ROLL NUMBER				

SET	1

QP.Code:043/01/1

INDIAN SCHOOL MUSCAT
PRE-BOARD EXAMINATION 2022-23
CHEMISTRY(043)

CLASS : XII
DATE: 08-01-2023

TIME ALLOTED : 3 HRS.
MAXIMUM MARKS:70

GENERAL INSTRUCTIONS:

a) Read the following instructions carefully.
b) There are 35 questions in this question paper with internal choice.
c) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
d) SECTION B consists of 7 very short answer questions carrying 2 marks each.
e) SECTION C consists of 5 short answer questions carrying 3 marks each.
f) SECTION D consists of 2 case- based questions carrying 4 marks each.
g) SECTION E consists of 3 long answer questions carrying 5 marks each.
h) All questions are compulsory.

SECTION A

The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. The amount of solute (molecular mass 60 g/mol) that must be added to 180 g water so that vapour pressure of water is lowered by 10% 1

(a) 30 g (b) 60g (c)120g (d)12g

2. The cell constant of a conductivity cell _____ 1

(a) changes with change of electrolyte.
(b) changes with change in concentration of electrolyte.
(c) changes with temperature of electrolyte.
(d) remains constant for a cell

3. The hydrogen electrode is dipped in a solution of pH 3 at 298 K. The potential of the electrode would be; 1

(a) 0.177V (b) - 0.087V (c) -0.177V (d) 0.059V

4. Transition elements form alloys because 1

(a) Similar electronic configuration

(b) Nearly same atomic size

(c) Presence of d orbitals

(d) Paramagnetic nature

5. Which of the following is a diamagnetic ion: (Atomic numbers of Sc, V, Mn and Cu are 21, 23, 25 and 29 respectively) 1

(a) V^{2+} (b) Sc^{3+} (c) Cu^{2+} (d) Mn^{3+}

6. One mole of ethyl acetate on treatment with an excess of $LiAlH_4$ in dry ether and subsequent acidification produces 1

(a) 1 mole acetic acid + 1 mole ethyl alcohol

(b) 1 mole ethyl alcohol + 1 mole methyl alcohol

(c) 2 moles of ethyl alcohol

(d) 1 mole of butan-2-ol

7. Phenol reacts with which one of the following reagents to give a conjugated diketone ? 1

(a)H_3PO_4 (b) $Na_2Cr_2O_7, H_2SO_4$ (c) Zn/Δ (d)Con HNO_3

8. Choose the acid with highest value of K_a: 1

(a) FCH_2COOH (b) $ClCH_2COOH$ (c) $BrCH_2COOH$ (d)ICH_2COOH

9. Acid anhydrides on reaction with primary amine gives_____ 1

(a) Amide (b)Imide (c)Secondary amine (d) imine

10. In the acetylation of glucose, which group is involved in the reaction 1

(a) CHO group (b) >C = O group (c) alcoholic OH group (d) all of these

11. Match the vitamins given in column I with the deficiency diseases caused by it given in column II and mark the appropriate choice 1

i)Vitamin A	p) Scurvy
ii)Vitamin C	q) Pernicious anemia
iii)Vitamin B_{12}	r) Xerophthalmia
iv)Vitamin D	s) Rickets

(a) i-s,ii-r,iii-p,iv-q (b) i-p,ii-s,iii-r,iv-q (c) i-q,ii-p,iii-s,iv-r (d)i-r,ii-p,iii-q,iv-s

12. The correct order for the CFSE (numerical value) for the following complexes is 1

P=$[CoF_6]^{3-}$ Q=$[Co(CN)_6]^{3-}$ R=$[Co(NH_3)_6]^{3+}$ S=$[Co(H_2O)_6]^{3+}$

(a) P > Q > R > S (b) S > R > P > Q (c) R > Q > P > S (d) Q > R > S > P

13. Which of the following is not an example of fibrous protein? 1

(a) Keratin (b) Albumin (c) Collagen (d) Myosin

14. Which of the following alkyl halides will undergo S_N1 reaction most readily? 1

(a) $(CH_3)_3C$-Cl (b) $(CH_3)_3C$-I (c) $(CH_3)_3C$-Br (d) $(CH_3)_3C$-F

Question numbers15 to18 are two statements labelled as Assertion (A) and Reason (R). Select the most appropriate answer from the options given below:

A. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is not the correct explanation of A.
C. A is true but R is false.
D. A is false but R is true.

15. Assertion(A): The cell potential of mercury cell is 1.35V, which remains constant. 1
Reason(R) : In mercury cell ,the electrolyte is a paste of KOH and ZnO.

16. Assertion(A) : Transition metals show variable valency. 1
Reason(R): There is large energy difference between the ns and (n-1)d electrons

17. Assertion(A) :S_N1 mechanism is facilitated by polar protic solvents like water,alcohol etc 1
Reason(R):$C_6H_5CHC_6H_5Br$ is less reactive than $C_6H_5CH(CH_3)Br$ in S_N1 reactions.

18. Assertion (A): Alpha amino acids exist as zwitter ion . 1

Reason (R): Alpha amino acids are the building block of protein.

SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

19. A 0.01 m aqueous solution of $AlCl_3$ freezes at – 0.068 ^{0}C. Calculate the degree of dissociation. [Given : K_f for Water = 1.86 K kg mol^{-1}] 2

20. Convert 2

(i) Ethanol to but-2-enal

(ii) Benzoyl chloride to benzaldehyde

OR

Complete the following:

i) $CH_3MgBr + CO_2 \xrightarrow[H_3O^+]{\text{Dry ether}}$

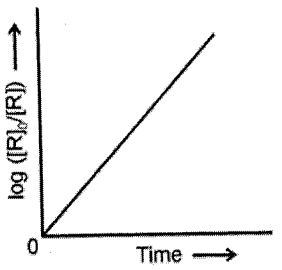
ii) $CH_3CH_2COOH + Br_2 \xrightarrow{\text{Red Phosphorus}}$

21. (a) For a reaction A+B $\rightarrow$P, the rate is given by Rate = k[A][B]^2. How is the rate of reaction affected if the concentration of B is doubled? 2

(b) What do you mean by collision frequency?

OR

Observe the following graph and answer the following questions



(i) What is the order of the reaction?

(ii) What is the slope of the graph?

22. (a) Write the reaction for catalytic reduction of nitrobenzene followed by reaction of product so formed with bromine water. 2

(b) Write the IUPAC name of CH_2=CHCH(CH_3)NH(CH_3)

23. Write the names of reagents for the following conversions: 2

(a) Benzene to Phenol.

(b) Phenol to Anisole.

24. (a) What is essentially the difference between α-form and β-form of glucose? 2

(b) Write a reaction which shows that all the carbon atoms in glucose are linked in a straight chain.

25. Define the following terms 2

(i) Isoelectric point

(ii) Phosphodiester linkage

SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each

26. (a) Write the cell reaction which occur at cathode and anode in the lead storage battery while in use. 3

(b) Molar conductivity of CH_3COOH increases on dilution. Why?

27. What happens when 3

(i) n-butyl chloride is treated with alcoholic KOH.

(ii) bromobenzene is treated with Mg in the presence of dry ether.

(iii)methyl bromide is treated with sodium in the presence of dry ether.

28. Resistance of a conductivity cell filled with 0.1 mol L^{-1} KCl solution is 100 ohm. If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520 ohm , 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 1.29×10^{-2} ohm^{-1} cm^{-1} . 3

OR

(a) Determine the value of equilibrium constant for the following reaction:

$$Ni(s) + 2Ag^{+}(aq) \longrightarrow Ni^{2+}(s) + 2Ag(s), E^{\circ} = 1.05\ V$$

(b) Calculate the time to deposit 1.27 g of copper at cathode when a current of 2 A was passed through the solution of $CuSO_4$.

(Molar mass of Cu = 63.5 g mol^{-1}, 1 F = 96500 C mol^{-1})

29. Write the structures of main products when benzene diazonium chloride reacts with the following reagents: (Answer any three) 3

(i) H_3PO_2 /H_2O

(ii) HBF_4 / Δ

(iii)Cu_2Cl_2

(iv)C_6H_5OH/OH^-

30. Write the mechanism of acid catalyzed dehydration of ethanol to yield ethene. 3

OR

Explain why

(i) Preparation of ethers by acid-catalyzed dehydration of secondary and tertiary alcohols is not a suitable method.

(ii) Phenol is more acidic than methanol.

(iii)The C—O—H bond angle in alcohols is slightly less than the tetrahedral angle.

SECTION D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

31. The transition metals are elements with partially filled d orbitals, located in the d-block of the periodic table. The reactivity of the transition elements varies widely from very active metals such as scandium and iron to almost inert elements, such as the platinum metals. The type of chemistry used in the isolation of the elements from their ores depends upon the concentration of the element in its ore and the difficulty of reducing ions of the elements to the metals. Metals that are more active are more difficult to reduce. Transition metals exhibit chemical behavior typical of metals. For example, they oxidize in air upon heating and react with elemental halogens to form halides. Those elements that lie above hydrogen in the activity series react with acids, producing salts and hydrogen gas. Oxides, hydroxides, and carbonates of transition metal compounds in low oxidation states are basic. Halides and other salts are generally stable in water, although oxygen must be excluded in some cases. Most transition metals form a variety of stable oxidation states, allowing them to demonstrate a wide range of chemical reactivity. 4

(a) Arrange the following in increasing order of acidic character: CrO_3, CrO, Cr_2O_3.

(b) Name the oxo metal anion of the first series of the transition metals in which the metal exhibits the oxidation state equal to its group number.

(c) Represent the reactions of $K_2Cr_2O_7$ With

(a) KI Solution (ii) $FeSO_4$ Solution with the help of balanced chemical equation .

OR

Which is more stable Eu^{2+} or Ce^{2+} and why?

