

**QP Code : 75278**

(3 Hours)

[ Total Marks :100

[Old Course]

- N.B. :** (1) All Questions are compulsory  
(2) Figures to the right indicate full marks.  
(3) Use of log tables/non programmable Calculator is allowed

1. (a) Explain the term Atomic Packing Factor (A.P.F). Show that A.P.F. for face centered cubic structure is  $\frac{\sqrt{2}\pi}{6}$  or 74%. 5

**OR**

- (a) Draw a neat labelled molecular orbital diagram for methane molecule showing distribution of electrons in various energy levels, predicting its magnetic behaviour. 5

Answer any three of the following :-

- (b) Describe the structure of sodium chloride with a neat diagram. 5  
(c) Explain the terms:  
(i) Symmetry elements 2  
(ii) Formation of tetrahedral void in solids. 3  
(d) Give the applications of super conducting materials. 5  
(e) Explain the point group along with symmetry operations for ammonia molecule. 5
2. (a) Discuss the principles involved in ion-exchange method for the separation of lanthanides. 5

**OR**

- (a) What are oxocations? How do oxocations render acidity to aqueous solution? 5

Answer any three of the following :-

- (b) On the basis of electronic configuration of lanthanides explain their complex formation tendency. 5  
(c) With reference to dinitrogen tetroxide as non-aqueous solvent explain :- 5  
(i) acid-base reactions  
(ii) redox reactions.

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- (d) (i) Give any two applications of lanthanides 2  
(ii) Distinguish between protonic and aprotic solvents 3  
(e) Describe Drago-Wayland concept to measure reactivity of acids and bases. 5

3. (a) What is crystal field splitting? Discuss the splitting of d orbitals of the central metal in tetrahedral complexes. 5

OR

- (a) Discuss spin selection rules. 5

Answer any three of the following :-

- (b) Explain Russell Saundèr's coupling. 5  
(c) Distinguish between stepwise stability Constant and overall stability Constant. 5  
(d) Draw a neat and labelled molecular orbital diagram of  $[Fe_2F_4]^{4+}$  ion and comment on it's magnetic behaviour. 5  
(e) Discuss  $SN^1CB$  reactions with reference to octahedral complexes of cobalt. 5

4. (a) Write a note on different forms of nano materials. 5

OR

- (a) Discuss any two methods of preparation of organo metallic compounds. 5

Answer any three of the following :-

- (b) Discuss polymerization of alkene using zeigler Natt a catalyst. 5  
(c) Explain Primary treatment Process for waste water. 5  
(d) (i) What is calamine? Give it's use in inorganic pharmaceuticals. 3  
(ii) Give any two applications of borazine. 2  
(e) Distinguish between aerobic and anaerobic process of treatment of waste water. 5

5. Answer the following :-

- (a) Explain P- type semiconductors on the basis of band theory. 3

OR

- (a) Define the term 'proper rotation axis of symmetry with a suitable example. 3

- (b) Discuss the position of actinide members in the periodic table. 3

OR

- (b) Give any three applications of plutonium. 3

- (c)  $\Delta_t$  is less than  $\Delta_o$  in complexes explain. 3

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- (d) Write brief note on tincture iodine 3
- (e) Explain the term unit cell 2
- (f) Name any two minerals of uranium 2
- (g) 8-hydroxyquinoline complex of  $\text{Ni}^{+2}$  is more stable than the complex with 2-methyl, 8-hydroxyquinoline, explain. 2

**OR**

- (g) Calculate number of microstates for  $p^3$  configuration. 2
- (h) Give any two chemical properties of ferrocene. 2

**OR**

- (h) Give two examples of complexes which show quadruple bonding. 2

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