DPP - Daily Practice Problems

Name : Date :

Start Time : End Time :

CHEMISTRY 60

SYLLABUS : Analytical Chemistry : Preliminary Tests, Wet tests for acid radicals, Wet tests for basic radicals, Volumetric Analysis.

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 gives violet coloured bead in borax bead test?

(a) Fe^{2+} (b) Ni^{2+}

(c) Co^{2+} (d) Mn^{2+}

Q.2 Which one of the following salt gives green coloured flame when the salt is tested by Pt wire?

(a) Barium salt (b) Calcium salt

(c) Borate (d) Lead salt

Q.3 Sodium sulphite on heating with dilute HCl liberates a gas which

(a) Turns lead acetate paper black

(b) Turns acidified potassium dichromate paper green

(c) Burns with a blue flame

(d) Smells like vinegar

Q.4 MnO_2 and H_2SO_4 added to NaCl, the greenish yellow gas liberated will be

(a) Cl_2 (b) NH_3

(c) N_2 (d) H_2

Q.5 For precipitating out group II cations, H_2S gas is passed through O.S. acidified with HCl, group II cations are completely removed before proceeding to analysis of group III cations. However sometimes a yellow precipitate is persistently formed even after repeatedly passing H_2S gas. This is due to

(a) CdS (b) As_2S_3

(c) AsO_4^{3-} (d) S

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

Space for Rough Work

Q.6 When a mixture of solid NaCl, solid $K_2Cr_2O_7$ is heated with conc. H_2SO_4, orange red vapours are obtained of which of the compound ?

(a) Chromous chloride (b) Chromyl chloride
(c) Chromic chloride (d) Chromic sulphate

Q.7 A salt gives violet vapours when treated with conc. H_2SO_4, it contains.

(a) Cl^- (b) I^-
(c) Br^- (d) NO_3^-

Q.8 Which compound is soluble in NH_4OH ?

(a) $PbCl_2$ (b) $PbSO_4$
(c) AgCl (d) $CaCO_3$

Q.9 Aqueous solution of a salt when treated with $AgNO_3$ solution gives a white precipitate which dissolves in NH_4OH. Radical present in the salt is

(a) Cl^- (b) Br^-
(c) I^- (d) NO_3^-

Q.10 In the test of sulphate radical, the white precipitate of sulphate is soluble in

(a) Conc. HCl (b) Conc. H_2SO_4
(c) Conc. HNO_3 (d) None of these

Q.11 Na_2CO_3 cannot be used to identify

(a) CO_3^{2-} (b) SO_3^{2-}
(c) S^{2-} (d) SO_4^{2-}

Q.12 Gas A is bubbled through slaked lime when a white precipitate is formed. On prolonged bubbling, the precipitate is dissolved. On heating the resultant solution, the white precipitate reappears with the evolution of gas B. The gases A and B respectively are

(a) CO_2 and CO (b) CO and CO_2
(c) CO and CO (d) CO_2 and CO_2

Q.13 Reagent used in the qualitative analysis of IVth group is

(a) HCl (b) H_2S(alkaline)
(c) $(NH_4)_2S$ (d) None of these

Q.14 Which one among the following pairs of ions cannot be separated by H_2S in dilute hydrochloric acid ?

(a) Bi^{3+}, Sn^{4+} (b) Al^{3+}, Hg^{2+}
(c) Zn^{2+}, Cu^{2+} (d) Ni^{2+}, Cu^{2+}

Q.15 Which of the following changes the colour of the aqueous solution of $FeCl_3$?

(a) $K_4[Fe(CN)_6]$ (b) H_2S
(c) NH_4CNS (d) All of these

Q.16 When HCl gas is passed through saturated solution of $BaCl_2$, a white ppt is obtained. This is due to

(a) Impurities in $BaCl_2$ (b) Impurities in HCl
(c) Precipitation of $BaCl_2$ (d) Formation of complex

Q.17 Nessler's reagent is used to detect

(a) CrO_4^{2-} (b) PO_4^{3-}
(c) MnO_4^- (d) NH_4^+

Q.18 Sodium nitroprusside when added to an alkaline solution of sulphide ions produces a

(a) Red colouration
(b) Blue colouration
(c) Violet colouration
(d) Brown colouration

Q.19 A 100 ml solution of 0.1 N–HCl was titrated with 0.2 N–NaOH solution. The titration was discontinued after adding 30 ml of NaOH solution. The remaining titration was completed by adding 0.25 N– KOH solution. The volume of KOH required for completing the titration is

