

**KENDRIYA VIDYALYA SANGATHAN**

**Model question paper**

**Class-XII      Sub-Chemistry**

**Time: 3 Hours**

**Max. Marks :70**

**General Instructions :**

- **All questions are compulsory.**
  - **Questions nos. 1 to 5 are very short answer question and carry 1 marks each.**
  - **Question nos. 6 to 10 are short answer questions and carry 2 marks each.**
  - **Question nos. 11 to 22 are also short answer questions and carry 3 marks each.**
  - **Question nos. 23 is also short answer questions and carry 4 marks .**
  - **Question nos. 24 to 26 are long answer questions and carry 5 marks each.**
  - **Use log tables if necessary, use of calculators is not allowed.**
1. Frenkel defect is not found in pure alkali metal halide. Why?
  2. Draw the structural isomer of  $\text{CH}_3\text{CH}(\text{Cl})\text{CH}_2\text{Cl}$  which can exhibit enantiomerism.
  3. Give the IUPAC name of  $\text{C}_6\text{H}_5\text{-CH}_2\text{-CH}(\text{OH})\text{-CH}_3$
  4. Write the structural formula of 3-phenylprop-2-en-1-al
  5. What do you understand by peptide linkage ?
  6. A)How is osmotic pressure related with the molecular mass of a non-volatile substances?  
  
B) What advantage does osmotic pressure method have over other methods for determining molecular masses of macromolecules ?
  7. A solution of  $\text{CuSO}_4$  is electrolysed for 10min with a current of 1.5 Amperes. What is the mass of Cu deposited at the cathode ? (atomic mass,Cu=63) .
  8. Draw the structure of a) $\text{H}_3\text{PO}_3$  b) $\text{XeOF}_4$
  9. Write a short note on a) Coupling reaction b)Carbylamine reaction .

10. What happens when

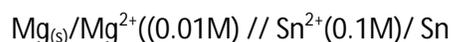
a)  $\text{CH}_3\text{NH}_2$  is treated with chloroform and alc. KOH

b) Ethylamine is treated with  $\text{HNO}_2$

11. (a) What are biodegradable polymers. Give an example of a biodegradable polymer?

(b) Write the monomer of nylon-6.

12. Calculate the cell emf at  $25^\circ\text{C}$  for the following cell



$$\text{Given } E^\ominus \text{Mg}^{2+} / \text{Mg} = -2.34\text{V}, E^\ominus \text{Sn}^{2+} / \text{Sn} = -0.136\text{V}$$

13. Account for the following

a)  $\text{NH}_3$  has higher Boiling point than  $\text{PH}_3$

b)  $\text{OF}_2$  should be called oxygen difluoride and not fluorine Oxide.

c) HI is stronger acid than HF.

14. An element has a bcc structure with a cell edge of 288 pm. The density of the element is  $7.2\text{g/cm}^3$ , How many atoms are present in 208 g of element?

15. The freezing point of pure nitrobenzene is 278.8 K. When 2.5 g of unknown substance is dissolved in 100 g of nitrobenzene, the freezing point of the solution is found to be 276.8 K, what is the molar mass of the unknown substance.

$$(K_f \text{ of nitrobenzene} = 8 \text{ K kg mol}^{-1})$$

16. Give reason

a) Fluorine is most reactive among halogens

b) Bleaching of flowers by chlorine is permanent while that by  $\text{SO}_2$  is temporary.

c) Bi is a strong oxidizing agent in the pentavalent state.

OR

What happens when :-

- White phosphorus is heated with con. NaOH solution in an inert atmosphere of  $\text{CO}_2$ ?
- $\text{XeF}_6$  is hydrolysed?
- Iodine is treated with con.  $\text{HNO}_3$ ?

17. using VBT explain diamagnetic nature of  $[\text{Ni}(\text{CN})_4]^{2-}$  ion [at .No.of Ni=28].

b) show splitting of degenerate d- orbitals in octahedral field.

18. What is meant by  $\text{S}_\text{n}^1$  mechanism ? Illustrate with the help of an example and discuss the stereochemistry involved.

