**SET-4**

**BOARD MODEL PAPER**
**SESSION: 2022-23**
**SUBJECT: CHEMISTRY THEORY**
**CLASS-XII**

**MM: 70** **Time:3 Hours**

General Instructions:

**Read the following instructions carefully.**

a) There are **33** questions in this question paper with internal choice.
b) SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
c) SECTION B consists of 5 very short answer questions carrying 2 marks each.
d) SECTION C consists of 7 short answer questions carrying 3 marks each.
e) SECTION D consists of 2 case-based questions carrying 4 marks each.
f) SECTION E consists of 3 long answer questions carrying 5 marks each.
g) All questions are compulsory.
h) h) Use of log tables and calculator is not allowed.

## SECTION A

**1.** . What will be the fraction of molecules having energy equal to or greater than activation energy, Ea?

(a) K (b) A
(c) $Ae^{-Ea/Rt}$ (d) $e^{-Ea/Rt}$

2 . Transition elements form alloys easily because they have

(a) Same atomic number (b) Same electronic configuration
(c) Nearly same atomic size (d) None of the above

3 . Anomalous electronic configuration in the 3d series are of

(a) Cr and Fe (b) Cu and Zn
(c) Fe and Cu (d) Cr and Cu

4. Phenol reacts with $Br_2$ in $CS_2$ at low temperature to give

(a) o-Bromophenol (b) o-and p-Bromophenol
(c) p-Bromophenol (d) 2, 4, 6-Tribromophenol

5. In the lead storage battery during charging ,the cathode reaction is

(a) Formation of $PbO_2$ (b) Formation of $PbSO_4$
(c) Reduction of $Pb^{2+}$ to Pb (d) Decomposition of Pb at the anode

6. Which of the following condition is not satisfied by an ideal solution?

(a) $\Delta H_{mixing} = 0$ (b) $\Delta V_{mixing} = 0$
(c) Raoult's Law is obeyed (d) Formation of an azeotropic mixture

7. The compound which gives the most stable carbonium ion on dehydration is

(a) $(CH_3)_2CHCH_2OH$ (b) $(CH_3)_3COH$
(c) $CH_3CH_2CH_2CH_2OH$ (d) $CH_3CH\ OH\ CH_2\ CH_3$

8. Molar conductivity of 0.15 M solution of KCl at 298 K, if its conductivity of 0.0152 S $cm^{-1}$ will be

(a) 124 $\Omega^{-1}$ $cm^2$ $mol^{-1}$ (b) 204 $\Omega^{-1}$ $cm^2$ $mol^{-1}$
(c) 101 $\Omega^{-1}$ $cm^2$ $mol^{-1}$ (d) 300 $\Omega^{-1}$ $cm^2$ $mol^{-1}$

9. How much electricity in in terms of Faraday is required to produce 100 g of Ca from molten $CaCl_2$?

(a) 1F (b) 2F

(c) 3F (d) 5F

10. Equilibrium constant K is related to $E^0$cell and not Ecell because

(a) $E^0$cell is easier to measure than Ecell

(b) Ecell becomes zero at equilibrium point but $E^0$cell remains constant under all conditions

(c) at a given temperature, Ecell changes hence value of K can't be measured.

(d) any of the terms Ecell or $E^0$cell can be used

11. The correct order of increasing acidic strength is

(a) Phenol < Ethanol < Chloroacetic acid < Acetic acid

(b) Ethanol < Phenol < Chloroacetic acid < Acetic acid

(c) Ethanol < Phenol <Acetic acid < Chloroacetic acid

(d) Chloroacetic acid < Acetic acid < Phenol < Ethanol

12. Osmotic pressure is proportional to

(a) Molality (b) Molarity

(c) Mole fraction (d) Vapour pressure

13. Given below are two statements labelled as Assertion (A) and Reason (R)

**Assertion (A):** For complex reaction the order of overall reaction is equal to the molecularity of the slowest step of the reaction.

**Reason (R):** The rate of the complex reaction is controlled by the slowest step of the reaction

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.