(a) 16ml (b) 32ml
(c) 35ml (d) 70ml

Q.20 0.45 g of an acid (mol wt. = 90) required 20 ml of 0.5 N KOH for complete neutralization. Basicity of acid is

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

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

Space for Rough Work

Q.21 20 ml of a solution of a weak monobasic acid neutralizes 22.18 ml of a solution of NaOH and 20 ml of N/10 HCl neutralizes 21.5 ml of the same NaOH solution. The normality for the acid is nearly

(a) 10 N (b) 1 N

(c) 0.10 N (d) 100 N

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 Which of the following statement (s) is (are) correct when a mixture of NaCl and $K_2Cr_2O_7$ is gently warmed with conc. H_2SO_4?

(1) An orange red vapour is evolved

(2) The vapour when passed into NaOH solution gives a yellow solution of Na_2CrO_4

(3) Chromyl chloride is formed

(4) Chlorine gas is evolved

Q.23 The reagents, NH_4Cl and aqueous NH_3 will precipitate

(1) Ca^{2+} (2) Al^{3+}

(3) Bi^{3+} (4) Mg^{2+}

Q.24 Which of the folowing substances are soluble in concentrated HNO_3 ?

(1) HgS (2) CuS

(3) PbS (4) $BaSO_4$

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

p-Amino-*N*, *N*-dimethylaniline is added to a strongly acidic solution of **X**. The resulting solution is treated with a few drops of aqueous solution of **Y** to yield blue coloration due to the formation of methylene blue. Treatment of the aqueous solution of **Y** with the reagent potassium hexacyanoferrate(II) leads to the formation of an intense blue precipitate. The precipitate dissolves on excess addition of the reagent. Similarly, treatment of the solution of **Y** with the solution of potassium hexacyanoferrate (III) leads to a brown coloration due to the formation of **Z**.

Q.25 The compound **X** is

(a) $NaNO_3$ (b) NaCl

(c) Na_2SO_4 (d) Na_2S

Q.26 The compound **Y** is

(a) $MgCl_2$ (b) $FeCl_2$

(c) $FeCl_3$ (d) $ZnCl_2$

Q.27 The compound **Z** is

(a) $Mg_2[Fe(CN)_6]$ (b) $Fe[Fe(CN)_6]$

(c) $Fe_4[Fe(CN)_6]_3$ (d) $K_2Zn_3[Fe(CN)_6]_2$

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.

Q.28 **Statement 1 :** Sb (III) is not precipitated as sulphide when in its alkaline solution H_2S is passed.

Statement 2 : In basic medium, concentration of S^{2-} ions is not enough for precipitation

Q.29 **Statement 1:** Acidified $K_2Cr_2O_7$ is turned green when SO_2 is passed through it.

Statement 2 : In this reaction SO_2 acts as a reducing agent.

Q.30 **Statement 1:** A solution of $BiCl_3$ in conc. HCl when diluted with water gives white ppt.

Statement 2 : $BiCl_3$ in insoluble in dil. HCl

RESPONSE GRID	28.ⓐⓑⓒⓓ	29.ⓐⓑⓒⓓ	30.ⓐⓑⓒⓓ

DAILY PRACTICE PROBLEM SHEET 60 - 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

60

1. **(d)** As Mn^{2+} has all its electrons (5) unpaired in its *d*-orbital, so it has extra stable configuration and requires high excitation energy and gives violet colour.

2. **(a)** Barium salt gives green coloured flame as it has low ionization energy.

3. **(b)** $Na_2S + dil.2HCl \rightarrow 2NaCl + H_2S$

$$H_2S + H_2SO_4 + K_2Cr_2O_7 \xrightarrow{\text{acidic}} K_2SO_4 + Cr_2(SO_4)_3 + S$$

(green)

4. **(a)** Yellowish-green gas chlorine with suffocating odour is evolved when sodium chloride mixed with manganese dioxide is heated with concentrated H_2SO_4.

$NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$

$Mn\bullet_2 + 4\,HCl \rightarrow MnCl_2 + 2H_2O + Cl_2\uparrow$

5. **(c)** This is due to presence of AsO_4^{3-}.

6. **(b)** $NaCl + H_2SO_4 \rightarrow NaHS\bullet_4 + HCl$

$K_2Cr_2O_7 + 2H_2SO_4 \rightarrow 2KHSO_4 + 2Cr\bullet_3 + H_2O$

$CrO_3 + 2HCl \rightarrow \underset{\text{(Orange red vapour)}}{CrO_2Cl_2} + H_2O$

7. **(b)** Iodine vapours are violet the salt must contain I^-.

