

Attempt **ALL** Questions

[1-mark Questions]

1. Why does KCl turn violet on heating in potassium vapours? 1
2. Mention a large-scale use of the phenomenon called 'reverse osmosis'. 1
3. How is half life period of a zero order reaction related to rate constant? 1
4. Write the IUPAC name of the following organic compound:
 $\text{H}_3\text{C}-\text{CH}(\text{CH}_3)-\text{CO}-\text{CH}(\text{CH}_3)-\text{O}-\text{CH}_2-\text{CH}_3$ 1
5. Arrange the following compounds in the decreasing order of basic strength:
 NH_3 , $\text{C}_6\text{H}_5\text{NH}_2$, $\text{CH}_3-\text{CH}_2\text{NH}_2$, $(\text{CH}_3-\text{CH}_2)_2\text{NH}$ 1

[2-mark Questions]

6. Why is Mg an excellent conductor? Explain on the basis of band theory. 2
 7. Find out whether it is possible to reduce MgO using carbon at 298 K.
 For the reaction, $\text{MgO}_{(s)} + \text{C}_{(s)} \longrightarrow \text{Mg}_{(s)} + \text{CO}_{(g)}$
 $\Delta_r H^\circ = 491.18 \text{ kJmol}^{-1}$ and $\Delta_r S^\circ = 197.67 \text{ JK}^{-1}\text{mol}^{-1}$. 2
 8. Write the overall reaction that takes place during the charging and discharging of a lead storage battery. 2
 9. Name the principal ore of lead and describe the extraction of the metal from it. 2
- OR**
- Describe how bauxite ore is concentrated. 2
10. Write balanced equations for the following reactions: 2
 - (i) $\text{P}_4\text{O}_6 + \text{H}_2\text{O} \longrightarrow$
 - (ii) $\text{XeF}_6 + \text{KF} \longrightarrow$
 11. An alkyl halide with molecular formula $\text{C}_4\text{H}_9\text{Cl}$ is optically active. Draw the structures of enantiomers and assign (R) and (S) configuration to them. 2
 12. Write the information asked for in the following: 2
 - (i) PVC [monomeric unit]
 - (ii) Nylon-66 [materials used for preparation]
 - (iii) Nylon-6 [copolymer or homopolymer?]
 - (iv) PHBV [An important use]

[Please Turn Over]

[3-mark Questions]

13. An electron beam emerges from an accelerator with kinetic energy 1.14×10^{-25} J
What is its de Broglie wavelength of the electron?
[$h = 6.6 \times 10^{-34}$ Js; $m_e = 9.1 \times 10^{-31}$ kg] 3

14. An element X crystallises in fcc structure. If 104 g of the element contains 2.42×10^{24} atoms, calculate the edge length of its unit cell. Density of the element is 7.2 g cm^{-3} . 3

OR

An element has bcc structure with cell edge of 228 pm. How many atoms are present in 100 g of the element? Density of the element is 7.2 g cm^{-3} . 3

15. (a) Blood cells swell and burst when placed in pure water. Give reason. 1

(b) 45 g of ethylene glycol $\text{C}_2\text{H}_6\text{O}_2$, is mixed with 600 g of water. Calculate the depression of freezing point of the solution.
[$K_f(\text{H}_2\text{O}) = 1.86 \text{ K kg mol}^{-1}$; H = 1; C = 12; O = 16] 2

16. (a) Predict the sign of ΔS for the following processes :-

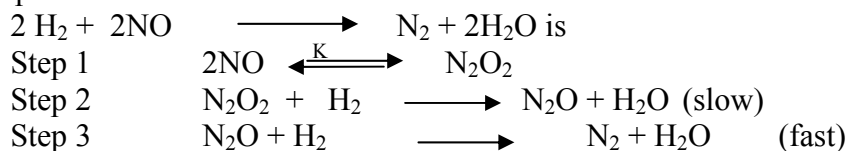
(i) $\text{I}_{2(\text{g})} \rightarrow \text{I}_{2(\text{s})}$
(ii) $\text{AgNO}_{3(\text{s})} \rightarrow \text{AgNO}_{3(\text{aq})}$ 1

