DPP - Daily Practice Problems

Name : _____ Date : _____

Start Time : _____ End Time : _____

CHEMISTRY 53

SYLLABUS : Carboxylic acids & their uses : General introduction of carboxylic acids and their preparation. Properties & uses of carboxylic acids and their derivatives

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.

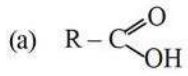
DIRECTIONS (Q.1-Q.21) : There are 21 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE choice is correct.

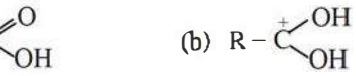
Q.1 Which of the following is optically active?

(a) Ethylene glycol (b) Oxalicacid

(c) Glycerol (d) Tartaric acid

Q.2 Which of the following structure of carboxylic acid accounts for the acidic nature?

(a) 

(b) 

(c) 

(d) None of these

Q.3 Urea

(a) Is an amide of carbonic acid

(b) It is diamide of carbonic acid

(c) Gives carbonic acid on hydrolysis

(d) Resembles carbonic acid

Q.4 Which of the following acids is isomeric with phthalic acid?

(a) Succinic acid

(b) Salicylicacid

(c) 1, 4-Benzenedicarboxylic acid

(d) Methyl benzoate

Q.5 Which of these do not contain –COOH group?

(a) Aspirin (b) Benzoic acid

(c) Picric acid (d) Salicylic acid

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

Space for Rough Work

Q.6 Which is most reactive of the following?
(a) Ethyl acetate (b) Acetic anhydride
(c) Acetamide (d) Acetyl chloride

Q.7 Reimer-Tiemann reaction involves a
(a) Carbonium ion intermediate
(b) Carbene intermediate
(c) Carbanion intermediate
(d) Free radical intermediate

Q.8 Glacial acetic acid is obtained by
(a) Distilling vinegar
(b) Crystallizing, separating and melting acetic acid
(c) Treating vinegar with dehydrating agent
(d) Chemically separating acetic acid

Q.9 Ethyl acetate is obtained when methyl magnesium iodide reacts with
(a) Ethyl formate (b) Ethyl chloroformate
(c) Acetyl chloride (d) Carbon dioxide

Q.10 Which reaction is used for the preparation of α-bromoacetic acid?
(a) Kolbe's Reaction
(b) Reimer-Tiemann Reaction
(c) Hell Volhard Zelinsky Reaction
(d) Perkin's Reaction

Q.11 Tertiary alcohols (3°) having at least four carbon atoms upon drastic oxidation yield carboxylic acids with
(a) One carbon atom less
(b) Two carbon atoms less
(c) Three carbon atoms less
(d) All the above three options are correct

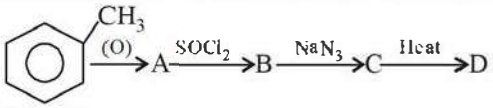
Q.12 In the reaction, $C_6H_5OH \xrightarrow{NaOH} (A) \xrightarrow[140°C,(4-7)atm]{CO_2} (B) \xrightarrow{HCl} (C)$, the compound (C) is
(a) Benzoic acid (b) Salicylaldehyde
(c) Chlorobenzene (d) Salicylic acid

Q.13 Which of the following esters cannot undergo Claisen self condensation?
(a) $CH_3-CH_2-CH_2-CH_2-COOC_2H_5$
(b) $C_6H_5COOC_2H_5$
(c) $C_6H_5CH_2COOC_2H_5$
(d) $C_6H_{11}CH_2COOC_2H_5$

Q.14 What is obtained, when propene is treated with N-bromo-succinimide ?
(a) $CH_3-\underset{\displaystyle Br}{\underset{|}{C}}=CH_2$ (b) $BrCH_2-CH=CH_2$
(c) $BrCH_2-CH=CHBr$ (d) $BrCH_2-\underset{\displaystyle Br}{\underset{|}{CH}}-CH_2Br$

Q.15 Which one of the following is strongest acid ?
(a) CH_2FCOOH (b) $CH_2ClCOOH$
(c) $CHCl_2COOH$ (d) CHF_2COOH

Q.16 In the following sequence of reactions, what is D



(a) Primary amine
(b) An amide
(c) Phenyl isocyanate
(d) A chain lengthened hydrocarbon

Q.17 Acetic acid dissolved in benzene shows a molecular mass of
(a) 30 (b) 60
(c) 120 (d) 240