$KI + H_2S\bullet_4 \rightarrow KHS\bullet_4 + HI$

$2HI + H_2SO_4 \rightarrow \underset{\text{violet vapour}}{I_2\uparrow} + 2H_2O + SO_2$

8. **(c)** AgCl forms complex with NH_4OH

9. **(a)** When Cl^-, Br^- and F^- are treated with $AgNO_3$ solution in presence of dilute HNO_3, corresponding silver halide is obtained which is soluble in NH_4OH, NaCN, and $Na_2S_2O_3$.

$$AgNO_3 + NaCl \longrightarrow \underset{\text{white}}{AgCl\downarrow} + NaNO_3$$

$$AgCl + dil.2NH_4OH \longrightarrow \underset{\text{complex}}{[Ag(NH_3)_2]Cl} + 2H_2O$$

10. **(d)** As the sulphate radical is a strong oxidising agent, it is insoluble in acids and so detection of sulphate radical requires no other reagent.

11. **(a)** SO_3^{2-}, S^{2-} and SO_4^{2-} salts form comparatively stronger acids (than H_2CO_3) in solution, hence evolve CO_2 with Na_2CO_3 solution and give effervescence, while CO_3^{2-} does not react with Na_2CO_3 solution.

12. **(d)** According to the equation,

$Ca(OH)_2 + C\bullet_2 \xrightarrow{\Delta} CaC\bullet_3 + H_2\bullet$

$CaCO_3 + H_2O + CO_2 \xrightarrow{\Delta} Ca(HCO_3)_2$

$Ca(HC\bullet_3)_2 \xrightarrow{\Delta} CaO + H_2\bullet + 2CO_2$

Hence, the gasses A and B are CO_2 and CO_2 respectively

13. **(b)** In presence of NH_4OH, dissociation of H_2S is remarkablyhigh $H_2S \rightleftharpoons 2H^+ + S^{2-}$

$NH_4OH \rightarrow NH_4^+ + OH^-$

$OH^- + H^+ \rightarrow H_2O$

14. **(a)** Both will precipitate as sulphide.

15. **(d)** $FeCl_3 + K_4[Fe(CN)_6] \rightarrow \underset{\text{Ferri ferrocyanide (Blue)}}{Fe_4[Fe(CN)_6]_3}$

$2FeCl_3 + 3H_2S \rightarrow Fe_2S_3 + 6HCl$

$3NH_4CNS + FeCl_3 \rightarrow \underset{\text{(Blood red)}}{Fe(CNS)_3} + 3NH_4Cl$

16. **(c)** White precipitate obtained is of $BaCl_2$, as the Cl^- ions concentration increases due to the addition of HCl, the ionic product becomes more than solubility product and thus, $BaCl_2$ is precipitated.

17. **(d)** Nessler's reagent gives red precipitate with NH_4^+.

$NH_4Cl + 2K_2[HgI_4] + 4KOH \rightarrow$

$$\underset{\text{Iodide of Million's base (Brown ppt)}}{NH_2 - Hg - O - Hg - I} + 7KI + KCl + 3H_2O$$

18. **(c)** $Na_2S + Na_2[Fe(NO)(CN)_5] \rightarrow$

sodium nitroprusside

$Na_4[Fe(CN)_5NOS]$

purple colour complex

19. **(a)** In the neutralization of acid and base N × V of both must be equivalent

N × V of HCl = 0.1 × 100 = 10

N × V of NaOH = 0.2 × 30 = 6

as to obtain 10 N × V of base

4 N × V of base is required

N × V of KOH = 0.25 × 16 = 4

$$\underset{\text{NaOH}}{N_1V_1} = \underset{\text{KOH}}{N \times V} + \underset{\text{KOH}}{N \times V}$$

$0.1 \times 100 = 0.2 \times 30 + 0.25 \times V$

$10 = 6 + 0.25\,V$

$$V = \frac{400}{25} \Rightarrow V = 16\text{ ml}$$

20. **(b)** $\text{Normality} = N = \dfrac{W_A \times 1000}{\text{Eq.wt} \times V}$

$$\therefore \text{Eq. Wt} = \frac{0.45 \times 1000}{0.5 \times 20} = 45$$

$$\therefore \text{Basicity} = \frac{\text{Mol.Wt}}{\text{Eq.Wt}} = \frac{90}{45} = 2$$

