DPP - Daily Practice Problems

Name : _____ Date : _____

Start Time : _____ End Time : _____

CHEMISTRY 44

SYLLABUS : *d*- & *f*-Block Elements - II : Compounds of transition elements

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 Potassium permanganate acts as an oxidant in neutral, alkaline as well as acidic medium. The final products obtained from it in the three conditions are, respectively

(a) MnO_2, MnO_2, Mn^{2+} (b) $MnO_4^{2-}, Mn^{3+}, Mn^{2+}$

(c) $MnO_2, MnO_4^{2-}, Mn^{3+}$ (d) MnO, MnO_4^{2-}, Mn^{2+}

Q.2 Acidified potassium dichromate is treated with hydrogen sulphide. In the reaction, the oxidation number of chromium

(a) Increases from + 3 to +6

(b) Decreases from +6 to +3

(c) Remains unchanged

(d) Decreases from +6 to +2

Q.3 Equivalent weight of $KMnO_4$ acting as an oxidant in acidic medium is equal to

(a) Molecular weight of $KMnO_4$

(b) $\frac{1}{2}\times$ Molecular weight of $KMnO_4$

(c) $\frac{1}{3}\times$ Molecular weight of $KMnO_4$

(d) $\frac{1}{5}\times$ Molecular weight of $KMnO_4$

Q.4 AgCl dissolves in a solution of NH_3 but not in water because

(a) NH_3 is a better solvent than H_2O

(b) Ag^+ forms a complex ion with NH_3

(c) NH_3 is a stronger base than H_2O

(d) The dipole moment of water is higher than NH_3

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

Space for Rough Work

Q.5 A copper salt is isomorphic with $ZnSO_4$, the salt will be

(a) Paramagnetic (b) Diamagnetic

(c) Ferromagnetic (d) None

Q.6 In photography sodium thiosulphate is used as-

(a) Complexing agent (b) Oxidising agent

(c) Reducing agent (d) None of these

Q.7 When hypo solution is added to cupric sulphate solution, the blue colour of the latter is discharged, due to formation of

(a) CuS_2O_3 (b) $Na_2S_4O_6$

(c) $NaCuS_2O_3$ (d) Cu_2O

Q.8 Nessler's reagent is

(a) K_2HgI_4 (b) $K_2HgI_4 + KOH$

(c) $K_2HgI_2 + KOH$ (d) $K_2HgI_4 + Hg$

Q.9 Aqueous solution of ferric chloride is

(a) acidic (b) basic

(c) neutral (d) amphoteric

Q.10 A group of acidic oxide is

(a) CrO_3, Mn_2O_7 (b) ZnO, Al_2O_3

(c) CaO, ZnO (d) Na_2O, Al_2O_3

Q.11 The correct order of magnetic moments (spin only values in B.M.) among is

(a) $[Fe(CN)_6]^{4-} > [MnCl_4]^{2-} > [CoCl_4]^{2-}$

(b) $[MnCl_4]^{2-} > [Fe(CN)_6]^{4-} > [CoCl_4]^{2-}$

(c) $[MnCl_4]^{2-} > [CoCl_4]^{2-} > [Fe(CN)_6]^{4-}$

(d) $[Fe(CN)_6]^{4-} > [CoCl_4]^{2-} > [MnCl_4]^{2-}$

Q.12 In which of these processes, platinum is used as a catalyst?

(a) Oxidation of ammonia to form HNO_3

(b) Hardening of oils

(c) Production of synthetic rubber

(d) Synthesis of methanol

Q.13 Percentage of silver in German silver is

(a) 8% (b) 1%

(c) 5% (d) None of these

Q.14 Vanadium (III) oxide is a strong

(a) Drying agent (b) Oxidising agent

(c) Reducing agent (d) Wetting agent

Q.15 Which of the following is not oxidized by O_3 ?