32. The chemical structures of the solute and solvent dictate the types of forces possible and, consequently, are important factors in determining solubility. For example, under similar conditions, the water solubility of oxygen is approximately three times greater than that of helium, but 100 times less than the solubility of chloromethane. Considering the role of the solvent's chemical structure, note that the solubility of oxygen in the liquid hydrocarbon hexane, C_6H_{14}, is approximately 20 times greater than it is in water. Other factors also affect the solubility of a given substance in a given solvent. Temperature is one such factor, with gas solubility typically decreasing as temperature increases.This is one of the major impacts resulting from the thermal pollution of natural bodies of water. When the temperature of a river, lake, or stream is raised abnormally high, usually due to the discharge of hot water from some industrial process, the solubility of oxygen in the water is decreased. 4

(a) K_H (kbar) values for Ar (g),CO_2 (g), HCHO(g) and CH_4(g) are 40.39, 1.67,1.83x10 $^{-5}$ and 0.413 respectively. Arrange these gases in the order of their increasing solubility.

(b) An unknown gas 'X' is dissolved in water at 2.5 bar pressure and has mole fraction 0.04 in solution. What is the mole fraction of 'X' gas when the pressure of gas is doubled at the same temperature ?

(c) $PtCl_4 .6H_2O$ can exist as a hydrated complex. 1.0 molal aqueous solution has depression in freezing point of 3.72°C. Assume 100% ionization and K_f of water = 1.86°C mol^{-1} kg. Write the formula of the complex.

OR

Write any two applications of Henry's law.

SECTION E

The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

33. (a) Illustrate the following reactions giving suitable example in each case. 5

(i)Clemmensen reduction (ii) Cannizzaro reaction (iii) Gattermann-Koch reaction

(b) Arrange the following in increasing order of their reactivity towards nucleophilic addition reactions

CH_3COCH_3, CH_3CHO, HCHO, $C_6H_5COCH_3$

(c) Give the chemical test to distinguish between formic acid and benzoic acid.

34. (a) Define the following 5

(i) Pseudo first order reaction

(ii) Rate constant

(b) Show that in a first order reaction, time required for completion of 99.9% is 10 times of half-life ($t_{1/2}$) of the reaction.

(c) The rate constant for a reaction of zero order in A is 0.0030 mol L^{-1} s^{-1}. How long will it take for the initial concentration of A to fall from 0.10 M to 0.075 M.

OR

(a) Write any two characteristics of catalysts.

(b) What do you mean by most probable kinetic energy?

(c) The decomposition of A into products has a value of k as 4.5×10^3 s^{-1} at 10^0 C and energy of activation 60 kJ mol^{-1} . At what temperature would k be 1.5×10^4 s^{-1} ?

(R=8.314 $JK^{-1}mol^{-1}$ log4.5=0.6532 log1.5=0.1761

35. (a) Draw the meridional isomer of $[Co(NH_3)_3Cl_3]$ 5

(b) Write the IUPAC name of the coordination complex: $K_2[Zn(OH)_4]$

(c) Calculate the spin only magnetic moment of $[Fe(CN)_6]^{3-}$ ion.

(d) Explain why $[Co(NH_3)_6]^{3+}$ is an inner orbital complex whereas $[Ni(NH_3)_6]^{2+}$ is an outer orbital complex.

OR

(a) When one mole of $CoCl_3.5NH_3$ was treated with excess of silver nitrate solution, 2 mol of AgCl was precipitated. Write the formula of the compound.

(b) Write the formula of Diamminechloridonitrito-N-platinate(II).

(c) On the basis of crystal field theory, write the electronic configuration for d^7 ion if $\Delta o > P$.

(d) Explain why$[Ti(H_2O)_6]_3Cl_3$ is coloured.

(e) Write any two factors which affect crystal field splitting energy.

******END OF THE QUESTION PAPER******

ROLL NUMBER					

SET	2

QP.Code:043/01/2

INDIAN SCHOOL MUSCAT
PRE-BOARD EXAMINATION 2022-23
CHEMISTRY(043)

CLASS : XII
DATE: 08-01-2023

TIME ALLOTED : 3 HRS.
MAXIMUM MARKS:70

GENERAL INSTRUCTIONS:

a) Read the following instructions carefully.
b) There are 35 questions in this question paper with internal choice.
c) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
d) SECTION B consists of 7 very short answer questions carrying 2 marks each.
e) SECTION C consists of 5 short answer questions carrying 3 marks each.
f) SECTION D consists of 2 case- based questions carrying 4 marks each.
g) SECTION E consists of 3 long answer questions carrying 5 marks each.
h) All questions are compulsory.