(b) For the water gas reaction :- $\text{C}_{(\text{s})} + \text{H}_2\text{O}_{(\text{g})} \rightleftharpoons \text{CO}_{(\text{g})} + \text{H}_2_{(\text{g})}$
the standard Gibbs energy of reaction, at 1000K, is -8.1 kJmol^{-1} . Calculate its equilibrium constant. [$R = 8.314 \text{ J K}^{-1}\text{mol}^{-1}$] 2

17. (a) Explain with the help of a diagram the effect of change in concentration of solution on molar conductivity of a
(i) A weak electrolyte
(ii) A strong electrolyte 2

(b) State Kohlrausch law. 1

18. (a) The possible mechanism for the reaction :



If the second step is the rate determining step, what is:

(i) The rate law for the reaction
(ii) The order of the reaction 2

(b) What is meant by pseudo first order reaction? 1

19. (a) What is shape selective catalysis ?

(b) State Hardy – Schulze rule .
(c) What is demulsification ? 3

20. (a) Write the IUPAC name of the linkage isomer of $[\text{Co}(\text{NH}_3)_5\text{SCN}]\text{Cl}_2$

(b) Using valence bond theory, explain the shape and magnetic moment of $[\text{Ni}(\text{NH}_3)_6]^{2+}$. 3

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21. (a) How can a radioactive nucleus emit a beta particle (electron) if there are no electrons present in the nucleus? 1
 (b) What is meant by a fissile isotope? How such isotopes are produced artificially? Give an example? 2
22. When a ${}^7_3\text{Li}$ nuclide is bombarded with a proton, two alpha particles are produced:
 (i) Write the balanced equation for the above nuclear reaction 1
 (ii) Calculate the nuclear energy released in MeV
 [At.mass (m_u) Li = 7.01601; H = 1.00783; He = 4.00260 ; $1 m_u = 931.48 \text{ MeV}$] 2
23. (a) How will you carry out the following conversions? 2
 (i) aniline to benzoic acid
 (ii) ethanal to ethane
 (b) How will you distinguish HCOOH and CH_3COOH ? 1
24. State the reactions taking place when:
 (a) nitrobenzene is treated with a mixture of concentrated nitric acid and sulphuric acid.
 (b) an alkyl isocyanide is reduced with lithium aluminium hydride.
 (c) bromine water is added to an aqueous solution of aniline. 3

[5-mark Questions]

25. (a) Account for the following:
 (i) Aldehydes undergo nucleophilic addition reactions more readily than ketones.
 (ii) orthonitrophenol is more acidic than orthomethoxyphenol. 2
 (b) Two moles of an organic compound 'A' on treatment with a strong base gives two compounds 'B' and 'C'. Compound B on dehydrogenation over copper at 573 K gives A. On acidification, C yields a carboxylic acid 'D' having molecular formula CH_2O_2 . Identify A, B, C and D. 2
 (c) Write a chemical equation to illustrate Hell Volhard Zelinsky reaction. 1
26. (a) Account for the following:
 (i) Nitric acid makes aluminium passive.
 (ii) carbon shows remarkable tendency for catenation
 (iii) SF_6 is an inert, non-toxic gas. 3
 (b) How will you prepare:
 (i) HF from CaF_2 (ii) XeF_4 2

OR

- (a) Arrange the following in the increasing order of property mentioned against each in bracket.
 (i) H_2O , H_2S , H_2Se , H_2Te (boiling point)
 (ii) KF, KI, KCl, KBr (ionic character)
 (iii) HOCl , HOClO , HOClO_2 , HOClO_3 (acid strength) 3
 (b) Deduce the structure of BrF_3 by applying VSEPR theory. 2
27. (a) Account for the following:
 (i) Zirconium and hafnium have almost the same size.
 (ii) transition elements exhibit variable oxidation states.
 (iii) Zn^{2+} salts are not coloured. 3
 (b) Name the important ore of Mn. How will you prepare KMnO_4 from this ore? Give chemical reactions involved. 2