

LIONS SCHOOL MIRZAPUR  
HALF YEARLY EXAMINATION - 2020-21

CLASS - XII  
SUBJECT – CHEMISTRY (043)

TIME-3 HRS.  
M.M -70

GENERAL INSTRUCTIONS:-

Read the following instructions very carefully and strictly follow them:

- i. This question paper comprises four sections – A, B, C and D. These are 37 questions in the question paper. All questions are compulsory.
- ii. Section A- Q. No. 1 to 20 are very short answer type question , carrying 1 mark each.
- iii. Section B- Q. No. 21 to 27 are short answer type question , carrying 2 marks each.
- iv. Section C- Q. No. 28 to 34 are Long answer type question – I question, carrying 3 marks each.
- v. Section D- Q. No. 35 to 37 are Long answer type question – II question, carrying 5 marks each.
- vi. There is no overall choice in the question paper. However, an internal choice has been provided in 1 question of two marks, 1 question of three marks and all the 3 questions of five marks. You have to attend only one of the choices in such questions.
- vii. In addition to this, separate instructions are given with each section and questions, wherever necessary.
- viii. Use of calculator and log tables is not permitted.

SECTION – A

Q.1 Read the given passage and answer the questions (i) to (v) that follows:

The crystalline solid have definite orderly arrangement of their constituent particulars in three dimension known as lattice. The smallest repeating. Part in lattice is known as unit cell. The unit cell are described as simple cubic face centred and body centred unit cell. For the stable ionic crystalline structures, there is definite radius ratio limit for a cation to fit perfectly in the lattice of anion called radius ratio rule. This also defines the coordination number of an ion.

1X5=5

i) The number of atoms per unit cell in simple cubic (s), body centered (b) and face centred (f) unit cell is decreases as.

a)  $f > b > s$

b)  $s > b > f$

c)  $b > f > s$

d)  $f > b = s$

ii) Gold crystallises on a face centred unit cell. Its edge length is 0.410 nm. The radius of gold atom is:

a) 0.205 nm

b) 0.290 nm

c) 0.145 nm

d) 0.578 nm

iii) How does coordination number of ionic solids depends upon temperature and pressure?

iv) What is radius ratio for Tetrahedral, void?

v) What is percentage of vacant space in body centered cubic unit cell?

**Question No. 6 to 10 are one word answers: 1X5=5**

Q.6 Oxygen cylinders of scuba divers are diluted with which gas to avoid bends?

Q.7 Write mathematical expression of Kohlrausch law;

Q.8 Half – life of a reaction is independent of initial concentration of a reactant. What is the order of reaction?

Q.9 What is the sign of  $\Delta H$  and  $\Delta S$  for adsorption process?

Q.10 What is the shape of a molecule of  $\text{XeF}_2$ ?

**Question No. 11 to 15 are multiple choice questions: 1X5=5**

Q.11  $\text{XeF}_2$  is isostructural with:

a)  $\text{ICl}_2^-$                       b)  $\text{SbCl}_3$                       c)  $\text{BaCl}_2$                       d)  $\text{TeF}_2$

Q.12 Which of the following does not considered as transition elements?

a) Cd                      b) Pd                      c) Ag                      d) Ru

Q.13 What is the shape of  $\text{MnO}_4^-$  ion?

a) square planar    b) see-saw                      c) Tetrahedral                      d) square pyramidal

Q.14 Which of the following ligands gives Chelate complexes?

a)  $\text{SCN}^-$                       b)  $\text{C}_2\text{O}_4^{2-}$                       c) Pyridine                      d)  $\text{NH}_3$

Q.15 Of the following complex which one will show coordinator isomerism?

a)  $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{en})_3]$                       b)  $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_2$

c)  $[\text{Co}(\text{en})_2\text{Cl}_2]\text{Cl}$                       d)  $[\text{Cr}(\text{en})\text{Cl}_4]^-$

For question number 16 to 20, two statements are given – one labeled Assertion (A) and the other labeled Reason (R) Select the answer to these questions from the codes (i), (ii), (iii) and (iv) as given below: 1x5=5

(i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

(ii) Both Assertion (A) and Reason (R) are Correct Statements, but Reason (R) is not the correct explanation of the Assertion (A).

(iii) Assertion (A) is correct, but Reason (R) is incorrect statement.

(iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

Q.16 Assertion (A): a mixture of chloroform and acetone forms a solution with negative deviation from Raoult's law.

Reason (R): Chloroform forms hydrogen bonds with acetone.

Q.17 Assertion(A): Lithium ion is the weakest oxidizing agent.

Reason (R): Lithium has the lowest electrode potential.

- Q.18 Assertion (A) Order of a reaction is an experimental quantity.  
Reason (R): Order of a reaction can be zero and even a fraction.
- Q.19 Assertion (A): A colloid is a heterogeneous system.  
Reason (R): Colloidal particles have an enormous surface.
- Q.20 Assertion (A) Oxidation state of Fe in  $\text{Fe}(\text{CO})_5$  is zero.  
Reason (R) EAN of Fe in this complex is 36.

#### SECTION – B

- Q.21 A solution of glucose in water is labeled as 10 percent w/w. What would be the molality and mole fraction of each components in the solution? If the density of the solution is  $1.2 \text{ g mL}^{-1}$ ; what shall be the molarity of the solution? 2
- Q.22 Niobium Crystallizes in body – centred cubic structure. If density is  $8.55 \text{ g cm}^{-3}$ , calculate atomic radius of niobium using its atomic mass 93u. 2
- Q.23 For the reaction  $A \rightarrow B$ , the rate of reaction becomes three times when the concentration of A is increased by nine times; what is the order of reaction? 2
- Q.24 Distinguish between the meaning of the term adsorption and adsorption. Give one example of each. 2
- Q.25 a) How is  $\text{SO}_2$  an air pollutant? 1x2=2  
b) Why are halogens coloured?
- Q.26 Explain the following terms with suitable examples. 1x2=2  
i) Schottky defect ii) F-centres
- Q.27 What is the crystal field splitting energy? How does the magnitude of  $\Delta_0$  decide the actual configuration of d- orbitals in a coordination entity?

