DPP - Daily Practice Problems

Name : _____ Date : _____

Start Time : _____ End Time : _____

CHEMISTRY 23

SYLLABUS : General Organic Chemistry III : Inductive effect, Resonance (or mesomeric) effect, Electromeric effect, Hyperconjugation.

Max. Marks : 120 **Time : 60 min.**

GENERAL INSTRUCTIONS

- The Daily Practice Problem Sheet contains 30 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.
- You have to evaluate your Response Grids yourself with the help of solution booklet.
- Each correct answer will get you 4 marks and 1 mark shall be deduced for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus. Refer syllabus sheet in the starting of the book for the syllabus of all the DPP sheets.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

DIRECTIONS (Q.1-Q.21) : There are 21 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE choice is correct.

Q.1 The weakest acid among the following–

(a) CH_3COOH (b) CH_3CO_2OH

(c) $ClCH_2COOH$ (d) CH_3CH_2COOH

Q.2 The correct order of boiling point for primary (1°), secondary (2°) and tertiary (3°) alcohols is–

(a) $2^o > 1^o > 3^o$ (b) $3^o > 2^o > 1^o$

(c) $1^o > 2^o > 3^o$ (d) $2^o > 3^o > 1^o$

Q.3 Among the following which one is most basic ?

(a) NH_2 (b) CH_3NH_2

(c) $CH_3CH_2NH_2$ (d) $\underset{\displaystyle Cl}{\overset{\displaystyle |}{CH_2}} - NH_2$

Q.4 Polarisation of electrons in acrolein may be written as -

(a) $CH_2 = CH - CH = \overset{\delta-}{O}$ (b) $\overset{\delta+}{CH_2} = CH - \overset{\delta-}{CH} = O$

(c) $\overset{\delta-}{CH_2} = \overset{\delta+}{CH} - CH = O$ (d) $\overset{\delta-}{CH_2} = CH - CH = \overset{\delta+}{O}$

Q.5 Consider the following compound :

$$\underset{1}{CH_2} = \underset{2}{CH} - \underset{3}{CH} = \underset{4}{CH_2}$$

Carbon-carbon bond length between C_2 and C_3 will be-

(a) 1.54 Å

(b) 1.3 Å

(c) Less than 1.54 Å and greater than 1.33 Å

(d) 1.21 Å

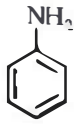
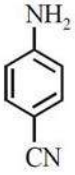
RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ	5. ⓐⓑⓒⓓ

Space for Rough Work

Q.6 In pyridine;  , number of conjugated electrons are -

(a) 6 (b) 8 (c) zero (d) 5

Q.7 Consider the following compounds -

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

Arrange these compounds in decreasing order of their basicity :

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

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

Q.8 Which of the following carboxylic acids is most acidic in character?

(a) *o*-methyl benzoic acid (b) *m*-methyl benzoic acid

(c) *p*-methyl benzoic acid (d) Benzoic acid

Q.9 Electromeric effect -

(a) comes into play at the demand of attacking reagent

(b) involves displacement of electrons in a sigma bond

(c) comes into play in the molecule when at least one atom has unshared pair of electrons

(d) involves the distortion of the electron cloud

Q.10 –M effect of $-CCl_3$ can be explained on the basis of

(a) –I effect

(b) +R effect

(c) negative hyperconjugative effect

(d) None of these

Q.11 Which one of the following is strongest acid ?

(a) 2-chloropentanoic acid

(b) 3-chloropentanoic acid

(c) 5-chloropentanoic acid

(d) 4-chloropentanoic acid

Q.12 Inductive effect refers to -

(a) electron displacement along a carbon chain

(b) complete transfer of one of the shared pair of electrons to one of the atoms joined by a double bond

(c) complete transfer of electron hither to unshared

(d) none of the above

Q.13 Which of the following groups has the highest + I effect ?

(a) CH_3- (b) CH_3

(c) $(CH_3)_2CH-$ (d) $(CH_3)_3C-$

Q.14 Maximum – I effect is exerted by the group-

(a) C_6H_5- (b) $-OCH_3$

(c) Cl (d) NO_2

Q.15 Strongest acid among the following is -

(a) CF_3COOH (b) CCl_3COOH

(c) CBr_3COOH (d) CH_3COOH

Q.16 Benzoic acid is less acidic than salicylic acid because of–

(a) Intermolecular hydrogen bond

(b) Inductive effect

(c) Resonance

(d) None of these

Q.17 In a reaction of C_6H_5Y, the major product (>60%) is *m*-isomer, so the group Y is–

(a) –COOH (b) –Cl

(c) –OH (d) $-NH_2$

Q.18 Which one of the following orders is correct regarding the –I effect of the substituents ?

