

[Time: 2.30 Hours]

[Marks:75]

Please check whether you have got the right question paper.

- N.B:
1. All questions are compulsory.
 2. Figures to the right indicates full marks.
 3. Use of log tables/non-programmable calculator is allowed.

Q1 Attempt any three questions from the following.

- A. Explain the terms and symmetry elements and symmetry operations with suitable examples. 5
- B. Discuss the constituents of point group with reference to boron trichloride molecule. 5
- C. What is Wale Correlation diagram ? Explain its use with suitable example. 5
- D. On the basis of SALC principle, draw molecular orbital diagram for water molecule. 5
- E. Describe conductors and insulators on the basis of band theory. 5
- F. Write a note on n type extrinsic semiconductor. 5

Q2 Attempt any three questions from the following.

- A. Show that packing factor for fcc lattice is $2\pi/6$ or 74%. 5
- B. Differentiate between Schottky and Frankel defect. 5
- C. Explain the unit cell and lattice constants with help of suitable diagram. 5
- D. Give a brief account of fullerenes. 5
- E. What are the applications of superconductors 5
- F. Discuss the Meissner effect for super conducting materials. 5

Q3 Attempt any three questions from the following.

- A. What are the inner transition elements ? Give their position in the periodic table. 5
- B. Write names , general configuration , symbol and atomic number of lanthanides. 5
- C. Give an account of lanthanide contraction. 5
- D. Explain TBP method for the extraction of lanthanides. 5
- E. Discuss the occurrence of Uranium . Give any two properties and applications of uranium. 5
- F. Define roasting and acid leaching for uranium . 5

Q 4 Attempt any three from the following

- A. Discuss the classification solvents with suitable examples. 5
- B. With reference to liquid ammonia as a solvent , give two balanced equations for acid base and complex formation reactions. 5
- C. State and explain geometry , hybridization of iodine pentafluoride. 5
- D. Discuss the method of preparation, properties and structure of thiocyanogen. 5

- E. How does xenon hexafluoride prepared ? give any three properties and its exact geometry. 5
- F. Write names atomic number and electronic configuration of 18 group elements. 5

Q5 Answer the following.

A) Select and write the most appropriate answer 4

- a) The rotation axis C_n for water is
 i) C_2 ii) C_3 iii) C_1
- b) In D type points group D stand for plane.
 i) Vertical ii) horizontal iii) dihedral
- c) Bond order of NO molecule is
 i) 2 ii) 2.5 iii) 3
- d) The insulators have Forbidden energy gap.
 i) large ii) small iii) no

OR

A) State whether the following statements are true or false. 4

- p) Improper rotational axis of symmetry is denoted by symbol S_n .
- q) BCl_3 molecule belongs to C_{3v} point group.
- r) In water molecule Oxygen is the central atom.
- s) n -type extrinsic semiconductors are obtained by adding small quantity of a pentavalent element impurity ..

B) Select and write most appropriate answer. 4

- a) A point in crystal lattice signifies.....
 i) Size of particles ii) position of particles iii) position of center of particles.
- b) ZnS is an example of ----- defects
 i) Frenkel ii) Scottky iii) Point
- c) Superconductors whose critical temperature is above 77k is called
 i) LTSC ii) HTSC iii) Organic
- d) Carbon in C_{60} have ----- hybridization.
 i) sp ii) sp^2 iii) sp^3

OR

B) State whether the following statements are true or false. 4

- p) The effect out the flux lines of magnetic field is known as Meissner effect.
- q) Efficiency of packing is expressed in terms of atomic packing factor.
- r) Nb_2Sn has a critical temperature 22.3 K.
- s) Prototype train floats on magnetic field and built up using Superconducting phenomenon.

C) Select and write most appropriate answer**4**

- a) The electronic configuration of Sm^{3+} is
 i) $[\text{Xe}] 4f^5$ ii) $[\text{Xe}] 4f^6$ iii) $[\text{Xe}] 4f^{10}$
- b) is a colourless lanthanide ion.
 i) Eu^{3+} ii) La^{3+} iii) Yb^{2+}
- c) is the member of actinide series.
 i) Gd^{3+} ii) Ti^{3+} iii) Np
- d) One of the important mineral from which Uranium is extracted is.....
 i) Haematite. ii) Pitchblende. iii) Ilmenite.

OR**C) State whether the following statements are true or false.****4**

- p) Pure Uranium is malleable and ductile.
- q) Lanthanide have weaker tendency to form complexes.
- r) Lanthanide contraction observed only for trivalent lanthanide ion.
- s) Cerium has atomic number 58.

D) Select and write most appropriate answer**3**

- a) dissolves alkali metals and gives blue colour solution.
 i) Water ii) Ammonium iii) Benzene
- b) Bromine trifluoride have type of interhalogen.
 i) XY_3 ii) XY_5 iii) XeF_6
- c) have sp^3 hybridisation.
 i) XeF_2 ii) XeF_4 iii) XeF_6

OR**D) State whether the following statements are true or false.****3**

- p) Cyanogen is a colourless poisonous gas soluble in water.
- q) Formation of Super Critical Liquid phase of substance can be describe by phase diagram.
- r) Nonionising solvents are practically polar.