PT-2/HALF YEARLY EXAMINATION, 2022-23

CHEMISTRY

Time – 3 hrs. **Class – XII** **M.M. : 70**

Date – 14.09.2022 (Wednesday)

Name of the student ____ **Section** _____

GENERAL INSTRUCTIONS:

- All questions are compulsory.
- Question nos. 1 to 21 are MCQs with one correct option and carrying 1 mark each.
- Question nos. 22 to 24 are objective/short answer type questions.
- Question nos. 25 to 28 are of 2 marks each.
- Question nos. 29 to 32 is of 3 marks each.
- Question nos. 33 to 35 is of 5 marks each.

SECTION - A

Q. 1 to 21 is of 1 mark each.

Q.1 Which of the following aqueous solution should have highest boiling point ?

a) 1 M NaOH b) 1 M Na_2SO_4 c) 1M NH_4NO_3 d) 1 M KNO_3

Q.2 Which of the following statement is false ?

a) Two different solution of sucrose of same molality prepare in different solvent will have the same depression in freezing point.

b) The osmotic pressure of a solution is given by the equation π=CRT. (where C is the molarity of the solution)

c) Decreasing order of osmotic pressure for 0.01M aqueous solution of Barium Chloride, Potassium chloride, acetic acid and sucrose is $BaCl_2$ > KCl > CH_3COOH > Sucrose

d) According to Raoult's Law, the vapour pressure exeterd by a volatile component of solution is directly proportional to its molar fraction in the solution.

Q.3 We have three aqueous solution of NaCl labelled as 'A', 'B' and 'C' with concentration 0.1 M, 0.01 M and 0.001 M respectively. The value of Van't Hoff factor for these solution will be in the order-

a) $i_A < i_B < i_C$ a) $i_A > i_B > i_C$ a) $i_A = i_B = i_C$ a) $i_A < i_B > i_C$

Q.4 On the basis of the information given below mark the correct options –

i) In bromoethane and chloroethane mixture intermolecular interaction of A-A and B-B type are nearly same as A-B type interaction.

ii) In the ethanol and acetone mixture A-A or B-B type intermolecular interactions are stronger than A-B type interaction.

iii) In chloroform and acetone mixture A-A or B-B type intermolecular interactions are weaker than A-B type interaction

a) solution (ii) and (iii) will follow Raoult's law

b) solution (i) will follow Raoult's law

c) solution (ii) will show negative deviation from Raoult's law

d) solution (iii) will show positive deviation from Raoult's law

Q.5 K_H valves for Ar(g), CO_2(g), HCHO(g) and CH_4(g) are 40.39, 1.67, 1.83 × 10^{-5} and 0.413 respectively. Arrange these gases in the order of their increasing solubility.

a) HCHO < CH_4 < CO_2 < Ar　　b) HCHO < CO_2 < CH_4< Ar

c) Ar < CO_2 < CH_4< HCHO　　b) Ar < CH_4 < CO_2 < HCHO

Q.6 Use the data given below, find out which of the following is the strongest oxidizing agent.

$E^0_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V$　　$E^0_{Cl_2/Cl^-} = 1.36V$

$E^0_{MnO_4^-/Mn^{2+}} = 1.51V$　　$E^0_{Cr^{3+}/Cr} = -0.74V$

a) Cl^-　　b) Mn^{2+}　　c) MnO_4^-　　d) Cr^{3+}

Q.7 The quantity of charge required to obtain 1 mole of Aluminium from Al_2O_3 is –

a) 1 F　　b) 6 F　　c) 3 F　　d) 2 F

Q.8 While charging the lead storage battery –

a) $PbSO_4$ anode is reduced to Pb　　b) $PbSO_4$ cathode is reduced to Pb

c) $PbSO_4$ cathode is oxidized to Pb　　d) $PbSO_4$ anode is oxidized to Pb

Q.9 $\wedge^0_M$ (NH4OH) is equal to –

a) $\wedge^0_M$ (NH_4OH) + $\wedge^0_M$ (NH_4Cl) - $\wedge^0_M$ (HCl)　　b) $\wedge^0_M$ (NH_4Cl) + $\wedge^0_M$ (NaOH) - $\wedge^0_M$ (NaCl)

c) $\wedge^0_M$ (NH_4Cl) + $\wedge^0_M$ (NaCl) - $\wedge^0_M$ (NaOH)　　d) $\wedge^0_M$ (NaOH) + $\wedge^0_M$ (NaCl) - $\wedge^0_M$ (NH_4Cl)

Q.10 Consider a first order gas phase decomposition reaction given below –

A(g) $\rightarrow$ B(g) + C(g)

The initial pressure of the system before decomposition of A was P_i. After lapse of time 't', total pressure of the system increased by x unit and become 'P_t'. The rate constant 'K' for the reaction is given as –

a) $K = \frac{2.303}{t}\log\left(\frac{P_i}{p_i - x}\right)$　　b) $K = \frac{2.303}{t}\log\left(\frac{P_i}{2p_i - P_t}\right)$

c) $K = \frac{2.303}{t}\log\left(\frac{P_i}{2p_i + P_t}\right)$　　d) $K = \frac{2.303}{t}\log\left(\frac{P_i}{p_i + x}\right)$

Q.11 Consider the Arrhenius equation given below and mark the correct option.

