NH}_2 - \text{C}(\text{NH}) - \text{NH}_2 \right]$ is more basic than pyridine because conjugate acid of guanidine has three equal contributing resonating structure.
 (B) Diethylamine is stronger base than triethylamine in aqueous medium.
 (C) Ortho-methyl aniline is weaker base than para-methyl aniline.
 (D) 2,4,6-Trinitro-N,N-dimethyl aniline is stronger base than 2,4,6-Trinitro aniline.
9. The tautomeric pairs are
 (A) $\text{Me}_2\text{C}=\text{NOH}$ and $\text{Me}_2\text{CH}-\text{N}=\text{O}$ (B) $\text{CH}_2=\text{CH}-\text{NHCH}_3$ and $\text{CH}_3-\text{CH}=\text{N}-\text{CH}_3$
 (C)  (D) $\text{CH}_2=\text{CH}-\underset{\text{OH}}{\text{CH}}-\text{CH}_3$ and $\text{CH}_3-\text{CH}_2-\underset{\text{O}}{\text{C}}-\text{CH}_3$
10. In which compounds (II) is more basic than (I)
 (A) $(\text{C}_2\text{H}_5)_3\text{N}$ (I) &  (II)
 (B)  (I) &  (II)
 (C) $\text{C}_2\text{H}_5-\text{NH}-\text{C}_2\text{H}_5$ (I) &  (II)
 (D) CH_3NH_2 (I) & $(\text{CH}_3)_2\text{NH}$ (II)
11. Which of the following reactions is/are not feasible :
 (A) $\text{CH}_3\text{COONa} + \text{HCOOH} \longrightarrow \text{CH}_3\text{COOH} + \text{HCOONa}$
 (B) $\text{CH}_3\text{COONa} + \text{Ph}-\text{OH} \longrightarrow \text{CH}_3\text{COOH} + \text{PhONa}$
 (C) $\text{NH}_2-\underset{\text{CH}_2}{\overset{\text{CH}_2}{\text{C}}}-\text{NH}_2 + \text{NH}_2-\overset{\oplus}{\text{C}}(\text{NH}_2)-\text{NH}_2 \longrightarrow \text{NH}_2-\underset{\text{CH}_2}{\overset{\text{CH}_2}{\text{C}}}-\text{NH}_2 + \text{NH}_2-\overset{\text{NH}}{\text{C}}(\text{NH}_2)-\text{NH}_2$
 (D) 

Section-3: (One Numerical Value Correct Type.)

This section contains 3 questions. Each question, when worked out will result in one numerical value from 0 to 9 (both inclusive)

12. In the given molecule the sites undergoes deprotonation and protonation most readily respectively are x & y then x + y = ?

$$\begin{array}{ccccccc} 1 & & 3 & & & & 5 \\ \text{H}_2\text{N}-\text{C}-\text{NH}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}-\text{COOH} \\ & 2 & & & & & 4 \\ & \parallel & & & & & | \\ & \text{NH} & & & & & \text{NH}_2 \end{array}$$
13. How many of the following compounds will accept H^+ from ammonium ion.
 Pyridine, Aniline, Pyrrole, Triphenyl amine,
 Benzyl amine, Methyl amine, Di-methyl amine, Tri-methyl amine



14. How many of the following compounds react with NaHCO_3 and liberate $\text{CO}_2(\text{g})$
- | | | | |
|-------------------|-----------------|----------------|------------------|
| 1. Salicylic acid | 2. Pthalic acid | 3. Picric acid | 4. Resorcinol |
| 5. Carboic acid | 6. Aspirin | 7. Anisol | 8. Tarteric acid |

SECTION-4 : Matching List Type (Only One options correct)

This section contains 1 questions, each having two matching lists. Choices for the correct combination of elements from List-I and List-II are given as options (A), (B), (C) and (D) out of which one is correct

15. Match each List-I with List-II and select the correct answer using the code given below the lists.

	Column-I		Column-II
P		1	Zero enolizable H-atom
Q		2	7-enolizable H-atom
R	$\text{CH}_3\text{-CH}_2\text{-C(=O)-CH}_2\text{-C(=O)-CH}_3$	3	2-enolizable H-atom
S		4	3-enolizable H-atom

Code :

	P	Q	R	S		P	Q	R	S
(A)	3	1	2	4	(B)	1	2	4	3
(C)	2	1	3	4	(D)	3	2	1	4

Practice Test-2 ((IIT-JEE (ADVANCED Pattern)))

OBJECTIVE RESPONSE SHEET (ORS)

Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15					
Ans.										