(a) KI (b) $FeSO_4$

(c) $KMnO_4$ (d) K_2MnO_4

Q.16 Iron is rendered passive by the action of

(a) Conc. H_2SO_4 (b) Conc. H_3PO_4

(c) Conc. HCl (d) Conc. HNO_3

Q.17 F_2 is formed by reacting K_2MnF_6 with

(a) SbF_5 (b) MnF_3

(c) $KSbF_6$ (d) MnF_4

Q.18 Reaction between the following pairs will produce H_2 except

(a) Na + ethyl alcohol (b) Fe + steam

(c) Fe + H_2SO_4 (aq.) (d) Cu + HCl (aq.)

Q.19 Copper sulphate solution reacts with KCN to give

(a) $Cu(CN)_2$ (b) CuCN

(c) $K_2[Cu(CN)_4]$ (d) $K_3[Cu(CN)_4]$

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

Space for Rough Work

Q.20 Hydrogen is not obtained when zinc reacts with

(a) Cold water

(b) Dilute H_2SO_4

(c) DiluteHCl

(d) Hot20%NaOH

Q.21 The extraction of which of the following metals involves bessemerisation

(a) Fe (b) Ag

(c) Al (d) Cu

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 one of the following statements are not correct?

(1) Manganese salts give violet borax bead test in the reducing flame.

(2) On boiling a solution having K^+, Ca^{2+} and HCO_3^- ions we get a precipitate of $K_2Ca(CO_3)_2$.

(3) Ferric ions give a deep green precipitate on adding potassium ferrocyanide solution.

(4) From a mixed precipitate of AgCl and AgI, ammonia solution dissolves only AgCl.

Q.23 Which of the following statements are true?

(1) Coloured compounds of transition elements are paramagnetic.

(2) Colourless compounds of transition elements are diamagnetic.

(3) Transition elements form the complex compounds.

(4) Colourless compounds of transition elements are paramagnetic.

Q.24 Which of the following pair of elements can form an alloy?

(1) Zn, Cu (2) Fe, C

(3) Na, Hg (4) Fe, Hg

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

A water insoluble solid "*A*" turns yellow on heating and becomes white again on cooling. When "*A*" is treated with HCl (aq) it forms a clear solution "*B*". "*A*" when treated with NaOH (aq) also gives a clear solution "*C*". When H_2S (g) is bubbled through clear solution "*B*", no change is observed but when H_2S is bubbled through clear solution "*C*", a white precipitate of compound "*D*" is observed.

Q.25 The nature of compound "*A*" is

(a) acidic (b) basic

(c) amphoteric (d) neutral

Q.26 The compound "*A*" is

(a) ZnO (b) PbO

(c) MnO (d) CdO

Q.27 The compound "*B*" is

(a) $ZnCl_2$ (b) $PbCl_2$

(c) $MnCl_2$ (d) $NiCl_2$

RESPONSE GRID					
	20. ⓐⓑⓒⓓ	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 : Transition metals show variable valency.

Statement -2 : Due to a large energy difference between the ns^2 and $(n-1)d$ electrons.

Q.29 Statement -1 : In transition elements, *ns* orbital is filled up first and $(n-1)d$ afterwards. During ionization *ns* electrons are lost prior to $(n-1)d$ electrons.

Statement -2 : The effective nuclear charge felt by $(n-1)d$ electrons is higher as compared to that by *ns* electrons.

Q.30 Statement-1 : It is not possible to obtain anhydrous $ZnCl_2$ by heating $ZnCl_2.2H_2O$.

Statement-2 : $ZnCl_2.2H_2O$ undergoes hydrolysis to produce $Zn(OH)_2$ and HCl.

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

DAILY PRACTICE PROBLEM SHEET 44 - CHEMISTRY			
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	32	Qualifying Score	52
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work

DAILY PRACTICE PROBLEMS

CHEMISTRY SOLUTIONS

44

1. (a) In neutral medium:

$2KMnO_4 + 3MnSO_4 + 2H_2O \rightarrow K_2SO_4 + 2H_2SO_4 + 5MnO_2$

In alkaline medium:

$2KMnO_4 + H_2O \rightarrow 2MnO_2 + 2KOH + 3O$

In acidic medium:

$2KMnO_4 + 3H_2SO_4 \rightarrow K_2SO_4 + 2\overset{+2}{Mn}SO_4 + 5H_2O + 5O$

2. (b) Decreases from +6 to +3.

