

## **ATOMIC STRUCTURE**

### **Questions carry two marks:**

1. Write Schrodinger equation and explain the terms.
2. What do you mean by quantum numbers?
3. What is electromagnetic radiation?
4. Deduce De Broglie equation.
5. Differentiate orbit and orbital.
6. Draw the shape of s and p orbital.
7. What is the shape of orbital when  $l=0$  and  $l=1$ .
8. State Pauli's exclusion principle.
9. State Hund's rule.
10. State Aufbau principle.
11. Write electronic configuration of copper and chromium.
12. Calculate wavelength of a cricket ball of mass 0.08 Kg & moving with a velocity of 30m per second.
13. Arrange the following orbital in increasing order of energy 3d, 3p, 3s, 4p, 4d, 4s, 5s

### **Questions carry four marks:**

1. What are quantum numbers? Explain significance of each of these.
2. Write the possible values of  $l, m, s$  when  $n=3$ .
3. Give differences between orbit and orbital.
4. State and explain Heisenberg uncertainty principle.
5. What is Electromagnetic spectrum? Arrange it from longest to shortest wavelength. Give their wavelength range.
6. What are the factors to be kept in mind to work out Electronic configuration of atom?

## **PERIODIC CLASSIFICATION.**

### **Questions carry two marks:**

1. Define atomic radius.
2. Explain the variation of atomic radius across period and down a group.

3. Why do noble gases have largest atomic radii in each period?
4. Why is atomic radius of caesium larger than that of sodium?
5. What is Lanthanide contraction?
6. The cationic radius is smaller than the radius of corresponding atom. Why?
7. Why is ionic radius of  $\text{Fe}^{3+}$  ions less than  $\text{Fe}^{2+}$  ions?
8. What are isoelectronic ions? Give example.
9. Define a) electron affinity b) Ionisation potential c) Electronegativity.
10. Why is second ionisation energy greater than first ionisation energy?
11. Calculate the oxidative number of S in a)  $\text{SO}_3$  b)  $\text{H}_2\text{SO}_4$ .
12. Explain how ionisation energy varies with increase in atomic number down a group.
13. Why is cation larger than corresponding atom?

**Questions carry four marks:**

1. How does electron affinity and ionisation potential vary along a period and group?
2. What are the rules to be followed in computing oxidation numbers?
3. Assign oxidation numbers to oxygen in a)  $\text{HNO}_3$  b)  $\text{H}_2\text{O}_2$  c)  $\text{Na}_2\text{O}_2$  d)  $\text{H}_2\text{SO}_4$
4. What is electronegativity? How does it vary along period and down group?
5. What are the factors affecting Electron affinity. Why N and P have unexpected lower values of electronegativity?

**CHEMICAL BONDING**

**Questions carry two marks:**

1. What is the reason for the atoms to combine to form molecules?
2. What is A. ionic bond B. covalent bond C. coordinate bond?
3. Define 'Lattice Energy'. How does it influence the stability of an ionic compound?
4. What is meant by resonance? Give example.
5. Write the resonance forms of Hydrogen.
6. Give two properties of a. Ionic compound b. covalent compound.
7. What are bonding and anti-bonding orbitals?
8. What is bond order? How is it related to stability of a compound?
9. Define bond length. Which type of bond has least bond length?

10. What is bond angle? What is the bond angle in methane?
11. What is bond energy?
12. Give two differences between sigma and pi bond.
13. What is polar bond? Give an example.
14. Define Dipole moment. What is its significance?
15. What is Coordinate bond? Give an example.
16. What is Hydrogen bond? What are the types?
17. Give example for intra and inter Hydrogen bonding.
18. What are Vander Waals forces in biomolecules?
19. What is hydrophobic force? Give example.
20. Mention the shapes of molecules with angle 180 & 120 degrees
21. C-H bond is polar but CH<sub>4</sub> is non polar why?
22. Ice floats on water. Why?

**Questions carry four marks:**

1. Setup Born Haber cycle for formation of NaCl and calculate Lattice energy.
2. Explain molecular orbital theory of covalent bond.
3. Compare properties of ionic and covalent compound.
4. Explain abnormal properties of water on the basis of Hydrogen bonding
5. Explain with examples the formation of s-s, s-p and p-p bonds between atoms.
6. Explain sp<sup>3</sup>, sp<sup>2</sup>, sp hybridization with example.
7. On the basis of VSEPR theory explain geometry of H<sub>2</sub>O, NH<sub>3</sub>, ICl<sub>2</sub>, BF<sub>3</sub> molecules.
8. Write a note on Vander Waal's forces of attractions.
9. Explain molecular orbital theory of covalent bonding.
10. Explain factors favouring formation of ionic bond.
11. Compare bonding and anti-bonding orbitals.
12. Explain formation of oxygen molecule, nitrogen molecule on the basis of MOT.