APSP Answers

PART - I

- | | | | | |
|---------|---------|---------|-----------|---------|
| 1. (4) | 2. (3) | 3. (2) | 4. (3) | 5. (3) |
| 6. (3) | 7. (3) | 8. (4) | 9. (2) | 10. (2) |
| 11. (1) | 12. (4) | 13. (2) | 14. (4) | 15. (3) |
| 16. (3) | 17. (1) | 18. (4) | 19. (2) | 20. (3) |
| 21. 5.0 | 22. 6.0 | 23. 6 | 24. 03.00 | 25. 06 |

PART- II

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (3) | 2. (4) | 3. (2) | 4. (3) | 5. (4) |
| 6. (3) | 7. (1) | 8. (4) | 9. (3) | 10. (3) |
| 11. (1) | 12. (3) | 13. (1) | 14. (1) | 15. (2) |

PART- III

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (D) | 2. (C) | 3. (A) | 4. (B) | 5. (D) |
| 6. (A) | 7. (A) | 8. (A) | 9. (D) | 10. (A) |
| 11. (C) | 12. (C) | 13. (C) | 14. (A) | 15. (B) |
| 16. (C) | 17. (A) | 18. (B) | 19. (A) | 20. (C) |
| 21. (D) | 22. (D) | 23. (A) | 24. (A) | 25. (B) |
| 26. (D) | 27. (D) | 28. (C) | 29. (C) | 30. (B) |
| 31. (A) | 32. (C) | 33. (A) | 34. (D) | 35. (B) |
| 36. (C) | | | | |

PART- IV

- | | | | | |
|-----------|---------|--------------------------|-------------------|------------|
| 1. (C) | 2. (A) | 3. (C) | 4. (C) | 5. (D) |
| 6. (B) | 7. (BC) | 8. (ABCD) | 9. (AB) | 10. (ABCD) |
| 11. (BCD) | 12. 7 | 13. 4 (v, vi, vii, viii) | 14. 5 (1,2,3,6,8) | |
| 15. (A) | | | | |



APSP Solutions

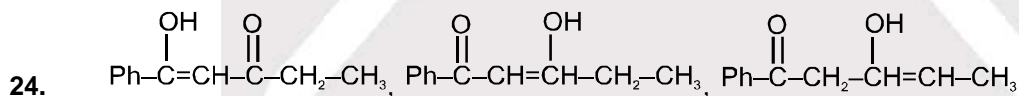
PART - I

1. All acids which are stronger than carbonic acid will produce effervescence with sodium bicarbonate.
2. Self explanatory.
3. Electron withdrawing group increases acidic strength and electron releasing group decreases acidic strength.
5. An acid with weaker conjugate base is stronger.
6. The polarity of N-H bond will be maximum on the N-atom which is most electron deficient.
8. Lone pair electrons present on more electronegative atom is less basic.
9. Secondary amine is most basic in aqueous solution among aliphatic amines.
11. $\text{CF}_3\text{-COOH} > \text{CCl}_3\text{-COOH} > \text{HCOOH} > \text{CH}_3\text{COOH}$ (K_a order)
17. Acetyl acetone is liquid and exists mainly as III due to intramolecular H-bonding and the correct answer is $\text{III} > \text{II} > \text{I}$.
However in aqueous medium, the correct answer is $\text{II} > \text{III} > \text{I}$.
18. Salicylic acid is more acidic than p-hydroxy benzoic acid.
21. $a = 3$
 $b = 4$
 $c = 4$

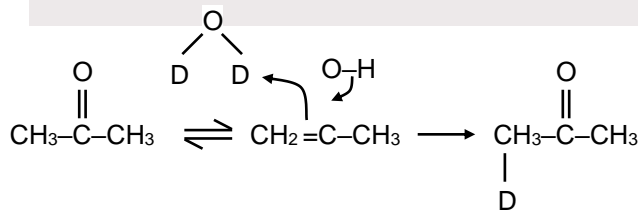


HCl & HCOOH are stronger acids than H_2CO_3 .