Or

Write the IUPAC names of the following coordination compounds. 1x2=2

- i)  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$  ii)  $\text{K}_3[\text{Fe}(\text{N})_6]$

#### SECTION - C

- Q.28 Suggest the most important type of intermolecular interaction in the following pairs: 3  
i) n-hexane and n- octane (ii)  $\text{I}_2$  and  $\text{CCl}_4$  (iii)  $\text{NaClO}_4$  and water  
iv) methanol and acetone (v) acetonitrile ( $\text{CH}_3\text{N}$ ) and acetone ( $\text{C}_3\text{H}_6\text{O}$ ).
- Q.29 Calculate the standard cell potentials of galvanic cell in which the reactions take place: 3  
i)  $2\text{Cr}(s) + 3\text{Cd}^{2+}(\text{aq}) \rightarrow 2\text{Cr}^{3+}(\text{aq}) + 3\text{Cd}(s)$   
ii)  $\text{Fe}^{2+}(\text{aq}) + \text{Ag}^+(\text{aq}) \rightarrow \text{Fe}^{3+}(\text{aq}) + \text{Ag}(s)$   
Given  $E_{\text{Cr}^{3+}/\text{Cr}}^0 = -0.74\text{V}$ ,  $E_{\text{Cd}^{2+}/\text{Cd}}^0 = -0.40\text{V}$ ,  
 $E_{\text{Ag}^+/\text{Ag}}^0 = 0.80\text{V}$ ,  $E_{\text{Fe}^{3+}/\text{Fe}^{2+}}^0 = 0.77\text{V}$

Calculate  $\Delta_r G^\circ$  and equilibrium constant of the reactions also.

Q.30 Explain the following terms: 3

- i) Electrophoresis                      ii) Coagulation                      iii) Dialysis

Q.31 Predict the products of electrolysis of the following: 3

- i). An aqueous solution of  $\text{AgNO}_3$  with silver electrodes.  
ii). An aqueous solution of  $\text{AgNO}_3$  with platinum electrodes.  
iii). A dilute aqueous solution of  $\text{H}_2\text{SO}_4$  with platinum.

Q.32 Describe the oxidizing action of potassium dichromate and write the ionic equations for its reaction with. 3

- i) iodine                      ii) iron (II) solution                      iii)  $\text{H}_2\text{S}$

Q.33 An element crystallizes in a bcc lattice with cell edge of 500 pm. The density of the element is  $7.5 \text{ cm}^{-3}$ . How many atoms are present in 300g of the element? 3

Q.34 Draw the structures of optical isomers of:-

- i)  $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$                       ii)  $[\text{PtCl}_2(\text{en})_2]^{2+}$                       iii)  $[\text{Cr}(\text{NH}_3)_2\text{Cl}_2(\text{en})]^+$  3

Or

Discuss the nature of bonding in the following coordination entities on the basis of valence bond theory:

- i)  $[\text{Fe}(\text{CN}_6)]^{4-}$                       ii)  $[\text{FeF}_6]^{3-}$                       iii)  $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$

#### SECTION – D

Q.35 a) Explain ideal and non ideal solution with example. 5

b) Calculate the depression in the freezing point of water when 10g of  $\text{CH}_3\text{CH}_2\text{CHClCOOH}$  is added to 250g of water;  $K_a = 1.4 \times 10^{-3}$ ,  $K_f = 1.86 \text{ K Kg mol}^{-1}$

Or

a) Define the following terms:

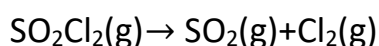
- i) Azeotrope                      ii) Osmotic pressure                      iii) Colligative properties

b) How many mL of a 0.1 M HCl are required to react completely with 1g mixture of  $\text{Na}_2\text{CO}_3$  containing equimolar amounts of the two?

Q.36a) Define the following terms:

- i) Pseudo first order reaction                      ii) Half life period of reaction ( $t_{1/2}$ )

b) The following data were obtained during the first order thermal decomposition of  $\text{SO}_2\text{Cl}_2$  at a constant volume:



Experiment	Time/second-1	Total pressure/atm
1	0	0.4
2	100	0.7

Calculate the rate constant.

(Given:  $\log 4 = 0.6021$ ,  $\log 2 = 0.3010$ )

Or

- a) Differentiate between rate of reaction and reaction rate constant.
- b) After 24 hrs, only 0.125 gm out of the initial quantity of a radioactive isotope remains behind. What is its half-life period?

Q.37a) Give the formula and describe the structure of a noble gas species which is isostructural with: 5

i)  $ICl_4^-$                       ii)  $IBr_2^-$

- b) Discuss the general characteristics of group 15 elements with reference to their electronic configuration, oxidation state, atomic size, ionization enthalpy and electronegativity.

Or

- a)
  - i) With what natural molecule is  $ClO^-$  isoelectronic? Is that molecule a Lewis base?
  - ii) How are  $XeO_3$  and  $XeOF_4$  prepared?
- b) Write balanced equations for the following:
  - i) NaCl is heated with sulphuric acid in the presence of  $MnO_2$ .
  - ii) Chlorine gas is passed into a solution of NaI in water.