**SOLUTIONS**

**Questions carry two mark questions:**

1. Explain the terms with suitable examples. A. Molarity B. Normality  
C. Molality

- 2.State Henry's law of gas solubility. Mention the limitations.
- 3.Define A.vapour pressure B.Lowering of vapour pressure C.Relative lowering of vapour pressure.
- 4.StateRaoult's Law. Give its mathematical expression.
- 5.Establish relationship between Relative lowering of vapour pressure and molar mass of a solute.
7. What is semipermeable membrane? How is copper Ferrocyanide semipermeable membrane prepared?
- 8.State the Law of Osmotic pressure.
- 9.Define A.Isotonic B. Hypotonic C. Hypertonic solutions.
10. What is meant by A. Elevation in boiling point of solvent B.depression in freezing point of a solvent?
11. Write short notes on A.Abnormal molecular weights B.Vant Hoff factor. C.Degree of association D.Degree of dissociation.
- 12.Define A.Molal elevation constant B.Cryoscopic constant.

**Questions carry fourmarks :**

1. What are the factors affecting solubility.
- 2.Write a note on solubility curves.
3. What are the limitations of Henry's law? What are its applications?
- 4.How do you determine lowering of vapour pressure by Oswald and Walker method?
- 5.How is osmotic pressure determined by Berkely Hartley method?
- 6.Explain the factors regulating Osmotic pressure.
7. What are the salient features of Donnan Membrane equilibrium?
- 8.How is molecular weight of the given solute determined by Walker Lumsden method?
- 9.Describe the depression in freezing point method of determining molar mass of solute.
10. Calculate the Normality and Molarity of 20% H<sub>2</sub>SO<sub>4</sub>.specific gravity of H<sub>2</sub>SO<sub>4</sub> is 1.14.
11. Calculate the mass of Oxalic acid crystals required to prepare 250ml of 0.1M solution.

## **ELECTROLYTIC DISSOCIATION AND MASS LAW**

### **Questions carry 2 mark questions**

1. Distinguish between strong and weak electrolytes.
2. What is the relationship between ionic strength and activity coefficient?
3. Give reason. A. ZnS is precipitated by H<sub>2</sub>S from Ammoniacal solution but not from HCl solution. B. H<sub>2</sub>S is a weak acid, yet it precipitates CuS from a solution of CuSO<sub>4</sub>.
4. Define equivalent conductance and molar conductance of an electrolyte
5. Define cell constant. How is it determined?
6. What are reversible and irreversible cells? Give one example for each.
7. What are the advantages of conductometric titration?
8. What are electrochemical cells?
9. Give the redox reactions of Daniel cell.
10. Define single electrode potential.
11. What are reversible electrodes? Give example.
12. Mention different types of reversible electrodes giving example.
13. Write Nernst equation and explain terms.
14. Define standard electrode potential.
15. What are reference electrodes? Give example.
16. What is electrochemical series?
17. State limitations of glass electrode.
18. What are ion selective electrodes?
19. What are the different types of ion selective electrodes?
20. What is the use of salt bridge? How is it made?
21. Calculate ionic strength of 0.04M sodium chloride.
22. The activity coefficient of 0.2M NaCl at 298K is 0.888. Calculate the activity of the ions.
23. What concentration of SO<sub>4</sub> ions will be required to precipitate CaSO<sub>4</sub> in solution containing 3×0.01 moles/lit of Ca<sup>2+</sup> ions  
K<sub>sp</sub>=2.4×0.00001

**Questions carry four marks:**

- 1.Explain selective precipitation of second and fourth group Basic radicals.
- 2.How is cell constant measured using Wheatstone bridge?
- 3.How is Equivalent Conductivity and Molar conductivity measured using Wheatstone bridge?
- 4.What are the advantages of conductometric titration?
- 5.Discuss Construction of a Daniel cell and its mechanism.
- 6.Explain construction of Weston Cadmium cell.Give the cell reaction.
- 7.How is Standard Hydrogen Electrode constructed? What are its limitations.
- 8.How is pH of a solution determined using calomel electrode.
- 9.How is pH of a solution determined using Quinhydrone electrode?
- 10.What are the advantages and limitations of Quinhydrone electrode?
- 11.What is a glass electrode? How is pH of a solution determined using glass electrode.
- 12.What are the advantages and disadvantages of Glass Electrode?
- 13.What are the applications of Electrochemical Series?
- 14.What are the types of ion selective electrodes?How is it used in Biochemistry

**ACIDS, BASES AND BUFFERS**

**Questions carry two marks:**

- 1.What are the important concepts that define acids and bases?
- 2.What is Arrhenius concept of acids and bases? What are its limitations?
- 3.What is Lowry Bronsted concept of acids and bases? What are its limitations?
- 4.What are conjugate bases of the following?  
$$\text{NH}_3, \text{H}_3\text{PO}_4, \text{CH}_3\text{OH}, \text{OH}^-, \text{H}_3\text{O}^+$$
- 5.What are the conjugate acids of the following?  
$$\text{F}^-, \text{PO}_3^{3-}, \text{SO}_4^{2-}, \text{NH}_3$$
- 6.What is Lewis concept of acids and bases? Give examples.
- 7.Explain why acetic acid is weak acid in water and strong acid in liquid ammonia.
- 8.What are  $K_a$  and  $pK_a$ .
- 9.What are  $K_b$  and  $pK_b$ .