23. Following are less acidic than formic acid
(i) Ph-OH (ii) Ph-COOH (iv) H_2CO_3
(v) $\text{CH}_3\text{-OH}$ (vii) $\text{Cl-CH}_2\text{CH}_2\text{COOH}$ (viii) Ph-NH₂



25. Enolisation occurs in presence of D_2O and new C-D bonds are formed instead of -CH bonds on C-D bonds are stronger than -C-H bonds but breaking occurs of -C-H bond during enolisation.



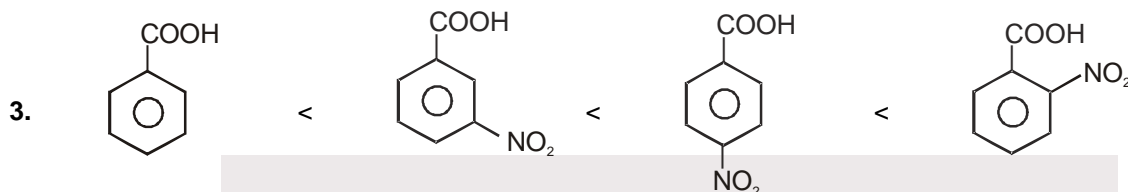
Like this way all H's are displaced by deuterium on $\text{CD}_3\text{-C(=O)-CD}_3$ is formed.



PART – II

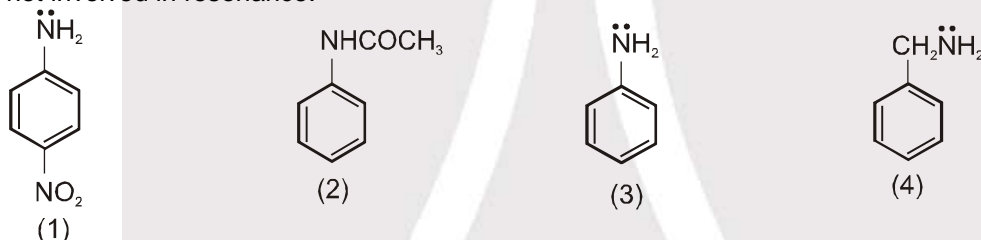
1. Except the amines containing tertiary butyl group, all lower aliphatic amines are stronger bases than ammonia because of +I (inductive). The alkyl groups, which are electron releasing groups, increase the electron density around the nitrogen there by increasing the availability of the lone pair of electrons to proton or Lewis acids and making the amine more basic. Thus the relative strength is in order $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > \text{NH}_3$.

2. Lone pairs of N are not taking part in conjugation whereas in other options lone pairs are taking part in conjugation.



E.W.G. increases the acidity of benzoic acid, o-isomer will have higher acidity than corresponding m and p isomer due to ortho effect.

5. Due to resonance of electron pair in aniline, basic strength decreases. In benzylamine electron pair is not involved in resonance.



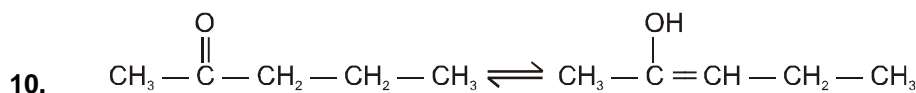
Decreasing order of basic strength is $4 > 3 > 2 > 1$.

