

DAV PUBLIC SCHOOL, MCL, KALINGA AREA

PRACTICE PAPER - 08

CHEMISTRY

Max. Marks : 70

Time : 3 hrs

Instructions

1. There are 33 questions in this question paper. All questions are compulsory.
2. **Section A** : Q. no. 1-2 are case-based questions having four MCQs or Assertion-Reason type based on given passage each carrying 1 mark and Question 3 to 16 are MCQs and Assertion-Reason type questions carrying 1 mark each.
3. **Section B** : Q. no. 17 to 25 are short answer type I questions and carry 2 marks each.
4. **Section C** : Q. no. 26 to 30 are short answer type II questions and carry 3 marks each.
5. **Section D** : Q. no. 31 to 33 are long answer questions carrying 5 marks each.
6. There is no overall choice. However, an internal choice has been provided.
7. Use of calculators and log tables is not permitted.

SECTION A : Objective Questions

(1 Marks)

Passage Based Questions

1. Read the passage given below and answer the following questions :

(1×4=4 Marks)

Amines constitute one of the most important class of organic compounds. In nature, they occur among vitamins, proteins, alkaloids and hormones. These are the derivatives of ammonia, obtained by the replacement of one, two or three hydrogen atoms by alkyl/aryl groups.

Amines are very reactive due to the difference in electronegativity between nitrogen and hydrogen atoms and due to the presence of unshared pair of electrons over N-atom. The number of hydrogen atoms attached to the N-atom decides the course of reactions of amine, that is why amines differ in many reactions. In aromatic amines like aniline, electron density at *ortho* and *para*-positions with respect to —NH_2 group is high. Therefore, this group is *ortho* or *para* directing and a powerful activating group

The following questions (i-iv) are multiple choice questions. Choose the most appropriate answer :

- (i) Carbylamine test is done for
- (a) detection of NO_2 group (b) confirming the presence of secondary amine
- (c) confirming the presence of primary amine (d) for confirming the basic nature of —NH_2 group

(ii) Aniline will not show which of the following reaction?

- (a) Isocyanide test
- (b) Diazotisation
- (c) Schotten Baumann reaction
- (d) Friedel-Crafts reaction

(iii) Which of the following on reduction with lithium aluminium hydride yields secondary amine?

- (a) Methyl cyanide
- (b) Nitroethane
- (c) Methyl isocyanide
- (d) Acetamide

Or

Which of the following amines cannot be prepared by Gabriel phthalimide synthesis?

- (a) Ethylamine
- (b) Isopropyl amine
- (c) Propylamine
- (d) Ethyl methyl amine

(iv) The solubility of water for $C_6H_5NH_2$ (I), $(C_2H_5)_2NH$ (II) and $C_2H_5NH_2$ (III) increases in the order.

- (a) $II < III < I$
- (b) $I < II < III$
- (c) $III < II < I$
- (d) $II < I < III$

2. Read the passage given below and answer the following questions : (1×4=4 Marks)

A battery or a cell is used in day-to-day life. It should be reasonably light, compact and its voltage should not vary various type of batteries are :

Primary cell A primary cell or battery is the one that cannot easily be recharged after one use and are discarded following discharge. These cell are not chargeable because the electrode reaction occurs only once and after the use over a period of time for batteries become dead and cannot be reused.

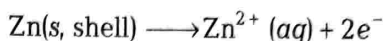
Secondary cell A secondary cell or battery is one that can be electrically recharged after its complete discharge. It is recharged by passing current through the circuit in the opposite direction to the current during discharge.

Fuel cell Fuel cells are another means by which chemical energy can be converted into electrical energy. Main disadvantage of a primary cell is that it can deliver current for short period of time only because, the quantity

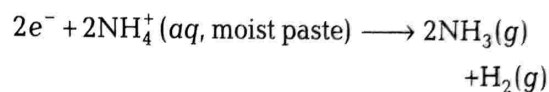
of oxidising and reducing agent is limited but energy can indefinitely be obtained from fuel cell as long as outside supply of fuel is maintained.