21. **(c)** $N_1V_1 = N_2 \times V_2$

$N_1 \times 20 = N_2 \times 22.28$

$$N_1 = \frac{N_2 \times 22.18}{20} \quad \ldots(i)$$

NaOH solution = HCl solution

$$N_2 \times 21.5 = \frac{1}{10} \times 20$$

$$N_2 = \frac{20}{10 \times 21.5} \quad \ldots(ii)$$

by eq. (i) and (ii)

$$N_1 = \frac{20 \times 22.18}{20 \times 10 \times 21.5} = \frac{22.18}{215} = 0.1\,N$$

22. **(a)** Chromyl chloride test

$$4NaCl + K_2Cr_2O_7 + 3H_2SO_4 \xrightarrow{\text{heat}}$$

$$K_2SO_4 + 2Na_2SO_4 + \underset{\text{chromyl chloride (orange red)}}{2CrO_2Cl_2} + 3H_2O$$

$$4NaOH + CrO_2Cl_2 \rightarrow 2NaCl + \underset{\text{Sod. chromate (yellow)}}{Na_2CrO_4} + 2H_2O$$

$$Na_2CrO_4 + (CH_3COO)_2Pb \rightarrow$$

$$2CH_3COONa + \underset{\substack{\text{Lead chromate}\\ \text{(yellow ppt.)}}}{PbCrO_4}\downarrow$$

23. **(b)** Al^{3+} (third group radical) and Ca^{2+} (fifth group radical) precipitate out as their hydroxides with NH_4Cl and aq. NH_3 (NH_4OH) which are the group reagents.

24. **(a)** HgS, CuS and PbS are soluble in conc. HNO_3.

For 25-27

Reaction of Y indicates that it is Fe^{3+} salt.

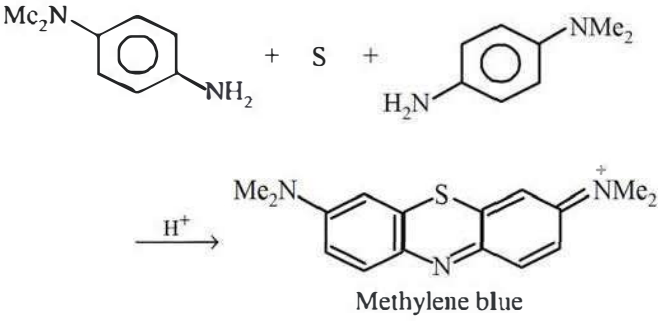
$$\underset{\text{Y}}{4Fe^{3+}} + \underset{\substack{\text{hexacyanoferrate (II)}\\ \text{or ferrocyanide}}}{3[Fe(CN)_6]^{4-}} \longrightarrow \underset{\substack{\text{Intense blue ppt. soluble in}\\ \text{excess of ferrocyanide}}}{Fe_4[Fe(CN)_6]_3}\downarrow$$

$$\underset{\text{Y}}{Fe^{3+}} + \underset{\substack{\text{hexacyanoferrate (III)}\\ \text{or ferricyanide}}}{[Fe(CN)_6]^{3-}} \longrightarrow \underset{\text{Brown colour}}{Fe[Fe(CN)_6]}$$

Since the product formed (methylene blue) has sulphur in its structure, it should be supplied by the compound X which is thus Na_2S.

$$Na_2S + 2H^+ \longrightarrow H_2S + 2Na^+$$

$$FeCl_3 + H_2S \longrightarrow FeCl_2 + 2HCl + S$$



Methylene blue

25. **(d)**

26. **(c)**

27. **(b)**

28. **(d)** Statement 1 is true but statement 2 is false

Sb(III) is a basic radical of IIB group of which group reagent is H_2S is presence of dilute HCl. It is necessary to maintain the proper hydrogen ion concentration for the precipitation of IV group cations.

29. **(a)** Both statement 1 and statement 2 are correct and statement 2 is the correct explanation of statement 1.

$$K_2Cr_2O_7 + 3SO_2 + H_2SO_4 \longrightarrow$$

$$K_2SO_4 + \underset{\text{green colour}}{Cr_2(SO_4)_3} + 3H_2O$$

30. **(d)** It is due to the formation of insoluble BiOCl on hydrolysis.

$$BiCl_3 + H_2O \rightarrow \underset{\text{White ppt.}}{BiOCl} + 2HCl$$