$K_2Cr_2O_7 + 4H_2SO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + 4H_2O + 3O$

$[H_2S + [O] \rightarrow S + H_2O] \times 3$

$\overset{+6}{K_2Cr_2O_7} + 4H_2SO_4 + 3H_2S \rightarrow K_2SO_4 + \overset{+3}{Cr_2}(SO_4)_3 + 7H_2O + 3S$

3. (d) $\frac{1}{5} \times$ molecular weight of $KMnO_4$

as transfer of $5e^-$ takes place when $KMnO_4$ acts as oxidant in acidic medium.

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

4. (b) Ag^+ forms a complex ion with NH_3

$AgCl + 2NH_3 \rightarrow [Ag(NH_3)_2]Cl$

5. (a) $ZnSO_4 \rightarrow Zn^{++} + SO_4^{2-}$

$Zn^{++} \approx Cu^{++}$

$Cu^{2+} \rightarrow 3d^9$ – 1 unpaired e^-

$\therefore$ paramagnetic in nature.

6. (a) In order to make the image permanent, it is necessary to remove the unreduced silver bromide from the surface of the developed film. This operation is called fixing of image. Fixing is done by dipping the developed film or plate in sodium thiosulphate (hypo) solution. The hypo solution dissolves the unreduced silver bromide by forming a complex.

$AgBr + 2Na_2S_2O_3 \rightarrow \underset{\text{Sodium argentothiosulphate (Soluble)}}{Na_3[Ag(S_2O_3)_2]} + NaBr$

Thus sodium thiosulphate acts as a complexing agent.

7. (c) $Na_2S_2O_3 + CuSO_4 \rightarrow NaCuS_2O_3$

8. (b) $2KI + HgI_2 \rightarrow \underset{\text{Nessler's reagent}}{K_2HgI_4} + KOH$

9. (a) $FeCl_3$ is a salt of strong acid and weak base. It gives $Fe(OH)_3$ and HCl on hydrolysis. $Fe(OH)_3$ is a weak base and HCl is strong acid.

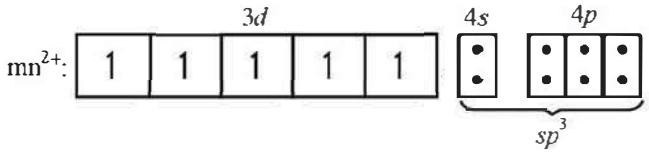
So the aqueous solution of $FeCl_3$ will be acidic in nature.

10. (a) CrO_3 and Mn_2O_7 are acidic oxides since they react with water to form acid.

$CrO_3 + H_2O \rightarrow \underset{\text{Chromic acid}}{H_2CrO_4}$;

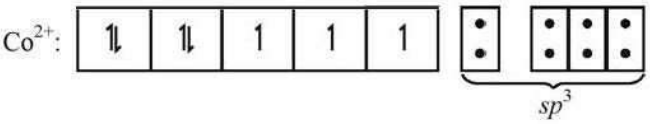
$Mn_2O_7 + H_2O \rightarrow \underset{\text{Permanganic acid}}{2HMnO_4}$

11. (c) $[MnCl_4]^{2-} \rightarrow$



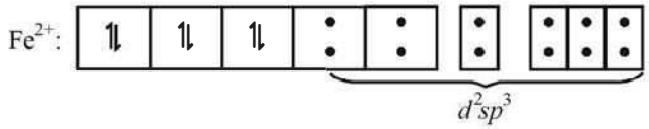
Number of unpaired electrons = 5

$[CoCl_4]^{2-}$



Number of unpaired electrons = 3

$[Fe(CN)_6]^{4-}$



Number of unpaired electron = 0

Greater the number of unpaired electrons greater will be the paramagnetic character.