6. Effect of substituent on the acid strength of aliphatic acids.
 (i) Acidity decreases as the +I – effect of the alkyl group increases.
 (ii) Acidity decreases as the –I – effect decreases.
 (iii) On the basis of given information the relative order of increasing acid strength of the given compounds:
 $(\text{CH}_3)_2\text{COOH} < \text{CH}_3\text{COOH} < \text{CH}_3\text{OCH}_2\text{COOH} < \text{CF}_3\text{COOH}$

7. The increasing order of basicity of the given compounds is $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N} > \text{C}_6\text{H}_5\text{NH}_2$
 Due to the +I effect of alkyl groups the electron density on nitrogen increases and thus the availability of the lone pair of electrons to proton increases and hence the basicity of amines also increases. So aliphatic amines are more basic than aniline.
 In case of tertiary amine $(\text{CH}_3)_3\text{N}$, the covering of alkyl groups over nitrogen atom from all sides makes the approach and bonding by a proton relatively difficult, hence the basicity decreases. Electron withdrawing (C_6H_5-) groups decrease electron density on nitrogen atom and thereby decreasing basicity.

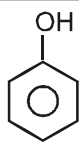
8. Basicity $\propto \frac{1}{\text{Electronegativity}}$ (In period)
 If lone pair of electron takes part in conjugation then availability of lone pair of electron decreases and basic strength decreases.

9. α -chlorobutyric acid is more stronger acid than others due to –I effect of Cl.

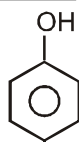




11.

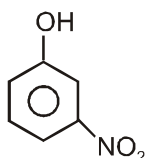


(A)



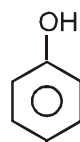
CH₃
HC, + I

(B)



- I

(C)

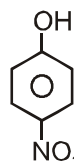


NO₂
- M, - I

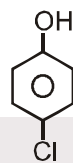
(D)

Therefore acidity order is : D > C > A > B.

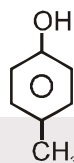
12.



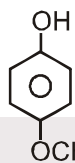
(-m, -I)



(-I)



(+I, + HC)



(+m)

electron releasing group decreases and electron withdrawing group increases acidic strength.

13.

Order of basic strength of aliphatic amine in aqueous solution is as follows.

order of K_b : $(\text{CH}_3)_2\ddot{\text{N}}\text{H} > \text{CH}_3\ddot{\text{N}}\text{H}_2 > (\text{CH}_3)_3\ddot{\text{N}} > \text{C}_6\text{H}_5\ddot{\text{N}}\text{H}_2$

As we know $\text{p}K_b = -\log K_b$

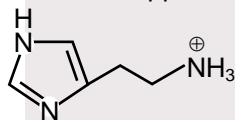
so $(\text{CH}_3)_2\ddot{\text{N}}\text{H}$ will have smallest $\text{p}K_b$ value.

14.

Imidine is more basic than 2° amine followed by 1° amine.

15.

The pH of blood is approx 7.0, therefore the acids with $\text{p}K_a$ less than 7 will loose H^+ .



PART - IV

1.

On the basis of stability of conjugate base due to electronic effects.

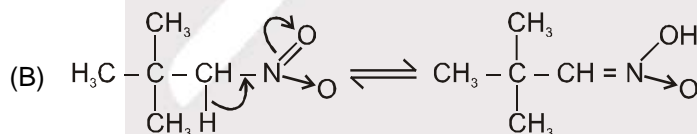
2.

Protonation at site 1 and 3 is supported by resonance stabilization.

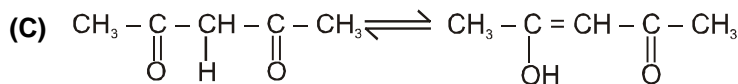
3.

(C) Phthalic acid is stronger acid due to intramolecular hydrogen bonding.

7.



2,2-dimethyl-1-nitropropane



Acetylacetone

8.

All statements are correct.

9.

(A,B) Nitroso \rightleftharpoons oxime (Tautomer)

Imine \rightleftharpoons enamine (Tautomer).

12.

5 is deprotonated since it is most acidic acid, 2 is protonated since it is most basic (guanidinic N).

$x = 5, y = 2$ so $x + y = 7$



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