19.a) How would you prepared  $\text{C}_2\text{H}_5\text{-O-C}_2\text{H}_5$  from ethanol

b) convert the following

i) Phenol to benzene

ii) Propene to propan-2-ol

20. a) What is tincture of iodine? What is its use?

b) Give an example of

i) antibiotic

ii) antipyretic

21. Explain the term:

a. Invert sugar    b. mutarotation    c. Denaturation of protein

22. Explain the main principle involved in the following

a) Zone refining    b) liquation    c) Vapour Phase refining

23. When two immiscible liquids are shaken to form a nearly homogenous mixture it is called an emulsion. We use a number of emulsions in everyday life. Digestion of fats in our intestine also takes place through emulsification . Emulsions have sometimes harmful effects too now answer the following questions:

i) give one example of emulsion which we use in everyday life for our health. What are its constituents? ii) How fats are digested in our intestine ? iii) How is that water alone doesnot remove oily or greasy spots from our clothes but soap solutions does it? iv) Give one example of formation of emulsion is harmful.

24.a) Rate of a reaction is given by the expression  $\text{Rate} = k[\text{A}]^2 [\text{B}]$

What are the units for the rate and the rate constant for the reaction

b) A first order reaction is 20% complete in 10 minutes. Calculate the time for 75% completion of the reaction

OR

- As a reaction proceeds why does its rate keep on changing?
- B) What will be the temperature on the rate of reaction?
- The rate constant of a reaction is  $1.5 \times 10^7 \text{ s}^{-1}$  at  $4.5 \times 10^7 \text{ s}^{-1}$  at  $1000^\circ\text{C}$

Calculate the value of activation energy for the reaction. [ $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ ]

25. a) Give reasons

i)  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  is coloured and  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$  is white.

ii) Transition elements act as good catalysts.

iii)  $\text{Cr}^{2+}$  is a strong reducing agent whereas  $\text{Mn}^{2+}$  is not.

b) Write chemical equations for the conversion of chromite ore to  $\text{K}_2\text{Cr}_2\text{O}_7$

18. What is meant by  $\text{S}_\text{n}^1$  mechanism? Illustrate with the help of an example and discuss the stereochemistry involved.

19. a) How would you prepare  $(\text{CH}_3)_3\text{C}-\text{O}-\text{C}_2\text{H}_5$  from ethanol

b) Convert the following

i) Phenol to benzene

ii) Propene to propan-2-ol

20. a) What is tincture of iodine? What is its use?

b) Give an example of

i) antibiotic

ii) antipyretic

21. Explain the term:

a. Invert sugar    b. mutarification    c. Denaturation of protein

22. Explain the main principle involved in the following

- a) Zone refining            b) liquation            c) Vapour Phase refining

23. activated charcoal absorbs better. Why? What value does this suggest

- a) Activated charcoal has greater surface area  
b) Narrow thinking brings us to low achievements in life.  
c) Think over each aspect of life to become a perfect individual.  
d) Focused thinking sometimes helps a lot in scientific investigations.

24. a) Rate of a reaction is given by the expression  $\text{Rate} = k[A]^2[B]$

What are the units for the rate and the rate constant for the reaction?

b) A first order reaction is 20% complete in 10 minutes. Calculate the time for 75% completion of the reaction

OR

- (a) As a reaction proceeds why does its rate keep on changing?  
B) What will be the effect of temperature on the rate of reaction?  
(c) The rate constant of a reaction is  $1.5 \times 10^7 \text{ s}^{-1}$  at  $4.5 \times 10^7 \text{ s}^{-1}$  at  $100^\circ\text{C}$

Calculate the value of activation energy for the reaction. [ $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ ]

25. a) Give reasons

- i)  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  is coloured and  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$  is white.  
ii) Transition elements act as good catalysts.  
iii)  $\text{Cr}^{2+}$  is a strong reducing agent where as  $\text{Mn}^{2+}$  is not.

b) Write chemical equations for the conversion of chromite ore to  $\text{K}_2\text{Cr}_2\text{O}_7$

OR

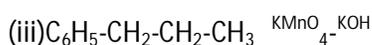
- Give reason
- i) Transition metals have high enthalpies of atomisation.
  - ii) Copper (I) has  $d^{10}$  configuration, while copper(II) had  $d^9$  configuration, still Cu(II) is more stable in aqueous solution than copper(I).
- What happens when (write balanced equation)
  - pH of a solution of dichromate ions is raised

- Acidified  $\text{KMnO}_4$  solution reacts with  $\text{Fe}^{2+}$  ions
- $\text{H}_2\text{S}$  gas is passed through acidified  $\text{Cr}_2\text{O}_7^{2-}$

26. (a) How would you distinguish between Acetophenone and benzophenone?