SECTION A

The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. The hydrogen electrode is dipped in a solution of pH 2 at 298 K. The potential of the electrode would be 1

(a) 0.177V (b) - 0.118V (c) -0.177V (d) 0.059V

2. Which of the following alkyl halides will undergo S_N1 reaction most readily? 1

(a) $(CH_3)_3C$-Cl (b) $(CH_3)_3C$-I (c) $(CH_3)_3C$-Br (d) $(CH_3)_3C$-F

3. Match the vitamins given in column I with the deficiency diseases caused by it given in column II and mark the appropriate choice 1

i)Vitamin A	p) Scurvy
ii)Vitamin C	q) Pernicious anemia
iii)Vitamin B_{12}	r) Xerophthalmia
iv)Vitamin D	s) Rickets

(a) i-s,ii-r,iii-p,iv-q (b) i-p,ii-s,iii-r,iv-q (c) i-q,ii-p,iii-s,iv-r (d)i-r,ii-p,iii-q,iv-s

4. The correct order for the CFSE (numerical value) for the following complexes is 1

$P=[CoF_6]^{3-}$ $Q=[Co(CN)_6]^{3-}$ $R=[Co(NH_3)_6]^{3+}$ $S=[Co(H_2O)_6]^{3+}$

(a) P > Q > R > S (b) S > R > P > Q (c) R > Q > P > S (d) Q > R > S > P

5. Which of the following ions will exhibit colour in aqueous solutions? 1

(a) La^{3+} (Z = 57) (b) Ni^{2+} (Z = 28) (c) Lu^{3+} (Z = 71) (d) Sc^{3+} (Z = 21)

6. The cell constant of a conductivity cell _____ 1

(a) changes with change of electrolyte.

(b) changes with change in concentration of electrolyte.

(c) changes with temperature of electrolyte.

(d) remains constant for a cell

7. Phenol is prepared commercially from : 1

(a) Benzyl alcohol (b) Ethyl benzene (c) Toluene (d) Isopropyl benzene

8. Transition elements form alloys because, 1

(a) Similar electronic configuration

(b) Nearly same atomic size

(c) Presence of d orbitals

(d) Paramagnetic nature

9. Which of the following compound is most basic? 1

(a) Benzylamine (b) Diphenylamine (c) Triphenylamine (d) Aniline

10. The amount of solute (molecular mass 60 g/mol) that must be added to 180 g water so that vapour pressure of water is lowered by 10% 1

(a) 30 g (b) 60g (c)120g (d)12g

11. One mole of ethyl acetate on treatment with an excess of $LiAlH_4$ in dry ether and subsequent acidification produces 1

(a) 1 mole acetic acid + 1 mole ethyl alcohol

(b) 1 mole ethyl alcohol + 1 mole methyl alcohol

(c) 2 moles of ethyl alcohol

(d) 1 mole of butan-2-ol

12. Choose the acid with highest value of pK_a: 1

(a) FCH_2COOH (b) $ClCH_2COOH$ (c) $BrCH_2COOH$ (d)ICH_2COOH

13. Which one of the amino acids can be synthesised in the body? 1

(a) Alanine (b) Lysine (c) Valine (d) Histidine

14. In the acetylation of glucose, which group is involved in the reaction 1

(a) CHO group (b) >C = O group (c) alcoholic OH group (d) all of these

Question numbers 15 to 18 are two statements labelled as Assertion (A) and Reason (R). Select the most appropriate answer from the options given below:

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

15. Assertion(A) : Transition metals show variable valency. 1

Reason(R): There is large energy difference between the ns and (n-1)d electrons

16. Assertion(A) :S_N1 mechanism is facilitated by polar protic solvents like water,alcohol etc 1

Reason(R):$C_6H_5CHC_6H_5Br$ is less reactive than $C_6H_5CH(CH_3)Br$ in S_N1 reactions.

17. Assertion (A): Alpha amino acids exist as zwitter ion . 1

Reason (R): Alpha amino acids are the building block of protein

18. Assertion(A): The cell potential of mercury cell is 1.35V, which remains constant. 1

Reason(R) : In mercury cell ,the electrolyte is a paste of KOH and ZnO.

SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

19. Define the following terms 2

(i) Isoelectric point

(ii) Phosphodiester linkage

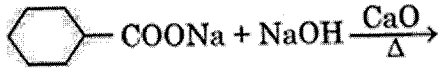
20. Convert 2

(i) Ethanol to but-2-enal

(ii) Benzoyl chloride to benzaldehyde

OR

Complete the following:

i) 

ii) $CH_3COCl + (CH_3)_2Cd \rightarrow$

21. Write the names of reagents for the following conversions: 2

(i) Benzene to Phenol

(ii) Phenol to Anisole

22. (a) Differentiate between amylose and amylopectin. 2

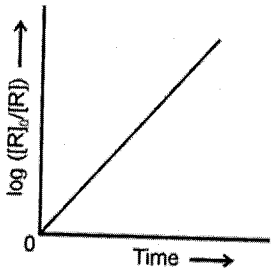
(b) Write a reaction which shows the presence of primary alcoholic group in glucose

23. (a) For a reaction A+B $\rightarrow$P, the rate is given by Rate = $k[A][B]^2$. How is the rate of reaction affected if the concentration of B is doubled? 2

(b) What do you mean by collision frequency?

OR

Observe the following graph and answer the following questions



(i) What is the order of the reaction?

(ii) What is the slope of the curve?