(a) $-NR_2 < -OR > -F$ (b) $-NR_2 > -OR > -F$

(c) $-NR_2 < -OR < -F$ (d) $-NR_2 > -OR < -F$

Q.19 Which of the following is most acidic ?

(a) *m*-chlorophenol (b) benzyl alcohol

(c) phenol (d) cyclohexanol

Q.20 Among the following the strongest base is–

(a) $C_6H_5NH_2$ (b) $p\text{-}NO_2\text{–}C_6H_4NH_2$

(c) $m\text{–}NO_2\text{–}C_6H_4NH_2$ (d) $C_6H_5CH_2NH_2$

RESPONSE GRID					
	6. ⓐⓑⓒⓓ	**7.** ⓐⓑⓒⓓ	**8.** ⓐⓑⓒⓓ	**9.** ⓐⓑⓒⓓ	**10.** ⓐⓑⓒⓓ
	11. ⓐⓑⓒⓓ	**12.** ⓐⓑⓒⓓ	**13.** ⓐⓑⓒⓓ	**14.** ⓐⓑⓒⓓ	**15.** ⓐⓑⓒⓓ
	16. ⓐⓑⓒⓓ	**17.** ⓐⓑⓒⓓ	**18.** ⓐⓑⓒⓓ	**19.** ⓐⓑⓒⓓ	**20.** ⓐⓑⓒⓓ

Space for Rough Work

Q.21 Strongest acid out of the following–

(a) CH_3COOH

(b) $ClCH_2COOH$

(c) CH_3CH_2COOH

(d) $(CH_3)_2CHCOOH$

DIRECTIONS (Q.22-Q.24) : In the following questions, more than one of the answers given are correct. Select the correct answers and mark it according to the following codes:

Codes :

(a) 1, 2 and 3 are correct

(b) 1 and 2 are correct

(c) 2 and 4 are correct

(d) 1 and 3 are correct

Q.22 In which compound delocalisation is possible?

(1) 1, 3-butadiene

(2) 1, 3, 5-hexatriene

(3) benzene

(4) 2-butene

Q.23 Resonance structures of a molecule should have :

(1) identical arrangement of atoms

(2) nearly the same energy content

(3) the same number of paired electrons

(4) identical bonding

Q.24 Phenol is less acidic than :

(1) acetic acid

(2) *p*-nitrophenol

(3) phenol

(4) ethanol

DIRECTIONS (Q.25-Q.27) : Read the passage given below and answer the questions that follows :

Hyperconjugation describes the orbital interaction between π-system and the adjacent σ bond of the substituent group in organic compounds. Thus the sufficient conditions for the hyperconjugation are

(i) the presence of at least one sp^2-hybrid carbon as in alkenes, carbocation and alkyl free radical.

(ii) the presence of α-carbon, with at least one hydrogen, with respect to sp^2-carbon atom.

More the number of hydrogen atoms attached on the α-carbon(s) of the sp^2-hybrid carbon, more will the hyperconjugative structures also called no-bond resonating structures of the compound.

Number of no-bond resonating structures due to hyperconjugation = $n + 1$, where n is the number of α-hydrogen.

25. Hyperconjugation is possible in

(a) $\overset{+}{C}H_3$ (b) $C_6H_5CH_3$

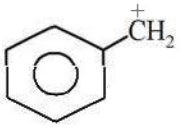
(c) $CH \equiv CH$ (d) $(CH_3)_3CCH = CH_2$

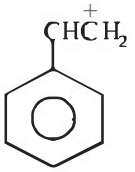
26. Which of the following has highest number of hyperconjugative structures ?

(a) 2-methylbut-2-ene (b) But-2-ene

(c) *tert*-Butyl cation (d) Hex-2-ene

27. Which of the following does not show hyperconjugation ?

(a)  (b) $CH_3\dot{C}H_2$

(c) $CH_3CH=CH_2$ (d) 

RESPONSE GRID					
	21. ⓐⓑⓒⓓ	22. ⓐⓑⓒⓓ	23. ⓐⓑⓒⓓ	24. ⓐⓑⓒⓓ	25. ⓐⓑⓒⓓ
	26. ⓐⓑⓒⓓ	27. ⓐⓑⓒⓓ			

Space for Rough Work

DIRECTIONS (Q. 28-Q.30) : Each of these questions contains two statements: Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

(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 False, Statement-2 is True.