14. Given below are two statements labelled as Assertion (A) and Reason (R)

**Assertion** -Compounds containing —CHO group are easily oxidised to corresponding carboxylic acids.

**Reason** : Carboxylic acids can be reduced to alcohols by treatment with LiAlH4.

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. Given below are two statements labelled as Assertion (A) and Reason (R)

**Assertion**-Tetrahedral complex will not show any geometrical isomerism.

**Reason**-The relative positions of unidentate ligands attached to Central metal ion are same with respect to each other.

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.

16. Given below are two statements labelled as Assertion (A) and Reason (R)

**Assertion**: The α- H atom in carbonyl compounds is acidic

**Reason**: The anion formed after the loss of α - H atom is resonance stablized

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.

## SECTION B

**This section contains 5 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each**

17. For a first order reaction show that time required for 99.9% completion is10 times the half life of the reaction.

**OR**

A reaction is first order with respect to A & second order with respect to B

(i) How is the rate affected on increasing Concentration of B three times.

(ii)How is the rate affected when concentration of A is reduced to half & that of B is doubled.

18..(i) Draw optical isomers of $[ Pt(en)_2Cl_2]^{2+}$.

(ii) Write IUPAC name of ionisation isomer of $[ Co( NH_3)_5Br]SO_4$

19 (i) Mention the condition when Raoult's law becomes special case of Henry's law

(ii) At the same temperature, $H_2$ is more soluble in water than He, which of them will have higher $K_H$ value and why?

20 Name the suitable reagent to carry out the following conversions

(i) Oxidation of primary alcohol to aldehyde

(ii) Phenol to picric acid

21.Write Equation involved in

(i) Wurtz Fittig Reaction

(ii)Friedal Craft Acylation

## SECTION C

**This section contains 7 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.**

22 .(a) Give the major products formed when

(i) $CH_3CH_2CH( CH_3)CH_2OCH_2CH_3$ reacts with HI

(ii) $(CH_3)_3CBr$ reacts$NaOCH_3$

(iii) Phenol reacts with Bromine water

23. Identify A,B, C in the following reaction

(i) $CH_3CH_2Cl \xrightarrow{KCN} \xrightarrow{HBF_4} A \xrightarrow{H_2Ni} B \xrightarrow{CH_3COCl/Base} C$

(ii) $C_6H_5N_2Cl \longrightarrow A \xrightarrow{NaNO_2/Cu} B \xrightarrow{Sn/HCl} C$

24. In a reaction between A and B the initial rate of reaction ($r^0$) was measured for different initial concentrations of A and B as Given below

| | | | |
|---|---|---|---|
| A/molL | 0.20 | 0.20 | 0.40 |
| B/mol L | 0.30 | 0.10 | 0.05 |
| $r^0$/mol L | $5.07x10^{-5}$ | $5.07x10^{-5}$ | $1.43x10^{-4}$ |

What is the order of reaction with respect to A & B?

25. Give reason :

(b) RX with KCN gives cyanides but with AgCN forms isocyanides.

(c) Haloarenes are less reactive towards $S_N$ reactions.

(d) Grignard reagents are prepared under anhydrous conditions.

26. The Vapour pressure of water at 20ºC is 17.5 mm Hg. Calculate the vapour pressure of water at 20ºC when 15 g of glucose (Molar mass = 180 g mol-1) is dissolved in 150 g of water.

**OR**

The boiling point of benzene is 353.23 K. when 1.80g of a non volatile solute was dissolved in 90 g of benzene, the b.p. is raised to 354.11 K. Calculate the molar mass of solute. ($K_b$= 2.53KKg/mol)

27. Differentiate between

(i) Nucleotides and nucleosides

(ii) Peptide and glycosidic linkage

(iii)amylose and amylopectin

28. Give reason :

(i) Gabriel phthalimide is not the suitable method for preparation of primary aromatic amines.

(ii) Aromatic amines are insoluble in water

(iii) B.P of primary amines is greater than secondary amines.