24. (a) Write the reaction for catalytic reduction of nitrobenzene followed by reaction of product so formed with bromine water. 2

(b) Write the IUPAC name of CH_2=CHCH(CH_3)NH(CH_3)

25. A 0.01 m aqueous solution of $AlCl_3$ freezes at – 0.068 ^{0}C. Calculate the degree of dissociation. 2
[Given : K_f for Water = 1.86 K kg mol^{-1}]

SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each

26. (a) Write any two advantages of H_2-O_2 fuel cells? 3

(b) State Faraday's first law of electrolysis.

(c) Why is alternating current used for measuring resistance of an electrolytic solution?

27. What happens when 3

(i) n-butyl chloride is treated with alcoholic KCN.

(ii) Chlorobenzene is treated with Mg in the presence of dry ether.

(iii)Bromobenzene is treated with sodium in the presence of dry ether.

28. Write the structures of main products when benzene diazonium chloride reacts with the following reagents: (Answer any three) 3

(i) H_3PO_2 /H_2O

(ii) HBF_4 / Δ

(iii)Cu_2Cl_2

(iv)C_6H_5OH/OH^-

29. Write the mechanism of acid catalysed dehydration of ethanol to yield ethene. 3

OR

Explain why

(i) Preparation of ethers by acid-catalysed dehydration of secondary and tertiary alcohols is not a suitable method.

(ii) Phenol is more acidic than methanol.

(iii)The C—O—H bond angle in alcohols is slightly less than the tetrahedral angle.

30. Resistance of a conductivity cell filled with 0.1 mol L^{-1} KCl solution is 100 ohm. If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520 ohm , 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 1.29×10^{-2} ohm^{-1} cm^{-1} 3

OR

(a) Determine the value of equilibrium constant for the following reaction:

$$Ni(s) + 2Ag^+(aq) \longrightarrow Ni^{2+}(s) + 2Ag(s), E^\circ = 1.05\ V$$

(b) Calculate the time to deposit 1.27 g of copper at cathode when a current of 2 A was passed through the solution of $CuSO_4$. (Molar mass of Cu = 63.5 g mol^{-1}, 1 F = 96500 C mol^{-1})

SECTION D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

31. The transition metals are elements with partially filled d orbitals, located in the d-block of the periodic table. The reactivity of the transition elements varies widely from very active metals such as scandium and iron to almost inert elements, such as the platinum metals. The type of chemistry used in the isolation of the elements from their ores depends upon the concentration of the element in its ore and the difficulty of reducing ions of the elements to the metals. Metals that are more active are more difficult to reduce. Transition metals exhibit chemical behavior typical of metals. For example, they oxidize in air upon heating and react with elemental halogens to form halides. Those elements that lie above hydrogen in the activity series react with acids, producing salts and hydrogen gas. Oxides, hydroxides, and carbonates of transition metal compounds in low oxidation 4

states are basic. Halides and other salts are generally stable in water, although oxygen must be excluded in some cases. Most transition metals form a variety of stable oxidation states, allowing them to demonstrate a wide range of chemical reactivity.

(a) Arrange the following in increasing order of acidic character: CrO_3, CrO, Cr_2O_3

(b) Name the oxo metal anion of the first series of the transition metals in which the metal exhibits the oxidation state equal to its group number.

(c) Represent the reactions of $K_2Cr_2O_7$ With

(i) KI Solution

(ii) $FeSO_4$ Solution with the help of balanced chemical equation

OR

Which is more stable Eu^{2+} or Ce^{2+} and why?

32. The chemical structures of the solute and solvent dictate the types of forces possible and, consequently, are important factors in determining solubility. For example, under similar conditions, the water solubility of oxygen is approximately three times greater than that of helium, but 100 times less than the solubility of chloromethane. Considering the role of the solvent's chemical structure, note that the solubility of oxygen in the liquid hydrocarbon hexane, C_6H_{14}, is approximately 20 times greater than it is in water. Other factors also affect the solubility of a given substance in a given solvent. Temperature is one such factor, with gas solubility typically decreasing as temperature increases .This is one of the major impacts resulting from the thermal pollution of natural bodies of water. When the temperature of a river, lake, or stream is raised abnormally high, usually due to the discharge of hot water from some industrial process, the solubility of oxygen in the water is decreased 4

(a) K_H (kbar) values 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.

(b) An unknown gas 'X' is dissolved in water at 2.5 bar pressure and has mole fraction 0.04 in solution. What is the mole fraction of 'X' gas when the pressure of gas is doubled at the same temperature ?

(c) $PtCl_4 .6H_2O$ can exist as a hydrated complex. 1.0 molal aqueous solution has depression in freezing point of 3.72°C. Assume 100% ionization and K_f of water = 1.86°C mol^{-1} kg. Write the formula of the complex.

OR

Write any two applications of Henry's law.

SECTION E

The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

33. (a) Define the following 5

(i) Pseudo first order reaction

(ii) Rate constant

(b) Show that in a first order reaction, time required for completion of 99.9% is 10 times of half-life ($t_{1/2}$) of the reaction.

(c) The rate constant for a reaction of zero order in A is 0.0030 mol L^{-1} s^{-1}. How long will it take for the initial concentration of A to fall from 0.10 M to 0.075 M.

OR

(a) Write any two characteristics of catalysts.