Primary Battery : The Leclanche Dry Cell

A flashlight battery, or dry cell, is constructed with a zinc shell that serves as the anode; a graphite rod which serves as the cathode and a moist mixture of ammonium chloride $[NH_4Cl]$, zinc chloride $[ZnCl_2]$, and manganese dioxide $[MnO_2]$. The half-reaction that occurs on the anode when the battery delivers current is the oxidation of zinc atoms.



The half-reaction that occurs simultaneously on the cathode is the reduction of ammonium ions :



In these questions (i-iv) a statement of Assertion followed by a statement of Reason is given. Choose the correct answer out of the following choices :

- (a) Assertion and Reason both are correct statements and Reason is correct explanation for Assertion.
- (b) Assertion and Reason both are correct statements but Reason is not correct explanation for Assertion.
- (c) Assertion is correct statement but Reason is incorrect statement.
- (d) Assertion is incorrect statement but Reason is correct statement.

(i) **Assertion** The cell potential of mercury cell is 1.35 V which remains constant.

Reason In mercury cell the electrolyte is a paste of KOH and HgO.

(ii) **Assertion** When a lead storage battery gets discharged, density of electrolyte present in it decreases.

Reason Lead and lead dioxide, both react with sulphuric acid to form lead sulphate.

(iii) **Assertion** H_2 and O_2 fuel cell is not preferred over the ordinary cell.

Reason These do not cause any pollution and its efficiency is 60 to 70%.

Or

Assertion A dry cell does not have a long life.

Reason Acidic $ZnCl_2$ corrodes the zinc container even when cell is not in use.

(iv) **Assertion** Lead storage battery is rechargeable.

Reason Reactions occurring in the battery are reversed by applying external voltage.

Multiple Choice Questions

Following questions (No. 3-11) are multiple choice questions carrying 1 mark each :

3. XeF_6 on complete hydrolysis gives
(a) Xe (b) $XeOF_2$ (c) XeO_2 (d) XeO_3
4. Carbon tetrachloride and chloroform belong to which of the following types :
(a) Negative deviation from Raoult's law
(b) Ideal solution
(c) Positive deviation from Raoult's law
(d) Azeotropic mixture

Or

The aqueous solution that has the maximum vapour pressure at a given temperature is

- (a) 0.1 molal sodium phosphate
(b) 0.1 molal barium chloride
(c) 0.1 molal sodium chloride
(d) 0.1 molal glucose
5. The oxidation states of some transition metals in their complex is given as follows:

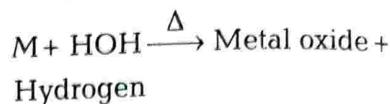
S. No.	Complex	Oxidation state of metal
1.	$[Fe(CN)_6]^{3-}$	+3
2.	$[PtCl_4]^{2-}$	+2
3.	$[Cu(NH_3)_4]^{2+}$	+2

The complex in which metal contains maximum number of unpaired electrons in *d*-subshell is

- (a) $[Fe(CN)_6]^{3+}$
(b) $[PtCl_4]^{2-}$
(c) $[Cu(NH_3)_4]^{2+}$
(d) All of the above contains same number of unpaired electrons

6. The number of monosaccharides formed when an oligosaccharide undergoes hydrolysis ranges between
(a) 1-10 (b) 2-10 (c) 4-10 (d) 5-10