(b) Would you expect benzaldehyde to be more reactive or less reactive in nucleophilic addition reactions than propanal? Explain

(c) Complete the following



OR

An organic compound (A) having molecular formula  $\text{C}_8\text{H}_8\text{O}$  forms an orange red precipitate (B) with 2,4-DNP reagent. Compound (A) gives a yellow precipitate (C) when heated in the presence of iodine and NaOH along with a colourless compound

(D). (A) does not reduce Tollen's reagent or Fehling's solution nor does it decolourise bromine water. On drastic oxidation of (A) with chromic acid, a carboxylic acid (E) of molecular formula  $\text{C}_7\text{H}_6\text{O}_2$  is formed. Deduce the structure of the organic compounds (A) to (E).

### MARKING SCHEME

Q.NO.	VALUE POINTS	MARKS
1.	Due to large size of alkali metal cation	1
2.	Correct answer	1
3.	1-phenylpropan-2-ol	1
4.	$(\text{C}_6\text{H}_5)\text{CH}=\text{CH}-\text{CHO}$	1
5.	-CONH- linkage which binds two amino acids units	1
6.	a) $\pi = \frac{W_b \cdot R \cdot T}{M_b \cdot V}$ b) i) It is measured at room temperature ii) based on molarity	1 1
7.	$M = ZIt$ , $M = 0.2938 \text{ gm}$	1+1
8.	Correct structure	1+1
9.	Correct equation	1+1

10.	<p>) Methylisocyanide is formed  <math>\text{CH}_3\text{CH}_2\text{NH}_2 + 3\text{KOH} + \text{CHCl}_3 = \text{CH}_3\text{NC} + 3\text{KCl} + 3\text{H}_2\text{O}</math>            b) Ethyl alcohol is formed <math>\text{CH}_3\text{CH}_2\text{NH}_2 \rightarrow \text{CH}_3\text{CH}_2\text{OH}</math></p>	1+1
11.	<p>the polymers which are degraded by microorganisms(a) PHBV( beta- Polyhydroxybutyrate-co-beta-hydroxyvalerate) or Nylon-2-nylon-6            b) Caprolactum</p>	1+1
12.	<p><math>E^0_{\text{cell}} = 2.204\text{V}</math>  <math>E_{\text{cell}} = E^0_{\text{cell}} - 0.059/n \log[\text{products}]/[\text{reactants}]</math>            Correct substitutions            Calculation <math>E_{\text{cell}} = 2.233\text{ V}</math></p>	1+1
13.	<p>i) Presence of intermolecular H-bonds in <math>\text{NH}_3</math> due to higher electronegativity of nitrogen            ii) F is more electronegative than O            iii) Low bond diss. Enthalpy of H-I</p>	1+1
14.	<p><math>q = zm/a^3 N_0</math>  <math>7.2 = 2x M / (288 \times 10^3) \times 6.023 \times 10^{23}</math>  <math>M = 51.8 \text{ gmol}^{-1}</math>            No. Of atoms = <math>2.417 \times 10^{24}</math></p>	2 1
15.	<p><math>T_f = k_f m</math>  <math>= k_f W_8 \times 1000 / M_8 \times W_A</math>            Correct substitution  <math>M_8 = 100 \text{ gmol}^{-1}</math></p>	$\frac{1}{2}$ $\frac{1}{2}$ 1 1
16.	<p>a) low bond dissociation energy            b) bleaching action of chlorine is oxidation &amp; sulphur dioxide is reduction            c) due to inert pair effect</p> <p style="text-align: center;">OR</p> <p><math>\text{P}_4 + 3\text{NaOH} + 3\text{H}_2\text{O} = \text{PH}_3 + 3\text{NaH}_2\text{PO}_2</math>  <math>\text{XeF}_6 + 3\text{H}_2\text{O} = \text{XeO}_3 + 6\text{HF}</math> (complete hydrolysis)  <math>\text{I}_2 + 10\text{HNO}_3 \rightarrow 2\text{HIO}_3 + 4\text{H}_2\text{O} + 10\text{NO}_2</math></p>	1 1 1  1+1+1
17.	<p>a) Configuration of <math>\text{Ni}^{2+}</math> ion is <math>[\text{Ar}]3d^8</math>            Distribution of electrons shows the presence of two unpaired electrons            In the ligand field of CN- ligand electrons get paired get paired            Hybridization is <math>dsp^2</math>            So the complex is <u>square planar</u> and <u>diamagnetic</u>            b) correct diagram</p>	2     1
18.	<p>Nucleophilic substitution in which the rate of reaction depends on the conc. Of only one reactant            Tert. Alkyl halides undergo <math>\text{SN}^1</math> mechanism as tert-carbocations are most stable            Products are with inverted config as well as retained config.            Correct illustration</p>	3
19.	<p>a) By treating ethanol with conc. <math>\text{H}_2\text{SO}_4</math> at 413K            b) i) By heating phenol with Zinc dust            ii) By hydration in presence of acid</p>	1 1+1