Q.18 Which one of the following orders of acid strength is correct?
(a) RCOOH > HC ≡ CH > HOH > ROH
(b) RCOOH > ROH > HOH > HC ≡ CH
(c) RCOOH > HOH > ROH > HC ≡ CH
(d) RCOOH > HOH > HC ≡ CH > ROH

Q.19 The weakest acid among the following is
(a) CH_3COOH (b) $Cl_2CHCOOH$
(c) $ClCH_2COOH$ (d) Cl_3CCOOH

Q.20 $CH_3COOC_2H_5$ with excess of C_2H_5MgBr and hydrolysis gives
(a) $CH_3-\underset{\displaystyle C_2H_5}{\underset{|}{C}}=O$ (b) $CH_3-\underset{\displaystyle C_2H_5}{\underset{|}{\overset{\displaystyle C_2H_5}{\overset{|}{C}}}}-OH$
(c) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}=O$ (d) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle C_2H_5}{\overset{|}{C}}}}-OH$

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

Space for Rough Work

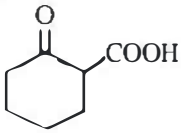
Q.21 Lactic acid molecule has
(a) One chiral carbon atom
(b) Two chiral carbon atoms
(c) No chiral carbon atom
(d) Symmetrical structure

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 $C_6H_5-\overset{O}{\overset{\|}{C}}-OH + H_2O^{18} \xrightarrow{H^+}$ Product
Here the product may be
(1) $C_6H_5CO^{18}OH$ (2) $C_6H_5COO^{18}H$
(3) $C_6H_5COOO^{18}H$ (4) $C_6H_5CO^{18}OOH$

Q.23 RCOOH can be reduced to RCH_2OH by
(1) $NaBH_4$ (2) $LiAlH_4$
(3) Na/C_2H_5OH (4) H_2/Catalyst

Q.24 Which of the following compound is decarboxylated on heating ?
(1)  (2) $C_2H_5CH(COOH)_2$
(3) CH_3COCH_2COOH (4) $\begin{matrix}CH_2COOH\\|\\CH_2COOH\end{matrix}$

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

Alkyl derivatives of acetoacetic ester can undergo two types of hydrolysis, ketonic and acidic hydrolysis. The scheme of these hydrolysis reactions are as follows :

Ketonic hydrolysis

$$CH_3COCHRCOOC_2H_5 \xrightarrow[(2)H_2SO_4]{(1)\ KOH\ (dil.)} CH_3-\overset{O}{\overset{\|}{C}}-CH_2-R + EtOH + CO_2$$

Acidic hydrolysis

$$CH_3COCHRCOOC_2H_5 \xrightarrow{Conc.KOH} CH_3COOK + RCH_2COOK + EtOH$$

The above names are in agreement to the type of products obtained.

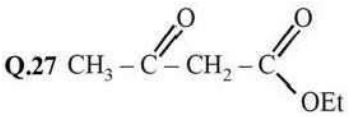
Q.25 What is the final product S in the given reaction?

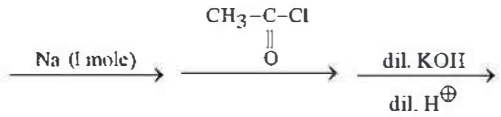
$$CH_3COCH_2COOC_2H_5 \xrightarrow{EtONa\ (1\ mole)} P \xrightarrow{EtI} \xrightarrow[(2)\ H_3PO_4]{(1)\ KOH} S$$

(a) CH_3COOH (b) $CH_3-\overset{O}{\overset{\|}{C}}-CH_2-CH_2-CH_3$
(c) $CH_3-\overset{O}{\overset{\|}{C}}-\underset{CH_3}{\underset{|}{CH}}-CH_3$ (d) $CH_3-\overset{O}{\overset{\|}{C}}-Et$

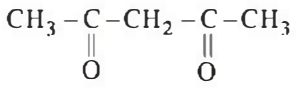
Q.26 Which reaction sequence can prepare succinic acid as final product ?
(a) $CH_3COCH_2COOEt \xrightarrow{EtONa\ (1\ eq)} \xrightarrow{Cl-CH_2COOEt} \xrightarrow[H^\oplus]{KOH}$
(b) $CH_3COCH_2COOEt \xrightarrow{EtONa\ (1\ eq)} \xrightarrow{Cl-CH_2COOH} \xrightarrow[H^\oplus]{KOH}$
(c) $CH_3COCH_2COOEt \xrightarrow{EtONa\ (1\ eq)} \xrightarrow{Cl-CH_2COOMe} \xrightarrow{Conc.\ KOH}$
(d) $CH_3COCH_2COOEt \xrightarrow{EtONa\ (1\ eq)} CH_3-\overset{O}{\overset{\|}{C}}-Cl \xrightarrow{Conc.KOH}$