(b) What do you mean by most probable kinetic energy?

(c) The decomposition of A into products has a value of k as 4.5×10^3 s^{-1} at 10^0 C and energy of activation 60 kJ mol^{-1} . At what temperature would k be 1.5×10^4 s^{-1} ?
(R=8.314 $JK^{-1}mol^{-1}$ log4.5=0.6532 log1.5=0.1761)

34. (a) Draw the meridional isomer of $[Co(NH_3)_2Cl_3]$ 5

(b) Write the IUPAC name of the coordination complex: $K_2[Zn(OH)_4]$

(c) Calculate the spin only magnetic moment of $[Fe(CN)_6]^{3-}$ ion.

(d) Explain why $[Co(NH_3)_6]^{3+}$ is an inner orbital complex whereas $[Ni(NH_3)_6]^{2+}$ is an outer orbital complex .

OR

(a) When one mole of $CoCl_3.5NH_3$ was treated with excess of silver nitrate solution, 2 mol of AgCl was precipitated. Write the formula of the compound .

(b) Write the formula of Diamminechloridonitrito-N-platinate(II).

(c) On the basis of crystal field theory,write the electronic configuration for d^7 ion if $\Delta o > P$.

(d) Explain why$[Ti(H_2O)_6]_3Cl_3$ is coloured?

(e) Write any two factors which affect crystal field splitting energy.

35. (a) Illustrate the following reactions giving suitable example in each case. 5

(i)Clemmensen reduction (ii) Cannizzaro reaction (iii) Gattermann-Koch reaction

(b) Arrange the following in increasing order of their reactivity towards nucleophilic addition reactions

CH_3COCH_3, CH_3CHO, HCHO, $C_6H_5COCH_3$

(c) Give the chemical test to distinguish between formic acid and benzoic acid.

******END OF THE QUESTION PAPER******

ROLL NUMBER				

SET	3

QP.Code:043/01/3

INDIAN SCHOOL MUSCAT
PRE-BOARD EXAMINATION 2022-23
CHEMISTRY(043)

CLASS : XII
DATE: 08-01-2023

TIME ALLOTED : 3 HRS.
MAXIMUM MARKS:70

GENERAL INSTRUCTIONS:

a) Read the following instructions carefully.
b) There are 35 questions in this question paper with internal choice.
c) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
d) SECTION B consists of 7 very short answer questions carrying 2 marks each.
e) SECTION C consists of 5 short answer questions carrying 3 marks each.
f) SECTION D consists of 2 case- based questions carrying 4 marks each.
g) SECTION E consists of 3 long answer questions carrying 5 marks each.
h) All questions are compulsory.

SECTION A

The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. Which one of the amino acids cannot be synthesised in the body? 1

(a) Alanine (b) Cysteine (c) Valine (d) Serine

2. Match the vitamins given in column I with the deficiency diseases caused by it given in column II and mark the appropriate choice 1

i)Vitamin A	p) Scurvy
ii)Vitamin C	q) Pernicious anemia
iii)Vitamin B_{12}	r) Xerophthalmia
iv)Vitamin D	s) Rickets

(a) i-s,ii-r,iii-p,iv-q (b) i-p,ii-s,iii-r,iv-q (c) i-q,ii-p,iii-s,iv-r (d)i-r,ii-p,iii-q,iv-s

3. Transition elements form alloys because 1

(a) Similar electronic configuration

(b) Nearly same atomic size

(c) Presence of d orbitals

(d) Paramagnetic nature

4. The cell constant of a conductivity cell _____ 1

(a) changes with change of electrolyte.

(b) changes with change in concentration of electrolyte.

(c) changes with temperature of electrolyte.

(d) remains constant for a cell.

5. Which of the following alkyl halides will undergo S_N1 reaction most readily? 1

(a) $(CH_3)_3C$-Cl (b) $(CH_3)_3C$-I (c) $(CH_3)_3C$-Br (d) $(CH_3)_3C$-F

6. The correct order for the CFSE (numerical value) for the following complexes is 1

P=$[CoF_6]^{3-}$ Q=$[Co(CN)_6]^{3-}$ R=$[Co(NH_3)_6]^{3+}$ S=$[Co(H_2O)_6]^{3+}$

(a) P > Q > R > S (b) S > R > P > Q (c) R > Q > P > S (d) Q > R > S > P

7. Choose the acid with highest value of pK_a: 1

(a) FCH_2COOH (b) $ClCH_2COOH$ (c) $BrCH_2COOH$ (d)ICH_2COOH

8. The amount of solute (molecular mass 60 g/mol) that must be added to 180 g water so that vapour pressure of water is lowered by 10% 1

(a) 30 g (b) 60g (c)120g (d)12g

9. In the acetylation of glucose, which group is involved in the reaction 1

(a) CHO group (b) >C = O group (c) alcoholic OH group (d) all of these

10. The hydrogen electrode is dipped in a solution of pH 8 at 298 K. The potential of the electrode would be, 1

(a) 0.377V (b) - 0.472V (c) -0.177V (d) 0.059V

11. Phenol is prepared commercially from : 1

(a) Benzyl alcohol (b) Ethyl benzene (c) Toluene (d) Isopropyl benzene

12. Which of the following ions will exhibit colour in aqueous solutions? 1

(a) La^{3+} (Z = 57) (b) Ti^{3+} (Z = 22) (c) Lu^{3+} (Z = 71) (d) Sc^{3+} (Z = 21)