12. (a) Platinum acts as catalyst in the oxidation of ammonia to form nitric oxide. This reaction is used in the Ostwald's method of nitric acid preparation

$4NH_3 + 5O_2 \xrightarrow[750^0C]{Pt} 4NO + 6H_2O$

$2NO + O_2 \rightarrow 2NO_2$

$4NO_2 + O_2 + 2H_2O \rightarrow 4HNO_3$

13. (d) Germans silver contains Cu = 56.0%, Zn = 24.0% and Ni = 20.0%

14. (c) Vanadium (III) oxide is a strong reducing agent because vanadium is electropositive metal and has high reduction potential. It has low heat of sublimation, low ionisation potential.

15. **(c)** $KMnO_4$ will not be oxidized further by ozone as manganese is already present in its highest possible oxidation state, i.e. +7

16. **(d)** Iron is rendered passive by conc. HNO_3 and other oxidising agents like $K_2Cr_2O_7$, $KMnO_4$, chloric acid, chromic acid, silver nitrate etc. A specimen of passive iron can be rendered active by scratching the film mechanically or chemically.

17. **(a)** $K_2MnF_6 + 2SbF_5 \rightarrow 2KSbF_6 + MnF_3 + \frac{1}{2}F_2$

In this reaction, the stronger Lewis acid SbF_5 displaces the weaker one, MnF_6 from its salt. MnF_6 is unstable and readily decomposes to give MnF_3 and fluorine.

18. **(d)** $Cu + HCl \rightarrow$ no reaction

Copper is less reactive than hydrogen. Therefore, it is unable to displace hydrogen from acid.

$E^0_{Cu} = +0.34$ and $E^0_H = 0.00$

19. **(d)** $CuSO_4 + 2KCN \rightarrow Cu(CN)_2 + K_2SO_4$

$2Cu(CN)_2 \rightarrow Cu_2(CN)_2 + (CN)_2$

$Cu_2(CN)_2 + 6KCN \rightarrow 2K_3[Cu(CN)_4]$

20. **(a)** Zn does not react with cold water. However, it reacts with hot water and yields H_2.

$Zn + H_2O \xrightarrow{\text{Boil}} ZnO + H_2$

$Zn + H_2SO_4(\text{dil}) \rightarrow ZnSO_4 + H_2$

$Zn + 2HCl(\text{dil}) \rightarrow ZnCl_2 + H_2$

$Zn + \underset{20\%}{2NaOH} \xrightarrow{\text{heat}} Na_2ZnO_2 + H_2$

21. **(d)** Copper metallurgy involves bessemerisation. In bessemerisation converter, the impurities of Ferric Oxide forms slag with silica, and copper oxide gets reduced to give blister copper.

$FeO + SiO_2 \longrightarrow \underset{\text{Slag}}{FeSiO_3}$

$Cu_2S + 2Cu_2O \longrightarrow 6Cu \downarrow + SO_2 \uparrow$

22. **(a)** From a mixed precipitate of AgCl and AgI, ammonia solution dissolves only AgCl.

23 **(a)** Colourless compounds of transition elements have no unpaired electron and paramagnetic substances do have unpaired electrons. Therefore, paramagnetic substance possess colour.

24 **(a)** Only Fe, Hg cannot form an alloy. While other pairs can do so.

25. **(c)** It is amphoteric in nature as it shows reaction both with acid [i.e., HCl (aq)] as well as alkali [i.e., NaOH (aq)].

26. **(a)** ZnO shows yellow colour on heating and becomes white on cooling.

27. **(a)** $\underset{A}{ZnO} + 2HCl(aq) \longrightarrow \underset{B\ (Soluble)}{ZnCl_2(aq)} + H_2O$

28. **(d)** Actually, transition metals show variable valency due to very small difference between the ns^2 and $(n-1)\,d$ electrons. Therefore, Statement-1 is correct but Statement-2 is false.

29. **(a)** Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1. Electrons are filled in orbitals according to increasing energy of orbitals.

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