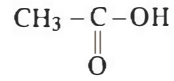
RESPONSE GRID	21. ⓐⓑⓒⓓ 22. ⓐⓑⓒⓓ 23. ⓐⓑⓒⓓ 24. ⓐⓑⓒⓓ 25. ⓐⓑⓒⓓ 26. ⓐⓑⓒⓓ

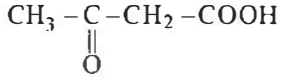
Q.27 

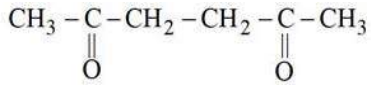


The final product is –

(a) 

(b) 

(c) 

(d) 

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.

Q.28 Statement-1 : Carboxylic acids do not give characteristic reactions of carbonyl group.
Statement-2 : Carboxylic acids exist as cyclic dimers in solid, liquid and even in vapour state.

Q.29 Statement-1 : Electron withdrawing groups decrease the acidity of carboxylic acids.
Statement-2 : Substituents affect the stability of the conjugate base and acidity of carboxylic acids.

Q.30 Statement-1 : Both formic acid and oxalic acid decolourize $KMnO_4$ solution.
Statement-2 : Both are easily oxidised to CO_2 and H_2O.

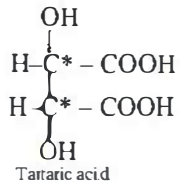
RESPONSE GRID	27. ⓐ ⓑ ⓒ ⓓ	28. ⓐ ⓑ ⓒ ⓓ	29. ⓐ ⓑ ⓒ ⓓ	30. ⓐ ⓑ ⓒ ⓓ

DAILY PRACTICE PROBLEM SHEET 53 - CHEMISTRY			
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	32	Qualifying Score	60
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work

DAILY PRACTICE PROBLEMS — CHEMISTRY SOLUTIONS — 53

1. **(d)** Tartaric acid has chiral carbon (*) atoms. So it is optically active.



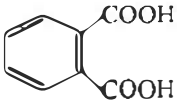
Tartaric acid

2. **(a)** $R-C(=O)-OH \rightarrow R-C(=O)-O^- \leftrightarrow R-C(-O^-)=O$

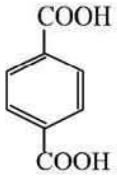
3 **(b)** Urea is the diamide of carbonic acid.

$$HO-\underset{\text{Carbonic acid}}{\overset{O}{\overset{\|}{C}}}-OH + 2NH_3 \xrightarrow{-H_2O} H_2N-\underset{\text{Urea}}{\overset{O}{\overset{\|}{C}}}-NH_2$$

4. **(c)** Phthalic acid is the isomer of 1, 4-benzenedicarboxylic acid because both have the same molecular formula but differ in their structure.

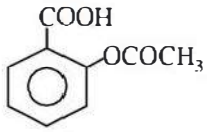


Phthalic acid



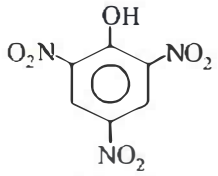
1, 4-benzenedicarboxylic acid

5. **(c)**

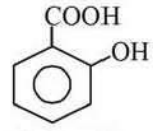


Aspirin

Benzoic acid



Picric acid

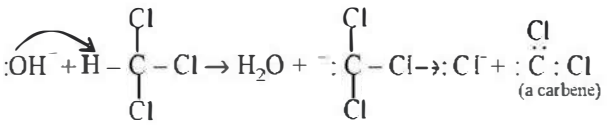


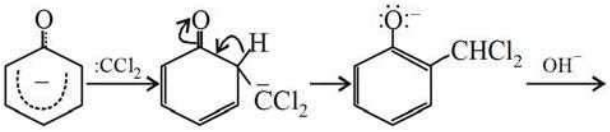
Salicylic acid

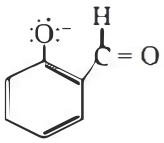
6. **(d)** The order of reactivity of acid derivatives towards different reactions decreases in the order,
$RCOCl > (RCO)_2O > RCOOR > RCONH_2$
In other words, the reactivity decreases as the basicity of the leaving group increases i.e.,

$$Cl^- < RCOO^- < RO^- < NH_2^-$$

7. **(b)** Reimer-Tiemann reaction involves a carbene intermediate.