13. Acid anhydrides on reaction with primary amine gives_____ 1

(a) Amide (b)Imide (c)Secondary amine (d) imine

14. One mole of ethyl acetate on treatment with an excess of $LiAlH_4$ in dry ether and subsequent acidification produces 1

(a) 1 mole acetic acid + 1 mole ethyl alcohol

(b) 1 mole ethyl alcohol + 1 mole methyl alcohol

(c) 2 moles of ethyl alcohol

(d) 1 mole of butan-2-ol

Question numbers15 to 18 are two statements labelled as Assertion (A) and Reason (R). Select the most appropriate answer from the options given below:

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

15. Assertion (A): Alpha amino acids exist as zwitter ion . 1

Reason (R): Alpha amino acids are the building block of protein

16. Assertion(A) : Transition metals show variable valency. 1

Reason(R): There is large energy difference between the ns and (n-1)d electrons

17. Assertion(A): The cell potential of mercury cell is 1.35V, which remains constant. 1

Reason(R) : In mercury cell ,the electrolyte is a paste of KOH and ZnO.

18. Assertion(A) :S_N1 mechanism is facilitated by polar protic solvents like water,alcohol etc 1

Reason(R):$C_6H_5CHC_6H_5Br$ is less reactive than $C_6H_5CH(CH_3)Br$ in S_N1 reactions.

SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

19. (a) Sucrose is a non-reducing sugar. Explain. 2

(b) Write a reaction which shows the presence of an aldehyde group in glucose

20. Define the following terms 2

(i) Isoelectric point

(ii) Phosphodiester linkage

21. Convert 2

(i) Ethanol to but-2-enal

(ii) Benzoyl chloride to benzaldehyde

OR

Complete the following:

i) $CH_3MgBr + CO_2 \xrightarrow[H_3O^+]{\text{Dry ether}}$

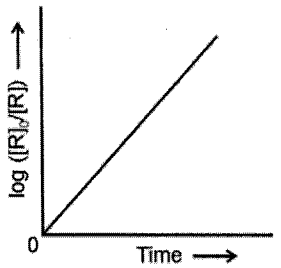
ii) $CH_3CH_2COOH + Br_2 \xrightarrow{\text{Red Phosphorus}}$

22. (a) For a reaction A+B $\rightarrow$P, the rate is given by Rate = $k[A][B]^2$ .How is the rate of reaction affected if the concentration of B is doubled? 2

(b) What do you mean by collision frequency?

OR

Observe the following graph and answer the following questions



(i) What is the order of the reaction?

(ii) What is the slope of the curve?

23. A 0.01 m aqueous solution of $AlCl_3$ freezes at – 0.068 ^{0}C. Calculate the degree of dissociation. 2
[Given : K_f for Water = 1.86 K kg mol^{-1}]

24. Write the names of reagents for the following conversions: 2
(a) Benzene to Phenol
(b) Phenol to Anisole

25. (a) Write the reaction for catalytic reduction of nitrobenzene followed by reaction of product so formed with bromine water. 2
(b) Write the IUPAC name of CH_2=CHCH(CH_3)NH(CH_3)

SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each

26. What happens when 3
(i) n-butyl chloride is treated with alcoholic KOH,
(ii) bromobenzene is treated with Mg in the presence of dry ether
(iii)Methyl bromide is treated with sodium in the presence of dry ether

27. Write the structures of main products when benzene diazonium chloride reacts with the following reagents: (Answer any three) 3
(i) H_3PO_2 /H_2O
(ii) HBF_4 / Δ
(iii)Cu_2Cl_2
(iv)C_6H_5OH/OH^-

28. (a) State Faraday's second law of electrolysis. 3
(b) Why is alternating current used for measuring resistance of an electrolytic solution?
(c) Conductivity of CH_3COOH decreases on dilution. Why?

29. Resistance of a conductivity cell filled with 0.1 mol L^{-1} KCl solution is 100 ohm. If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520 ohm , 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 1.29×10^{-2} ohm^{-1} cm^{-1} 3

OR

(a) Determine the value of equilibrium constant for the following reaction:

$$Ni(s) + 2Ag^{+}(aq) \longrightarrow Ni^{2+}(s) + 2Ag(s), E^{o} = 1.05\ V$$

(b) Calculate the time to deposit 1.27 g of copper at cathode when a current of 2 A was passed through the solution of $CuSO_4$. (Molar mass of Cu = 63.5 g mol^{-1}, 1 F = 96500 C mol^{-1})

30. Write the mechanism of acid catalysed dehydration of ethanol to yield ethene. 3

OR

Explain why

(i) Preparation of ethers by acid-catalysed dehydration of secondary and tertiary alcohols is not a suitable method.

(ii) Phenol is more acidic than methanol.