20.	A solution of iodine aq. Ethanol used as antiseptic Antibiotic- Penicillin or Amoxicillin Antipyretic-Paracetamol	1 1+1
21.	a)An equimolar mixture of levorotatory form of glucose and fructose b)Gradual change in optical rotation of cane sugar from dextro rotatory to levorotatory c)change in biological and native confirmation of proteins when exposed to change in ph, radiation etc.	1 1 1
22.	a) It is based on the principle that's the impurities are more soluble in molten state than in the solid state. eg-Zirconium b) Liquation – low melting metal like Sn can be made to flow on a sloping furnace to remove the higher melting impurities. c) In this the impure metal is converted into volatile compound and it is heated to give pure metal. eg- nickel	1 1 1
23.	(I)milk-It is an emulsion of liquid fats in water (ii)by the process of emulsification (iii)Soap acts as an emulsifying agent and helps in the formation of emulsion of oil in water which is washed away with water (iv)in the petroleum wells we get the emulsion sometimes instead of petroleum alone	1 1 1 1
24.	a) unit of Rate = $\text{mol L}^{-1}\text{s}^{-1}$ unit of rate const = $\text{mol}^{-2}\text{L}^2\text{s}^{-1}$ b) $k = 2.303/t \log [A^0]/[A]$ correct substitution and calculation time required=62.13min OR i)Rate keeps changing due to change in conc of reactants in temperature due to increase in kinetic energy of molecules b) $\log k_2/k_1 = E_a/2.303R [1/T_1 - 1/T_2]$ Correct substitutions Correct answer units	1 1 1 1 1 1 1 1 1 1
25.	a)(i) $\text{Cu}^{2+}$ has one unpaired electron –d-d transition possible $\text{Zn}^{2+}$ has no unpaired electrons (ii)show variable oxidation states, form intermediate compound easily, can form interstitial compounds (iii) $\text{Cr}^{3+}$ has $d^3$ configuration with 3 unpaired electrons in the lower energy d-orbitals, $\text{Mn}^{2+}$ has half-filled d-orbitals b) $4 \text{FeCr}_2\text{O}_4 + 8 \text{Na}_2\text{CO}_3 + 7\text{H}_2\text{O} = 8\text{Na}_2\text{CrO}_4 + \text{Fe}_2\text{O}_3 + 8\text{CO}_2$ $\text{NaCrO}_4 + \text{H}_2\text{SO}_4 = \text{Na}_2\text{Cr}_2\text{O}_7 + 2\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$ $\text{Na}_2\text{Cr}_2\text{O}_7 + 2\text{KCl} = \text{K}_2\text{Cr}_2\text{O}_7 + 2\text{NaCl}$ OR a) i) Due to strong metal bonds ii) High hydration energy of $\text{Cu}^{2+}$ ions b)(i) dichromate ions change to chromate ion $\text{Cr}_2\text{O}_7^{2-} = \text{CrO}_4^{2-}$ (ii) $\text{Cr}_2\text{O}_7^{2-} + 6\text{Fe}^{2+} + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 6\text{Fe}^{3+} + 14\text{H}_2\text{O}$	1 1 1 1 1 $\frac{1}{2}$ $\frac{1}{2}$ 1 1 1 1

	(iii) $\text{Cr}_2\text{O}_7^{2-} + 3\text{S}^{2-} + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 3\text{S} + 7\text{H}_2\text{O}$	1
26.	<p>a) iodoform test Acetophenone will form iodoform (yellow ppt) on treatment with NaOH &amp; <math>\text{I}_2</math>  <math>2\text{C}_6\text{H}_5\text{COCH}_3 + 2\text{NaOH} + 3\text{I}_2 = 2\text{C}_6\text{H}_5\text{COONa} + 2\text{CHI}_3</math></p> <p>b) benzaldehyde will be more reactive as phenyl gp. Is e-withdrawing gp &amp; hence increase the nucleophilicity of carbonyl carbon</p> <p>c) i) <math>\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CHO}</math>  ii) <math>\text{RCH}(\text{Cl})\text{COOH}</math>  iii) <math>\text{C}_6\text{H}_5\text{COOH}</math></p> <p style="text-align: center;">OR</p> <p>A= Acetophenone B= 2,4 dinitrophenyl hydrazine  C=<math>\text{CHI}_3</math> D=<math>\text{C}_6\text{H}_5\text{COOH}</math> E=<math>\text{HCOOH}</math></p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1 each</p>