7. Which of the following elements does not give the reaction?



- (a) Magnesium (b) Iron
(c) Sodium (d) Mercury

Or

The solubility of silver bromide in hypo solution is due to the formation of

- (a) $[Ag(S_2O_3)]^{3-}$ (b) Ag_2SO_3
(c) $[Ag(S_2O_3)]^-$ (d) $Ag_2S_2O_3$
8. Arrange Ce^{3+} , La^{3+} , Pm^{3+} and Yb^{3+} in increasing order of their ionic radii is
(a) $Yb^{3+} < Pm^{3+} < Ce^{3+} < La^{3+}$
(b) $Ce^{3+} < Yb^{3+} < Pm^{3+} < La^{3+}$
(c) $Yb^{3+} < Pm^{3+} < La^{3+} < Ce^{3+}$
(d) $Pm^{3+} < La^{3+} < Ce^{3+} < Yb^{3+}$

9. Which solid will have weakest intermolecular forces?

- (a) Phosphorus
(b) Ice
(c) Naphthalene
(d) Sodium fluoride

Or

Which of the following is true about the value of refractive index of quartz glass?

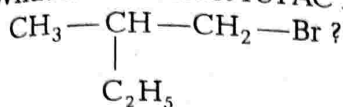
- (a) Same in all directions
(b) Different in different directions
(c) Cannot be measured
(d) Always zero
10. Which one of the following substance gives a positively charged sol?
(a) Gold
(b) A metal sulphide
(c) Ferric hydroxide
(d) Copper sulphate

Or

Which of the following is not a favourable condition for physical adsorption?

- (a) High pressure
- (b) Negative ΔH
- (c) Higher critical temperature of adsorbate
- (d) High temperature

11. What is the correct IUPAC name for



- (a) 1-bromo - 2 - ethyl propane
- (b) 1- bromo - 2 - ethyl - 2-methylpropane
- (c) 1- bromo - 2- methyl butane
- (d) 2- methyl - 1- bromobutane

Assertion and Reason

In the following questions (Q.No. 12-16) a statement of Assertion followed by a statement of Reason is given. Choose the correct answer out of the following choices.

- (a) Assertion and Reason both are correct statements and Reason is correct explanation for Assertion.
- (b) Assertion and Reason both are correct statements but Reason is not correct explanation for Assertion.
- (c) Assertion is correct statement but Reason is incorrect statement.
- (d) Assertion is incorrect statement but Reason is correct statement.

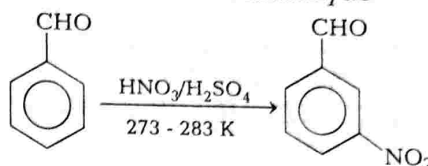
12. **Assertion** Coagulation power of Al^{3+} is more than Na^+ .

Reason Greater the valency of the flocculating ion added, greater is its power to cause precipitation (Hardy-Schulze rule).

13. **Assertion** \wedge_m for weak electrolytes shows a sharp increase when the electrolytic solution is diluted.

Reason For weak electrolytes, degree of dissociation increases with dilution of solution.

14. **Assertion** Benzaldehyde on nitration gives *meta* nitrobenzaldehyde



Reason Carbonyl group acts as a deactivating and *meta*-directing group.

15. **Assertion** Di- negative anion of S^{2-} is less common, whereas dinegative anion of O^{2-} is quite common.

Reason Covalency of oxygen is two.

16. **Assertion** All the octahedral complexes of Ni^{2+} must be outer orbital complexes.

Reason Outer orbital octahedral complexes are given by weak ligands.

Or

Assertion $\text{K}_2[\text{Ni}(\text{EDTA})]$ is more stable than $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$.

Reason Nickel is a transition metal while aluminium is a *p*-block element or non-transition element.

SECTION B : Short Answer Type I Questions (2 Marks)

17. In a pseudo first order hydrolysis of ester in water, the following results are obtained.

t (in sec)	0	30	60	90
[Ester]	0.55	0.31	0.17	0.085

Calculate the pseudo first order rate constant for hydrolysis of ester.

- (i) Why are reactions of higher molecularity less in number?
- (ii) Can activation energy for a reaction be zero?

18. Give reason for the following :

- (i) Low spin tetrahedral complexes are not formed.
- (ii) $[\text{Co}(\text{NH}_3)_6]^{3+}$ is an inner orbital complex, whereas $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ is an outer orbital complex.