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

28. **Statement 1 :** Same number of electron pairs are present in resonance structures.
Statement 2 : Resonance structures differ in the location of electrons around the constituent atoms.

29. **Statement 1 :** Carbon-oxygen bonds are of equal length in carbonate ion.
Statement 2 : Bond length decreases with the multiplicity of bond between two atoms.

30. **Statement 1 :** α-Hydrogen atoms in aldehydes and ketones are acidic.
Statement 2 : The anion left after the removal of α-hydrogen is stabilized by inductive effect.

RESPONSE GRID	28. ⓐ ⓑ ⓒ ⓓ	29. ⓐ ⓑ ⓒ ⓓ	30. ⓐ ⓑ ⓒ ⓓ

DAILY PRACTICE PROBLEM SHEET 23 - CHEMISTRY			
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	36	Qualifying Score	56
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

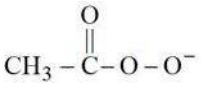
Space for Rough Work

DAILY PRACTICE PROBLEMS

CHEMISTRY SOLUTIONS

23

(1) **(b)** Anions of peracids do not exhibit resonance, hence not stabilized.



(2) **(c)** On increase branching, surface area decreases, thus boiling point decreases.

(3) **(c)** + I group increases the basicity of amine.

(4) **(a)** O atom is more electronegative

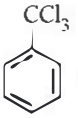
(5) **(c)** $C_2 - C_3$ are at conjugated position.

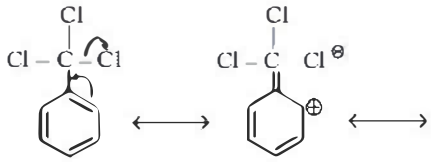
(6) **(a)** Lone pair of electrons on N-atom does not take part in resonance.

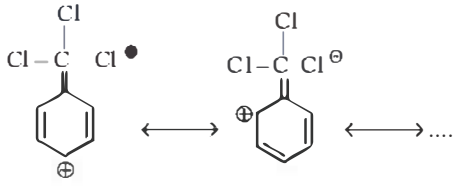
(7) **(c)** + I nature of CH_3 group increases electrons density on NH_2 group.

(8) **(a)** Due to ortho effect.

(9) **(a)** Electromeric effect comes into play at the demand of attacking reagent

(10) **(c)** There is a negative hyperconjugation in  as -





(11) **(a)** 2-chloropentanoic acid, due to more effective – I effect.

(12) **(a)** Partial displacement of electron takes place.

(13) **(d)** ter. alkyl group has highest + I effect.

(14) **(d)** NO_2

(15) **(a)** F has greater – I effect.

(16) **(a)**

(17) **(a)** – COOH exerts – M effect.

(18) **(c)**

(19) **(a)** Presence of – I group (-Cl) increases acidity of phenol.

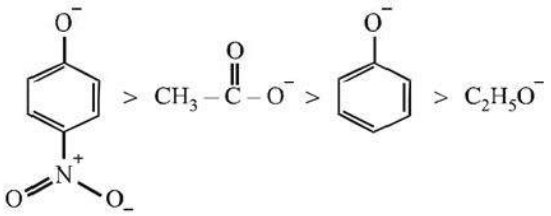
(20) **(d)** Presence of $-NO_2$ decreases electron density on N hence decreases basic character. Aryl substituted aliphatic amines ($C_6H_5CH_2NH_2$) are stronger bases than aniline because here lone pair of electrons is localised while in aniline it is delocalised.

(21) **(b)** Acidic strength $\propto$ –I power of the group.

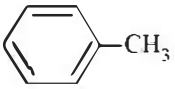
(22) **(a)** In 2-butene, no conjugation present.

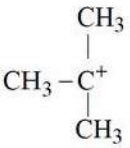
(23) **(a)** Resonating structures differ in bonding pattern.

(24) **(a)** Higher the stability of the corresponding anion, more will be the acidic character of the parent compound.



Higher stability of acetate ions than phenoxide ion is due to equivalent resonating structures in the former.

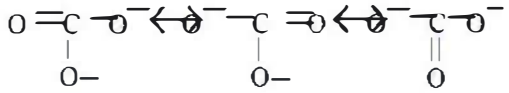
25. **(b)** 

26. **(c)** 

27. **(a)**

28. **(c)** Resonance structures contain the same number of unpaired electrons.

29. **(b)** CO_3^{2-} shows resonance and thus all the three bonds are of identical bond length.



30. **(d)** The anion left after the removal of α hydrogen is stabilized by resonance effect.