8. **(b)** Acetic acid freezes at 16.6°C while water freezes at 0°C. So glacial acetic acid is obtained by crystallizing, separating and melting acetic acid.

9. **(b)** $CH_3MgI + Cl-\underset{\text{Ethyl chloroformate}}{\overset{O}{\overset{\|}{C}}}-OC_2H_5 \rightarrow \left[Cl-\overset{OMgI}{\overset{|}{C}}(CH_3)-OC_2H_5\right]$

$$\rightarrow CH_3-\underset{\text{Ethyl acetate}}{\overset{O}{\overset{\|}{C}}}-OC_2H_5 + Mg\begin{matrix}Cl\\ I\end{matrix}$$

10. **(c)** When Cl_2 or Br_2 reacts with carboxylic acid in the presence of red phosphorus, α-hydrogen of carboxylic acid is replaced by Cl or Br.

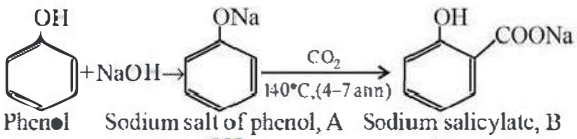
$$\underset{\text{Acetic Acid}}{CH_3COOH} \xrightarrow{Br_2} \underset{\alpha\text{–Bromoaceticacid}}{CH_2BrCOOH}$$

This reaction is known as Hell-Volhard-Zelinsky reaction.

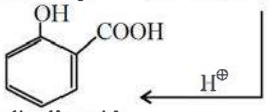
11. **(b)** Tertiary alcohols are not oxidised easily but on drastic conditions, these are oxidised to give first ketones and then acids by losing one carbon at each step.

$$\begin{matrix}R\\ R\\ R\end{matrix}\!\!>C-OH \xrightarrow{[O]} \begin{matrix}R\\ R\end{matrix}\!\!>C=O \xrightarrow{[O]} R.COOH$$

12. **(d)** Treatment of sodium salt of phenol with CO_2 under pressure brings about substitution of the –COOH group for the hydrogen of the ring. This is called as Kolbe's reaction



Phenol — Sodium salt of phenol, A — Sodium salicylate, B

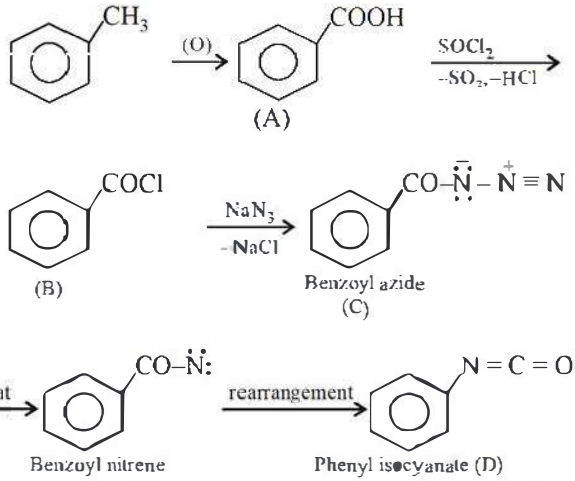


Salicylic acid

13. (b) Because it does not have α -hydrogen atom.

14. **(b)** $CH_3-CH=CH_2$ (Propene) + N-Bromosuccinimide $\xrightarrow{\text{allylic bromination}}$ $CH_2(Br)-CH=CH_2$ + succinimide

15. **(d)** CHF_2COOH. Difluoroacetic acid is the strongest acid because of two F atoms.

16. **(c)** 

17. **(c)** Acetic acid forms dimer in benzene due to which molecular mass becomes double.

18. **(a)**

19. **(a)** $CH_3COOH < ClCH_2COOH < Cl_2CHCOOH < Cl_3CCOOH$

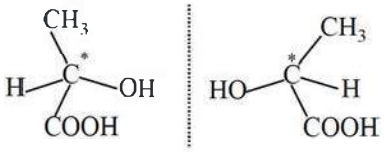
20. **(b)** $CH_3-\underset{\text{Ester}}{\overset{O}{\overset{\|}{C}}}-OC_2H_5 + C_2H_5MgBr \longrightarrow$

$CH_3-C(OC_2H_5)(C_2H_5)-OMgBr \xrightarrow{-Mg(OC_2H_5)Br} CH_3-C(=O)-C_2H_5$

$\xrightarrow{C_2H_5MgBr} CH_3-C(C_2H_5)_2-OMgBr \xrightarrow[HOH]{-Mg(OH)Br}$

$H_3C-C(C_2H_5)_2-OH$ 3° alcohol

21. **(a)** Lactic acid has one asymmetric (chiral) carbon atom, hence it has ($2^1 = 2$) optical isomers.



