

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 Na₂SO₄ c) 1M NH₄NO₃ d) 1 M KNO₃

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 $\pi = CRT$. (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 BaCl₂ > KCl > CH₃COOH > 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 values for Ar(g), CO₂(g), HCHO(g) and CH₄(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 < CH₄ < CO₂ < Ar

b) HCHO < CO₂ < CH₄ < Ar

c) Ar < CO₂ < CH₄ < HCHO

b) Ar < CH₄ < CO₂ < 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) Mn²⁺

c) MnO₄⁻

d) Cr³⁺

Q.7 The quantity of charge required to obtain 1 mole of Aluminium from Al₂O₃ is –

a) 1 F

b) 6 F

c) 3 F

d) 2 F

Q.8 While charging the lead storage battery –

a) PbSO₄ anode is reduced to Pb

b) PbSO₄ cathode is reduced to Pb

c) PbSO₄ cathode is oxidized to Pb

d) PbSO₄ anode is oxidized to Pb

Q.9 Δ^0_M (NH₄OH) is equal to –

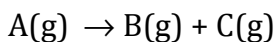
a) Δ^0_M (NH₄OH) + Δ^0_M (NH₄Cl) - Δ^0_M (HCl)

b) Δ^0_M (NH₄Cl) + Δ^0_M (NaOH) - Δ^0_M (NaCl)

c) Δ^0_M (NH₄Cl) + Δ^0_M (NaCl) - Δ^0_M (NaOH)

d) Δ^0_M (NaOH) + Δ^0_M (NaCl) - Δ^0_M (NH₄Cl)

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



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 –

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

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

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

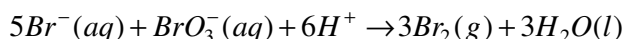
$$d) K = \frac{2.303}{t} \log \left(\frac{P_i}{p_i + x} \right)$$

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

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

- 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 –



- 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.

SECTION - B

Q.25 to 28 is of 2 marks each.

Q.25 Write the geometrical isomers of the compound $[\text{Cr}(\text{NH}_3)_4\text{Cl}_2]^+$ will they show optical isomerism. Justify your answer ?

Q.26 Draw the shape of following ions.

- a) CrO_4^{2-} b) $\text{Cr}_2\text{O}_7^{2-}$ c) MnO_4^- d) MnO_4^{2-}

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

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) $[\text{Co}(\text{NH}_3)_5(\text{ONO})]^{2+}$ b) $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3]$ c) $[\text{Fe}(\text{NH}_3)_4\text{Cl}(\text{NO}_2)]\text{Cl}$

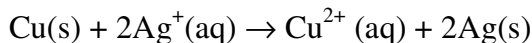
Q.30 a) Why mercury cell gives constant voltage throughout its life? Explain with reactions.

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

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 $\log K_c$ for the reaction at 298 K and also ΔG^0 .



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

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 ($K_f = 1.86 \text{ K kg mole}^{-1}$) (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 ml of solution. Its osmotic pressure is found to be 0.69 atm. at 27^0C . Calculate the value of Van't Hoff factor. (2)

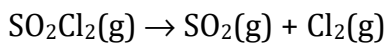
b) A solution containing 15 gm urea (MW=60) per litre of solution in water has same osmotic pressure as a solution of glucose (MW=180) in water calculate the mass of glucose present in one litre of its solution. (2)

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 $4 \times 10^{10} \text{ s}^{-1}$. Calculate $\log K$ at 320K and E_a . ($\log 3 = 0.4771$, $\log 2 = 0.3010$, $\log 2.73 = 0.436$) (3)
- b) Answer the following. (2)
- Give an example of fractional order reaction.
 - Rate determining 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)



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

Q.35 Give reason for the following -

- Cobalt (II) is stable in aqueous solution but in the presence of complexing reagent it is easily oxidised. (3)
 - Cr^{+2} is strongly reducing while Mn^{+3} is strongly oxidising.
 - $\Delta_a H$ of transition metal is very high.
- Write balanced chemical reaction of the following- (2)
 - $\text{Cr}_2\text{O}_7^{2-} + \text{I}^- \rightarrow$ (In acid medium)
 - $\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} \rightarrow$ (In acid medium)

OR

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

- A transition metal exhibits highest oxidation states in oxides and fluorides.
- The atomic size of Zr and Hf is almost same.
- Among all the 1st row transition elements only $E^0_{\text{Cu}^{2+}/\text{Cu}}$ is +ve
- Complete and balance the following equation -
 - $\text{MnO}_4^- + \text{SO}_2 \rightarrow$ (In acid medium)
 - $\text{MnO}_4^- + \text{I}^- + \text{H}_2\text{O} \rightarrow$