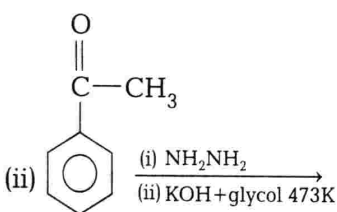
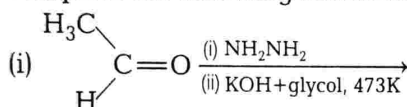
19. Resistance of a conductivity cell filled with 0.1 mol L^{-1} KCl solution is 100Ω . If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520Ω , calculate the conductivity and molar

conductivity of 0.02 mol L^{-1} KCl solution. The conductivity of 0.1 mol L^{-1} KCl solution is 1.29 S/m .

Or A current strength of 96.5 A is passed for 10 seconds through 1 L of a solution of 0.1 M aqueous CuSO_4 . Calculate the pH of the solution.

20. (i) What happens, when ozone is passed through acidified stannous chloride solution?
 (ii) Arrange the following in the order of property:
 (a) F_2 , Cl_2 , Br_2 , I_2 (increasing bond dissociation enthalpy)
 (b) HF , HCl , HBr , HI (increasing acidic strength)

21. Complete the following reactions :



22. Answer the following

- (i) What type of hybridisation takes place in xenon during the formation of XeF_4 ? What is its shape?

SECTION C : Short Answer Type II Questions (3 Marks)

26. Answer the following :

- (i) Define mutarotation and give one example.
 (ii) The two strands of DNA are not identical but are complementary. Explain.

Or Answer the following :

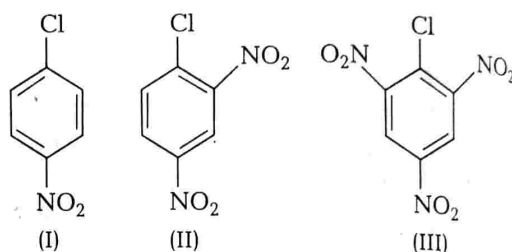
- (i) Write the product, when D-glucose reacts with conc. HNO_3 .
 (ii) Write one difference between α -helix and β -pleated structures of proteins.

- (ii) Write the balanced equation, when chlorine gas is passed into a solution of NaI in water.

23. Using valence bond theory, write electronic configuration of the central metal atom/ion and determine the magnetic moment value and hybridisation in the following complexes :



24. Aryl halides are extremely less reactive towards nucleophilic substitution. Predict and explain the order of reactivity of the following compounds towards nucleophilic substitution.



25. Calculate the potential of hydrogen electrode in contact with a solution whose pH is 10.

Or 0.01 m aqueous solution of $\text{K}_3[\text{Fe}(\text{CN})_6]$ freezes at -0.062°C . What is the apparent percentage of dissociation. K_f for water = $1.86 \text{ K kg mol}^{-1}$.

26. Answer the following :

- (i) Define mutarotation and give one example.
 (ii) The two strands of DNA are not identical but are complementary. Explain.

Or Answer the following :

- (i) Write the product, when D-glucose reacts with conc. HNO_3 .
 (ii) Write one difference between α -helix and β -pleated structures of proteins.

27. Give simple chemical tests to distinguish between following pairs of compounds.

- (i) Ethanal and propanal
 (ii) Phenol and benzoic acid

28. Vapour pressure of chloroform (CHCl_3) and dichloromethane (CH_2Cl_2) at 298 K are 200 mm Hg and 415 mm Hg , respectively.

- (i) Calculate the vapour pressure of the solution prepared by mixing 25.5 g of CHCl_3 and 40 g of CH_2Cl_2 at 298 K .

- (ii) Calculate the mole fractions of each component in vapour phase.