$K = Ae^{-Ea}/RT$

a) Rate constant increase exponentially with increasing activation energy and decreasing temperature.

b) Rate constant decrease exponentially with increasing activation energy and decreasing temperature.

c) Rate constant increase exponentially with decreasing activation energy and decreasing temperature.

d) Rate constant increase exponentially with decreasing activation energy and increasing temperature.

Q.12 Which of the following expression is correct for the rate of reaction given below –

$5Br^-(aq) + BrO_3^-(aq) + 6H^+ \rightarrow 3Br_2(g) + 3H_2O(l)$

a) $\frac{\Delta[Br^-]}{\Delta t} = 5\frac{\Delta[H^+]}{\Delta t}$

b) $\frac{\Delta[Br^-]}{\Delta t} = \frac{6}{5}\frac{\Delta[H^+]}{\Delta t}$

c) $\frac{\Delta[Br^-]}{\Delta t} = \frac{5}{6}\frac{\Delta[H^+]}{\Delta t}$

d) $\frac{\Delta[Br^-]}{\Delta t} = 6\frac{\Delta[H^+]}{\Delta t}$

Q.13 A first order reaction is 50% completed in 1.26×10^{14} sec. How much time would it takes for 100% completion ?

a) 1.26×10^{15} sec b) 2.52×10^{25} sec c) 2.52×10^{14} sec d) Infinite

Q.14 On addition of small amount of $KMnO_4$ to connected H_2SO_4 a green oily compound is obtained which is highly explosive in nature. Identify the compound from the following :

a) Mn_2O_7 b) MnO_2 c) $MnSO_4$ d) Mn_2O_3

Q.15 Which of the following are not disproportionation reactions ?

1. $Cu^+ (aq) \rightarrow Cu^{2+} (aq) + Cu(s)$

2. $3MnO_4^- + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

3. $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$

4. $2MnO_4^- + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H^+$

a) 1 & 3 b) 1, 2, & 3 c) 2, 3, 4 d) 1 & 4

Q.16 Gadolinium belong to 4f-series. It's atomic number is 64. Which of the following is correct electronic configuration of gadolinium ?

a) [Xe] $4f^7 5d^1 6s^2$ b) [Xe] $4f^6 5d^2 6s^2$ c) [Xe] $4f^8 6d^2$ d) [Xe] $4f^9 5s^1$

Q.17 Why HCl not used to make the medium acidic in oxidation reaction of $KMnO_4$ in acidic medium ?

a) Both HCl and $KMnO_4$ act as oxidising agents.

b) $KMnO_4$ oxidises HCl into Cl_2 which is also an oxidising agent.

c) $KMnO_4$ is weaker oxidising agent than HCl

d) $KMnO_4$ act as reducing agent in the presence of HCl.

Q.18 When 1 mole of $CrCl_3.6H_2O$ is treated with excess of $AgNO_3$, 3 mole of AgCl are obtained. The formula of the complex is -

a) $[CrCl_3(H_2O)_3].3H_2O$ b) $[CrCl(H_2O)_5]Cl_2.H_2O$

c) $[CrCl_2(H_2O)_4]Cl.2H_2O$ d) $[Cr(H_2O)_6]Cl_3$

Q.19 Indicate the complex ion which shows Geometrical Isomexism.

a) $[Cr(H_2O)_4Cl_2]^+$ b) $[Co(NH_3)_6]^{3+}$ c) $[Pt(NH_3)_3Cl]$ d) $[Cr(CN)_5(NC)]^{3-}$

Q.20 What kind of isomerism exist between $[Cr(H_2O)_6]Cl_3$ (violet) and $[Cr(H_2O)_5Cl]Cl_2.H_2O$ (greyish-Green)

a) Linkage isomerism b) Ionisation Isomerism

c) Hydrate isomerism d) Coordination Isomerism

Q.21 IUPAC name of $[Pt(NH_3)_2Cl\ (NO_2)]$ is

a) Platinum diaminechloronitrite b) Chloronitrito-N-ammineplatinum (II)

c) Diamminechlorido nitrito-N-platinum (II) d) Diammine chlorido nitrito-N-Platinate(II)

Q.22 Fill in the blanks. (1x4=4)

a) The coordination number of the central atom in $[Cr(en)_3]^{3+}$ is ___________

b) The oxidation number of Cr in CrO_5 is ___________

c) The order of the reaction $H_2+Cl_2 \rightarrow 2HCl$ is ___________

d) The electrolyte used for primary cell (Dry cell) is ___________

Q.23 Match the following. (1x6=6)

A	B
a) Ebulioscopic constant	i) High efficiency
b) Cryoscopic constant	ii) CrO_3
c) Rusting of Iron	iii) Fe_2O_3
d) Fuel cell	iv) Elevation in boiling point
e) Acidic oxide	v) Mn_2O_7
f) Amphoteric oxide	vi) Electrochemical process
	vii) Depression in freezing point
	viii) Osmotic pressure
	ix) Primary cell

Q.24 Define the following – (1x4=4)

a) Activation energy b) Pseudo first order reaction

c) Ambidentate ligand e) Ionisation isomers

SECTION - B

Q.25 to 28 is of 2 marks each.