(iii)The C—O—H bond angle in alcohols is slightly less than the tetrahedral angle.

SECTION D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

31. The transition metals are elements with partially filled d orbitals, located in the d-block of the periodic table. The reactivity of the transition elements varies widely from very active metals such as scandium and iron to almost inert elements, such as the platinum metals. The type of chemistry used in the isolation of the elements from their ores depends upon the concentration of the element in its ore and the difficulty of reducing ions of the elements to the metals. Metals that are more active are more difficult to reduce. Transition metals exhibit chemical behavior typical of metals. For example, they oxidize in air upon heating and react with elemental halogens to form halides. Those elements that lie above hydrogen in the activity series react with acids, producing salts and hydrogen gas. Oxides, hydroxides, and carbonates of transition metal compounds in low oxidation states are basic. Halides and other salts are generally stable in water, although oxygen must be excluded in some cases. Most transition metals form a variety of stable oxidation states, allowing them to demonstrate a wide range of chemical reactivity. 4

(a) Arrange the following in increasing order of acidic character: CrO_3, CrO, Cr_2O_3

(b) Name the oxo metal anion of the first series of the transition metals in which the metal exhibits the oxidation state equal to its group number.

(c) Represent the reactions of $K_2Cr_2O_7$ With

(i) KI Solution

(ii) $FeSO_4$ Solution with the help of balanced chemical equation

OR

Which is more stable Eu^{2+} or Ce^{2+} and why?

32. The chemical structures of the solute and solvent dictate the types of forces possible and, consequently, are important factors in determining solubility. For example, under similar conditions, the water solubility of oxygen is approximately three times greater than that of helium, but 100 times less than the solubility of chloromethane. Considering the role of the solvent's chemical structure, note that the solubility of oxygen in the liquid hydrocarbon hexane, C_6H_{14}, is approximately 20 times greater than it is in water. Other factors also affect the solubility of a given substance in a given solvent. Temperature is one such factor, with gas solubility typically decreasing as temperature increases .This is one of the major impacts resulting from the thermal pollution of natural bodies of water. When the temperature of a river, lake, or stream is raised abnormally high, usually due to the discharge of hot water from some industrial process, the solubility of oxygen in the water is decreased 4

(a) K_H (kbar) values 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.

(b) An unknown gas 'X' is dissolved in water at 2.5 bar pressure and has mole fraction 0.04 in solution. What is the mole fraction of 'X' gas when the pressure of gas is doubled at the same temperature ?

(c) $PtCl_4 .6H_2O$ can exist as a hydrated complex. 1.0 molal aqueous solution has depression in freezing point of 3.72°C. Assume 100% ionization and K_f of water = 1.86°C mol^{-1} kg. Write the formula of the complex.

OR

Write any two applications of Henry's law.

SECTION E

The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

33. (a) Draw the meridional isomer of $[Co(NH_3)_3Cl_3]$ 5

(b) Write the IUPAC name of the coordination complex: $K_2[Zn(OH)_4]$

(c) Calculate the spin only magnetic moment of $[Fe(CN)_6]^{3-}$ ion.

(d) Explain why $[Co(NH_3)_6]^{3+}$ is an inner orbital complex whereas $[Ni(NH_3)_6]^{2+}$ is an outer orbital complex .

OR

(a) When one mole of $CoCl_3.5NH_3$ was treated with excess of silver nitrate solution, 2 mol of AgCl was precipitated. Write the formula of the compound .

(b) Write the formula of Diamminechloridonitrito-N-platinate(II).

(c) On the basis of crystal field theory, write the electronic configuration for d^7 ion if $\Delta o > P$.

(d) Explain why $[Ti(H_2O)_6]_3Cl_3$ is coloured?

(e) Write any two factors which affect crystal field splitting energy.

34. (a) Illustrate the following reactions giving suitable example in each case. 5

(i) Clemmensen reduction (ii) Cannizzaro reaction (iii) Gattermann-Koch reaction

(b) Arrange the following in increasing order of their reactivity towards nucleophilic addition reactions

CH_3COCH_3, CH_3CHO, HCHO, $C_6H_5COCH_3$

(c) Give the chemical test to distinguish between formic acid and benzoic acid.

35. (a) Define the following 5

(i) Pseudo first order reaction

(ii) Rate constant

(b) Show that in a first order reaction, time required for completion of 99.9% is 10 times of half-life ($t_{1/2}$) of the reaction.

(c) The rate constant for a reaction of zero order in A is 0.0030 mol L^{-1} s^{-1}. How long will it take for the initial concentration of A to fall from 0.10 M to 0.075 M.

OR

(a) Write any two characteristics of catalysts.

(b) What do you mean by most probable kinetic energy ?

(c) The decomposition of A into products has a value of k as 4.5×10^3 s^{-1} at 10^0 C and energy of activation 60 kJ mol^{-1} . At what temperature would k be 1.5×10^4 s^{-1} ?

(R=8.314 $JK^{-1}mol^{-1}$ log4.5=0.6532 log1.5=0.1761)

******END OF THE QUESTION PAPER******