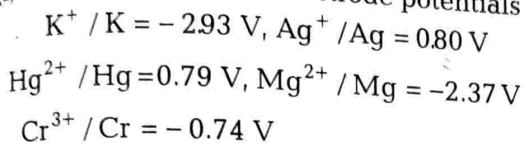
Or

Two liquids A and B form an ideal solution. At 300 K, the vapour pressure of a solution containing 1 mole of A and 3 moles of B is 500 mm of Hg.

At the same temperature, if one more mole of B is added to this solution, the vapour pressure of the solution increases by 10 mm of Hg. Calculate the vapour pressures of A and B in their pure states.

SECTION D : Long Answer Type Questions (5 Marks)

31. (i) Given the standard electrode potentials



Arrange these metals in their increasing order of reducing power.

- (ii) Calculate the emf of the following cell at 25°C



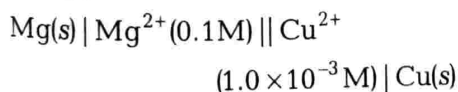
$$\text{Given, } E_{\text{cell}}^{\circ} = +0.46 \text{ V}$$

$$\text{and } \log 10^n = n$$

Or

- (i) If a reaction has an equilibrium constant $K < 1$, is E° positive or negative? What is the value of K , when $E^{\circ} = 0 \text{ V}$?

- (ii) Calculate the emf of the following cell at 298 K:



$$[\text{Given, } E_{\text{cell}}^{\circ} = 2.71 \text{ V}]$$

32. An organic compound A (C_8H_6) on reacting with dilute sulphuric acid containing mercuric sulphate gives a compound B which can also be obtained from the reaction of benzene and acid chloride in the presence of anhyd. $AlCl_3$.

29. Account for the following :

- Give the name and structure of the initial material used in the industrial preparation of phenol.
- Write complete reaction for the bromination of phenol in non-aqueous and aqueous medium.
- Explain, why Lewis acid is not required in bromination of phenol?

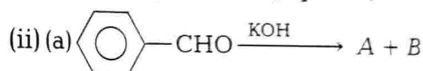
30. A compound forms hexagonal close packed structure. What is the total number of voids in 0.5 mole of it? How many of these are tetrahedral voids?

The compound B when treated with iodine and (aq) NaOH yields C and a yellow compound D.

Identify A, B, C and D with justification. Show how B is formed from A?

Or

- How will you convert the following into benzoic acid?
 - Ethyl benzene
 - Acetophenone
 - Phenylethene (styrene)



33. (i) For M^{2+} / M and M^{3+} / M^{2+} systems, E° values for some metals are as follows :

$$Cr^{2+} / Cr = -0.9 \text{ V}$$

$$Cr^{3+} / Cr^{2+} = -0.4 \text{ V}$$

$$Mn^{2+} / Mn = -1.2 \text{ V}$$

$$Mn^{3+} / Mn^{2+} = +1.5 \text{ V}$$

$$Fe^{2+} / Fe = -0.4 \text{ V}$$

$$Fe^{3+} / Fe^{2+} = +0.8 \text{ V}$$

Use this data to comment upon :

- The stability of Fe^{3+} in acid solution as compared to that of Cr^{3+} and Mn^{3+} .
- The ease with which iron can be oxidised as compared to the similar process for either Cr or Mn metals.

(ii) Describe the cause variation of following properties with respect to actinoids.

- (a) Electronic configuration
- (b) Oxidation states
- (c) Ionic size

Or

(i) Atomic radius of Cu is greater than that of Cr but ionic radius of Cr^{2+} is greater than that of Cu^{2+} . Give reason.

(ii) Explain the following trends in the properties of the members of the first series of transition elements.

- (a) Mn^{2+} is more stable than Fe^{2+} towards oxidation to +3 state.
- (b) The enthalpy of atomisation is lowest of Zn in 3d-series of the transition elements.
- (c) $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ is coloured while $[\text{Sc}(\text{H}_2\text{O})_6]^{3+}$ is colourless.