Q.25 Write the geometrical isomers of the compound $[Cr(NH_3)_4Cl_2]^+$ will they show optical isomerism. Justify your answer ?

Q.26 Draw the shape of following ions.

a) CrO_4^{-2} b) $Cr_2O_7^{-2}$ c) MnO_4^- d) MnO_4^{-2}

Q.27 a) Draw a graph for log A vs t for a 1st order reaction (A $\rightarrow$ product)

b) Draw a graph for $t_{1/2}$ vs $[A_0]$ for a zero order reaction.

Q.28 Define the following -

a) Osmotic pressure b) Anoxia

SECTION – C

Q.29 to 32 is of 3 marks each.

Q.29 Write IUPAC name of the following -

a) $[Co(NH_3)_5\,(ONO)]^{2+}$ b) $K_3[Cr(C_2O_4)_3]$ c) $[Fe(NH_3)_4\,Cl\,(NO_2)]Cl$

Q.30 a) Why mercury cell gives constant voltage throughout its life? Explain with reactions.

b) How many columbs of electricity is required for the following 20gm Ca from Ca^{2+} ions. (Ca = 40)

Q.31 a) State and explain Kohlrausch's law with a suitable example.

b) What is 'Sacrificial electrode'? Explain with an example.

Q.32 Calculate log Kc for the reaction at 298 K and also ΔG^0.

$Cu(s) + 2Ag^+(aq) \rightarrow Cu^{2+}\,(aq) + 2Ag(s)$

(given $E^0_{Ag^+/Ag} = 0.80V$ and $E^0_{Cu^{2+}/Cu} = 0.34V$)

SECTION – D

Q.33 a) What mass of NaCl (MW = 58.5 gm) must be dissolved in 65 gm of water to lower the freezing point by 7.5^0C (K_f = 1.86 K kg $mole^{-1}$) (i for NaCl = 1.87) (2½)

b) In a solvent 50% of an acid HA dimerises and rest dissociates. What is the Vant Hoff factor of acid? (2½)

OR

a) A solution contains 0.8960 gm of K_2SO_4 (MW=174) in 500 m of solution. Its osmotic pressure is found to be 0.69 atm. at 27^0C. Calculate the value of Van't Hoff factor. (2)

b) A solution containing 15 gm urea (MW=60) per litre of solution in water has same osmotic pressure as a solution of glucose (MW=180) in water calculate the mass of glucose present in one litre of its solution. (2)

c) What is edema ? (1)

Q.34 a) A time required for 10% completion of a 1st order reaction at 300K is equal to that required for its 25% completion at 310K. If the value of A is $4\times10^{10}\ s^{-1}$. Calculate log K at 320K and Ea. (log 3 = 0.4771, log2 = 0.3010, log2.73 = 0.436) (3)

b) Answer the following. (2)

i) Give an example of fractional order reaction.

ii) Rate determing step of a reaction.

OR

The following data were obtained during the 1st order thermal decomposition of SO_2Cl_2 at a constant volume - (2½)

$SO_2Cl_2(g) \rightarrow SO_2(g) + Cl_2(g)$

Expt.	(Time/sec)	Total pressure (in atm.)
1.	0	0.5
2	100	0.6

Calculate the rate of reaction when total pressure is 0.65 atm. (log 5 = 0.6990, log 4 = 0.6021)

b) The decomposition of A $\rightarrow$ product has a value of K as $4.5\times10^{3}\ s^{-1}$ at 10^{0}C and energy of activation 60 KJ/mole. At what temperature would K be $1.5\times10^{4}\ s^{-1}$. (2½)

Q.35 Give reason for the following -

a) (i) Cobalt (II) is stable in aqueous solution but in the pressure of complexing reagent it is easily oxidised. (3)

(ii) Cr^{+2} is strongly reducing while Mn^{+3} is strongly oxidising.

(iii) Δ_a H of transition metal is very high.

b) Write balance chemical reaction of the following- (2)

i) $Cr_2O_7^{-2} + I^- \rightarrow$ (In acid medium)

ii) $MnO_4^- + C_2O_4^{-2} \rightarrow$ (In acid medium)

OR

Give reason for the following. (1x5=5)

a) A transition metal exhibits highest oxidation states in oxides and fluorides.

b) The atomic size of Zr and Hf is almost same.

c) Among all the 1st row transition elements only $E^0{}_{Cu^{2+}/Cu}$ is +ve

d) Complete and balance the following equation –

(i) $MnO_4^- + SO_2 \rightarrow$ (In acid medium)

(ii) $MnO_4^- + I^- + H_2O \rightarrow$