22. **(b)** $C_6H_5-\overset{O}{\overset{\|}{C}}-OH \xrightarrow{H^+} C_6H_5-\overset{OH}{\overset{|}{C}}-OH \;(\oplus)$

$\xrightarrow{H_2O^{18}} C_6H_5-C(OH)(-{}^{18}\bullet H_2)-OH \xrightarrow{-H^+}$

$C_6H_5-C(OH)(-{}^{18}OH)-OH \dashrightarrow C_6H_5-C(=O)-OH + C_6H_5-C(=O)-{}^{18}OH$

$C_6H_5-C(=O)-{}^{18}OH$

Remember that $C-O^{18}$ bond is difficult to break than the C—O bond.

23. **(c)** RCOOH can be reduced to RCH_2OH by $LiAlH_4$ and H_2/Catalyst

24. **(a)** Dicarboxylic acids having two – –COOH groups on the same carbon atom ; and β -keto acids are easily decarboxylated on heating.

25. **(b)** $CH_3-\underset{\|}{\overset{O}{C}}-\underset{H}{CH}-COOEt \xrightarrow{EtO^-}$

$CH_3-\underset{O}{\overset{\|}{C}}-\overset{-}{C}H-COOEt \xrightarrow{CH_3-CH_2-I} CH_3-\underset{O}{\overset{\|}{C}}-CH(-CH_2-CH_3)-C\bullet\bullet Et$

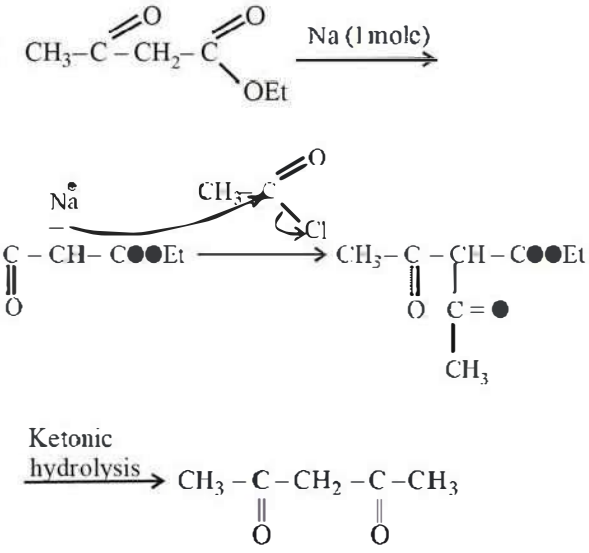
$\xrightarrow[\text{hydrolysis}]{\text{Ketonic}} CH_3-\underset{O}{\overset{\|}{C}}-CH_2-CH_2-CH_3$

26. **(c)** $CH_3-\underset{O}{\overset{\|}{C}}-CH_2-COOEt \xrightarrow{EtO^-}$

$CH_3-\underset{O}{\overset{\|}{C}}-\overset{-}{C}H-COOEt \xrightarrow{Cl-CH_2-COOMe} CH_3-\underset{O}{\overset{\|}{C}}-CH(-CH_2-COOMe)-COOEt$

$\xrightarrow[\text{hydrolysis}]{\text{Acidic}} \begin{matrix}CH_2COOK\\ CH_2COOK\end{matrix} \longrightarrow \begin{matrix}CH_2COOH\\ CH_2COOH\end{matrix}$

27. **(a)**



28. **(b)** As carboxylic acids are resonance stabilized they do not contain true carbonyl group as is present in carbonyl compounds.

29. **(c)** Electron withdrawing groups increase the acidity of carboxylic acids by stabilising the conjugate base through delocalisation of the negative charge by inductive and resonance effects.

30. **(a)** Both formic acid and oxalic acid behave as reducing agent and decolourise acidified $KMnO_4$ solution.

$$2KMnO_4 + 3H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5(O)$$

$$HCOOH + [O] \longrightarrow CO_2 + H_2O$$

$$\begin{matrix} C●OH \\ | \\ C●OH \end{matrix} + [O] \longrightarrow 2CO_2 + H_2O$$