## SECTION D

**The following section has two case study -based questions Read the passage carefully and answer the questions that follows**

29. Proteins are the polymers of a-amino acids and they are connected to each other by peptide bond or peptide linkage. Chemically, peptide linkage is an amide formed between–COOH group and –NH2 group. The reaction between two molecules of similar or different amino acids, proceeds through the combination of the amino group of one molecule with the carboxyl group of the other. This results in the elimination of a water molecule and formation of a peptide bond –CO–NH–. The product of the reaction is called a dipeptide because it is made up of two amino acids. For example, when carboxyl group of glycine combines with the amino group of alanine we get a dipeptide, glycylalanine. If a third amino acid combines to a dipeptide, the product is called a tripeptide. A tripeptide contains three amino acids linked by two peptide linkages. Similarly when four, five or six amino acids are linked, the respective products are known as tetrapeptide, pentapeptide or hexapeptide, respectively. When the number of such amino acids is more than ten, then the products are called polypeptides. A polypeptide with more than hundred amino acid residues, having molecular mass higher than 10,000u is called a protein. However, the distinction between a polypeptide and a protein is not very sharp. Polypeptides with fewer amino acids are likely to be called

proteins if they ordinarily have a well defined conformation of a protein such as insulin which contains 51 amino acids.

(i) Give an example of a globular and a fibrous protein.

(ii) Name the two forms of secondary structure of protein.

(iii) What are essential and non essential amino acids ?Give one example of each.

30. Below is the table given showing complexes formed from Cobalt(III) chloride and ammonia by Alfred Werner. Observe the table carefully and answer the questions that follow

| Compound | Colour | Moles of AgCl formed from 1 mol of compound | Total no. of ions produced |
|---|---|---|---|
| (A) $CoCl_3.4NH_3$ | Violet | 1 | 2 |
| (B) $CoCl_3.5NH_3$ | Rose | 2 | 3 |
| (C) $CoCl_3.3NH_3$ | Blue green | 0 | 0 |

Write the formula of Compound B

What is the primary and secondary valences of cobalt in compound A

Draw geometrical isomers of compound A

**OR**

Draw geometrical isomers of compound C

## SECTION E

**The following questions are long answer type and carry 5 marks each**

31. (a) Represent the cell in which the following reaction takes place

Mg(s) + 2Ag+ (0.0001M) Æ Mg2+(0.130M) + 2Ag(s)

Calculate its E(cell) if ( ) o E cell = 3.17 V.

Calculate the equilibrium constant of the reaction:

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

(b) $E^\circ_{(cell)} = 0.46$ V

OR

(a) Given the standard electrode potentials,

K + /K = –2.93V, Ag+ /Ag = 0.80V, Hg2+/Hg = 0.79V Mg2+/Mg = –2.37 V, Cr3+/Cr = – 0.74V

Arrange these metals in their increasing order of reducing power.

(b) Three electrolytic cells A,B ,C containing solutions of $ZnSO_4$, $AgNO_3$ and $CuSO_4$ respectively are connected in series. A steady current of 1.5 ampere was passed through them until 1.45 g of silver deposited at the cathode of cell B. How long did the current flow? What mass of copper & zinc were deposited?

32. (a) Give a chemical test to distinguish between

(i)Acetaldehyde & Acetone

(ii)Benzaldehyde & Formaldehyde

(b) How will you carry out the following conversions

(i)Propanone to Propan-2-ol

(ii Ethanal to 2- Hydroxy propanoic acid

iii) Ethyl benzene to Benzoic acid

**OR**

(a) Write the product of the following reactions

(i) $CH_3COCH_3 \xrightarrow[Br_2/FeBr_3]{Zn-Hg/HCl}$

(ii) $C_6H_5COOH \longrightarrow$

(iii) $C_6H_5COCl + H_2 \xrightarrow{Pd/BaSO_4}$

(b) Which Acid of each pair shown here would you expect stronger & why

(i)$FCH_2COOH$ Or $ClCH_2COOH$

(ii) $C_6H_5OH$ Or $CH_3COOH$

33 a) Give reason:

(i) zinc cadmium and mercury are not regarded as transition elements.

(ii) Transition elements form coloured compounds.

(iii) Zr and Hf have similar atomic and ionic radii.

(b) Complete and balance the following equation

(i) $MnO_4^{2-} + H^+ \rightarrow$

(ii) $Fe^{2+} + S_2O_8^{2-} \rightarrow$

OR

a) Give an example of

(i) An alloy made from lanthanoids

(ii) A transition metal which do not show variable oxidation state.

(iii) A inner transition element which shows +4 oxidation state.

b) Draw the structure of $CrO_4^{2-}$ ion and $Cr_2O_7^{2-}$ ion. What is the hybridisation of chromium in both the ions ?