ORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 8

Total Marks : 35

Max. Time : 37 min.

Topic : Acid and Basic Strength

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.9	**(3 marks, 3 min.)**	**[27, 27]**
Match the Following (no negative marking) Q.10	**(8 marks, 10 min.)**	**[8, 10]**

1. Order of K_a of following acids is :

$H_3\overset{\oplus}{N} - CH_2 - COOH$ (I) $\quad NC - CH_2 - COOH$ (II) $\quad H_3C - CH_2 - COOH$ (III) $\quad \overset{\ominus}{O}OC - CH_2 - COOH$ (IV)

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

2. The strongest acid among the following compounds is :

(A) $CH_3\underset{\displaystyle NO_2}{\underset{|}{C}}HCOOH$ (B) $CH_3 - \underset{\displaystyle Cl}{\underset{|}{C}}H - COOH$ (C) CH_3CH_2COOH (D) $CH_3\underset{\displaystyle C\equiv N}{\underset{|}{C}}HCOOH$

3. The order of acidity of following acids is

$CH_3 - CF_2 - COOH$ I $\quad CH_3 - \underset{\displaystyle Br}{\underset{|}{C}}H - COOH$ II $\quad CH_3 - \underset{\displaystyle Br}{\underset{|}{\overset{\displaystyle Br}{\overset{|}{C}}}} - COOH$ III $\quad CF_3 - COOH$ IV

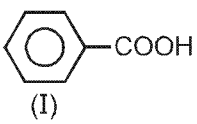
(A) I > II > III > IV (B) IV > III > II > I (C) IV > I > III > II (D) IV > III > I > II

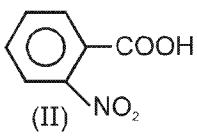
4. Which one of the following carboxylic acid is the strongest :

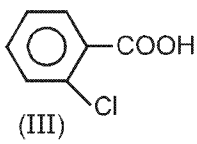
(A) o–methyl benzoic acid (B) m–methyl benzoic acid

(C) p-methyl benzoic acid (D) Benzoic acid

5. Increasing value of dissociation constant K_a of the following is :

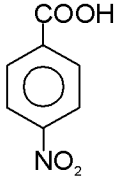

(I)

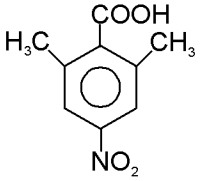

(II)

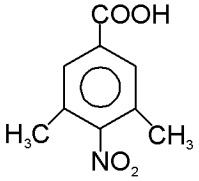

(III)

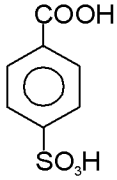
(A) I < II < III (B) II < III < I (C) III < II < I (D) I < III < II .

6. The correct decreasing order of acid strength of following compounds is :

(I) 

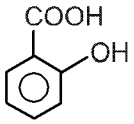
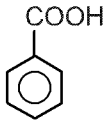
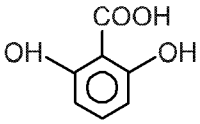
(II) 

(III) 

(IV) 

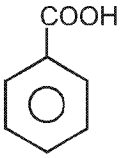
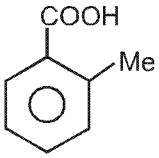
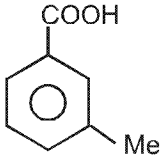
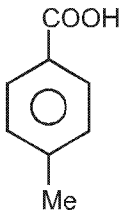
(A) IV > I > II > III (B) II > IV > III > I (C) I > IV > II > III (D) IV > II > I > III

7._ The correct decreasing order of acid strength of following compounds is :

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

8.

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

Pka. 4.17 3.91 4.27 4.37

Mark True and False statements related to the variation of pKa values given for the compounds mentioned above.

S_1 : Me is electron releasing group but (II) is more acidic than (I) due to SIR.

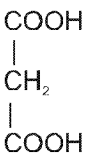
S_2 : (IV) is weaker acid than (III) due to + hyperconjugation effect in (IV).

S_3 : Only +I effect of Me is observed in (III).

S_4 : The conjugate base of (IV) is less stable than that of (I).

(A) TTTT (B) TFTF (C) FTFT (D) FFTT

9.

I II

$Ka_1 = 5400 \times 10^{-5}$ $Ka_1 = 140 \times 10^{-5}$

The reason for higher Ka_1 value of oxalic acid (I) as compared to that of malonic acid (II) is :

(A) The anion formed after the removal of first $H^{\oplus}$ of oxalic acid (I) is more stable due to stronger –I effect of –COOH present at close distance

(B) The anion formed after the removal of first $H^{\oplus}$ of oxalic acid (I) is less stable due to +I effect of –COOH group.

(C) The anion formed on removal of first $H^{\oplus}$ of malonic acid is more stable than that of oxalic acid due to –M effect of other –COOH group.

(D) Oxalic acid is more acidic than malonic acid due to its lesser molecular weight.

10. Match the acids with their K_a values.

Column-I (Acids)	**Column-II (K_a values)**
(A) Benzoic acid	(p) 10.3×10^{-5}
(B) p-Toluic acid	(q) 3.3×10^{-5}
(C) p-methoxy benzoic acid	(r) 6.4×10^{-5}
(D) p-chlorobenzoic acid	(s) 4.2×10^{-5}

Answer Key

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1.	(A)	**2.**	(A)	**3.**	(C)	**4.**	(A)	**5.**	(D)
6.	(D)	**7.**	(D)	**8.**	(A)	**9.**	(A)		

10. (A → r) ; (B → s) ; (C → q) ; (D → p)

Hints & Solutions

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1. On the basis of I effect.

2. On the basis of I effect.

3. –I effect increases the acidic strength and depends upon distance.

4. Due to ortho effect ortho substituted benzoic acid is stronger acid then other.

5. $K_a \propto$ stability of conjugate base $\propto$ (–I, –M groups).

6. SO_3H functional group will have maximum acidic strength. Then, in (II), acidity is increased due to SIR effect.

10. Acid strength order is
p-chlorobenzoic acid > benzoic acid > p-toluic acid > p-methoxy benzoic acid.