10. Define ionic product of water.
11. What are Buffer solutions?
12. Mention the Buffers of plasma, Red blood cells, and tissue fluids.
13. Explain the mechanism of action of above buffers
14. Derive H-H equation for a buffer solution of weak acid and its salt.
15. What are indicators?
16. Discuss the choice of indicator for acid base titration.
16. What is meant by iso electric pH of an Amino acid?
17. What is buffer capacity of a buffer?

**Questions carry four marks:**

1. Bring out the relationship between Dissociation constant and Degree of dissociation.
2. What is the effect of salt on Dissociation of acids?
3. Discuss the titration curve of acetic acid with sodium hydroxide.
4. Explain the titration curve of strong acid with strong base.
5. How do you experimentally calculate pKa value of Alanine?
6. Explain mechanism of action of an acidic buffer.
7. Explain mechanism of action of basic buffer.
8. Explain mechanism of action of neutral buffer
9. Derive Buffer equation for acid buffer and basic buffer.
10. Explain mechanism of action of Bicarbonate Carbonic acid buffer, Phosphate buffer, amino acid and protein buffers.

**ADSORPTION**

**Questions Carry two marks:**

1. Differentiate between adsorption and absorption.
2. Define the terms A. adsorption B. Adsorbate C. Adsorbent
3. What is physical absorption and chemical absorption?
4. Define heat of absorption.
5. What are the factors on which Adsorption of Gases by solids depend upon.

**Questions Carry four marks:**

1. Bring out the differences between Physical and Chemical adsorption.
2. What is Adsorption isotherm? Discuss.
3. Write a note on Freundlich adsorption isotherm. Mention a limitation.
4. Derive Langmuir adsorption isotherm and mention its limitation.
5. Explain the applications of Adsorption in biological systems.

**BIOPOLYMERS**

**Questions Carry twomarks:**

1. What are polymers? Give examples.
2. How are polymers classified?
3. Name the different types of polymerisation process.
4. What are Biopolymers? Give example.
5. Explain the terms A. Number average molecular weight B. Weight average molecular weight.

**Questions carryfourMarks :**

1. Explain addition polymerisation with example.
2. Explain condensation polymerisation with explain.
3. What are the monomer units of cellulose, starch, Glycogen, proteins and nucleic acids? What is the type of linkage between the monomer units?

**VISCOSITY**

**Questions Carry twomarks:**

1. What is viscosity? Define coefficient of viscosity.
2. What are the factors affecting viscosity
3. Explain the relationship of viscosity to size and shape of molecules.
3. What is the unit of viscosity in SI and CGS units?

**Question carry four marks:**

1. How is viscosity of a liquid determined experimentally?

**SURFACE TENSION**

**Questions carrytwo marks:**

1. What is surface tension?

2. Define surface tension
3. What is the unit of surface tension in SI unit & CGS unit?
4. Explain detergent action of soap.
5. What are surfactants? Give examples.

**Questions carry four marks:**

1. How is surface tension of a liquid determined experimentally?
2. What is the significance of surface tension in biological systems?

**RADIOACTIVITY**

**Questions carry two marks:**

1. What is natural Radioactivity?
2. Explain A. N/P ratio B. Mass defect C. Binding energy.
3. Explain the terms A. nuclide B. nucleons
4. What are parent nuclide and daughter nuclide?
5. Write group displacement law.
6. Give examples for 1. Alpha 2. Beta 3. Gamma 4. Positron 5. Electron capture.
7. What is the unit of radioactivity? How many disintegration is it?
8. What is radioactive series?
9. Explain radioactive equilibrium.
10. What is A. Decay law B. Decay Constant?
11. What is artificial radioactivity? Give one example.
12. What are the applications of artificial radioactivity?
13. Define A. Isotopes B. Isobars.
14. Explain Tracer technique

**Questions carry four marks:**

1. What are the characteristics of radioactive elements?
2. Derive an expression for Half-life period of a radioactive element.
3. Write a note on Nuclear Fission and Nuclear fusion.
4. Bring out the differences between Nuclear fission and Nuclear fusion.

5. How is radioactivity detected?
6. Write a note on A. Geiger Muller Counter B. Scintillation counter.
7. What are the applications of Phosphorus 32?
8. Write a note on carbon dating.
9. What are the biological effects of radiations?
10. What are the safety measures to be followed while using radioactive materials?