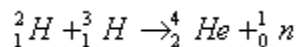


- Q. 1.** Name one ion whose central atom has the sp^3d^2 sp type of hybrid orbitals. **1**
- Q. 2.** Name a salt that can be added to AgCl so as to produce cation vacancies. **1**
- Q. 3.** Which radioactive series starts from U-235 and terminates at Pb-207? **1**
- Q. 4.** What is meant by 'shape selective' catalysis? **1**
- Q. 5.** Why is the bond dissociation energy of fluorine molecule less than that of chlorine molecule? **1**
- Q. 6.** What is the effect of increasing pH on $K_2Cr_2O_7$ solution? **1**
- Q. 7.** Name the following complex using IUPAC norms: $[Co(en)_2(ONO)Cl]Cl$ **1**
- Q. 8.** Why is cellulose in our diet not nourishing? **1**
- Q. 9.** Give one example each of (a) a vat dye, (b) a mordant dye. **1**
- Q. 10.** Mention the composition of a composite propellant. **1**
- Q. 11.** Br^- ions form close packed structure. If the radius of Br^- ion is 195 pm, calculate the radius of the cation that just fits in the tetrahedral hole.
Can a cation A^+ having a radius of 82 pm be slipped into the Octahedral hole of the crystal A^+Br^- ? **2**
- Q. 12.** Carbon tetrachloride and water are immiscible whereas ethanol and water are miscible in all proportions. Correlate this behaviour with molecular structures of these compounds. **2**
- Q. 13.** What is meant by bond order? Calculate the bond orders of He_2^+ , O_2^- and O_2^{2-} molecular ions. **2**
- Q. 14.** Why does the molar conductance increase on diluting the solution of a weak electrolyte? Electrolytic conductivity of 0.30 M solution of KCl at 298 K is $3.72 \times 10^{-2} S cm^{-1}$. Calculate its molar conductivity. **2**
- Q. 15.** (a) State the factors that influence the value of cell potential of the following cell:
 $Mg(s) | Mg^{2+}(aq) || Ag^+(aq) | Ag(s)$
(b) Write Nernst equation to calculate the cell potential of the above cell. **2**
- Q. 16.** What is known as 'activation energy'? How is the activation energy affected by (i) the use of a catalyst and (ii) a rise in temperature? **2**

Q. 17. The reaction $SO_2Cl_2 \rightarrow SO_2 + Cl_2$ is a first order reaction with half-life 3.15×10^4 s at $320^\circ C$. What percentage of SO_2Cl_2 would be decomposed on heating at $320^\circ C$ for 90 minutes? **2**

Q. 18. Calculate the energy released (in joules) in the fusion reaction per atom of helium formed: **2**



Given:

$${}^2_1H = 2.014 \text{ amu}, {}^3_1H = 3.016 \text{ amu}$$

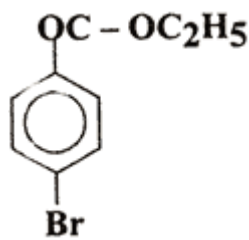
$${}^4_2He = 4.003 \text{ amu}, {}^1_0n = 1.009 \text{ amu}$$

$$1 \text{ amu} = 931.5 \text{ MeV}; 1 \text{ MeV} = 1.622 \times 10^{-13} \text{ J}$$

Q. 19. What is adsorption? How does adsorption of a gas on a solid surface vary with (a) temperature and (b) pressure?

Illustrate With the help of appropriate graphs. **2**

Q. 20. Write IUPAC names of the following: **2**



(ii) $CH_3 - C = C - CH_2 - CHO$

Q. 21. Write one chemical equation each to exemplify the following reactions: **2**

(i) Carbylamine reaction

(ii) Hofmann bromamide reaction

Q. 22. What are boranes? How is diborane prepared on an industrial scale? Draw the structure of diborane molecule. **2**

Q. 23. Draw the structure of ferrocene and write the reaction involved in the preparation of ferrocene. **2**

Q. 24. Write equations used for the synthesis of (i) terylene, (ii) neoprene. **2**

Q. 25. What are phospholipids? Give their important uses. **2**

Q. 26. Name the components of blood which are responsible for: **2**

(i) Blood clotting

- (ii) Source of energy
- (iii) Maintaining pH of blood within a suitable range
- (iv) Defence against infection.

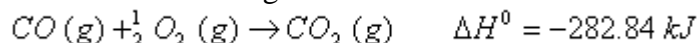
Q. 27. What is meant by the statement that 'an electron has dual nature'? Calculate the wavelength associated with a moving electron having a kinetic energy of 1.1375×10^{-25} J. **3**

[$m_e = 9.1 \times 10^{-31}$ kg; $h = 6.6 \times 10^{-34}$ Js]

Q. 28. An aqueous solution containing 1.248 g of barium chloride (molar mass = 208.34 mol^{-1}) in 100 g of water boils at 100.0832°C . Calculate the degree of dissociation of barium chloride.

[$K_b \text{ for water} = 0.52 \text{ K g mol}^{-1}$] **3**

Q. 29. How is a change in free energy related to the spontaneity of a reaction? Calculate ΔG° of the following reaction? **3**

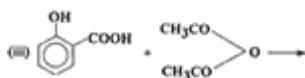
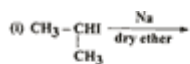


$$S^\circ_{\text{CO}_2 \text{ (g)}} = 213.8 \text{ J K}^{-1} \text{ mol}^{-1}$$

$$S^\circ_{\text{CO (g)}} = 197.9 \text{ J K}^{-1} \text{ mol}^{-1}$$

$$S^\circ_{\text{O}_2 \text{ (g)}} = 205.0 \text{ J K}^{-1} \text{ mol}^{-1}$$

Q. 30. Complete the following reactions: **3**



Q. 31. How is aniline prepared on a large scale? How will you convert it into: **3**

- (i) Benzonitrile,
- (ii) Acetanilide?

Write the reaction and the conditions in each case.

Q. 32. Account for the following: **3**

- (a) Tendency to show -2 oxidation state diminishes from sulphur to polonium in Group 16.
- (b) Boron forms electron deficient compounds.
- (c) PbCl_4 is less stable than SnCl_4 .

Q. 33. (a) Describe the preparation of acetic acid from acetylene.

(b) How can the following be obtained from acetic acid:

- (i) Acetone
- (ii) Acetaldehyde

- (c) In what way can acetic acid be distinguished from acetone?
- (d) Why do carboxylic acids not give the characteristic reactions of a carbonyl group? **5**

- Q. 34.** (a) What is the basic difference between the electronic configurations of the transition and inner transition elements?
- (b) Discuss the general trends in the following properties of the 3d transition elements (21 - 29):
- (i) Atomic size
 - (ii) Oxidation states
 - (iii) Formation of coloured ions