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Reg. No. : .....

Code No. : 7392

Sub. Code : HCHM 12

M.Sc. (CBCS) DEGREE EXAMINATION,  
NOVEMBER 2015.

First Semester

Chemistry

INORGANIC CHEMISTRY — I

(For those who joined in July 2012 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

- Which of the following molecules contain  $sp^2-sp^2$   $\sigma$  bond  
(a)  $CH_4$  (b)  $C_2H_4$   
(c)  $C_2H_2$  (d)  $C_2H_6$
- The hybridization of I in  $IF_4^-$  is  
(a) sp (b)  $sp^2$   
(c)  $dsp^3$  (d)  $d^2sp^3$

- In the molecular orbital description of CO  
(a) highest energy electrons occupy anti-bonding orbitals  
(b) the bond order is 3  
(c) 6 molecular orbitals contain electrons  
(d) all the above are false
- Which one of the following has the lowest dissociation energy?  
(a)  $O_2^{2-}$  (b)  $O_2^{2+}$   
(c)  $O_2^+$  (d)  $O_2$
- Doping Se with As would produce a — semiconductor  
(a) n type (b) p type  
(c) p-n type (d) n-p type
- Which of the following defects in the crystal lowers its density  
(a) Schottky (b) Frenkel  
(c) F-centre (d) interstitial
- Co-ordination number of body centered cubic lattice is  
(a) 6 (b) 10  
(c) 12 (d) 8

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8. Cesium chloride has the structure of
- (a) BCC (b) FCC
- (c) simple cubic (d) none of these
9. Which of the following ions is paramagnetic?
- (a)  $\text{La}^{3+}$  (b)  $\text{Lu}^{3+}$
- (c)  $\text{Yb}^{3+}$  (d)  $\text{Sm}^{3+}$
10. The principal oxidation state of lanthanides is
- (a) +2 (b) +3
- (c) +4 (d) zero

PART B — ( 5× 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain  $\text{sp}^3\text{d}^2$  hybridization with one example.
- Or
- (b) Draw and explain molecular orbital energy level diagram of  $\text{B}_2$  molecule.

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12. (a) Give three important properties of co-ordinate covalent compounds.

Or

- (b) Explain why  $\text{CO}_2$  and  $\text{CCl}_4$  molecules are non polar while  $\text{CHCl}_3$  molecule is polar.

13. (a) Briefly discuss the different types of solids.

Or

- (b) Write on n and p type semi-conductors.

14. (a) Draw the structure and explain the features of zinc blende structure.

Or

- (b) Give an account of the properties and applications perovskite spinels.

15. (a) Write a note on lanthanide contractions.

Or

- (b) Explain the separation of Np, Pu and Am from uranium.

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**PART C — (5 × 8 = 40 marks)**

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Give an account of Bent's rule with suitable illustration.

Or

- (b) Write a brief note on fluxional molecules and their characterizations.

17. (a) Discuss the reaction taking place in liquid  $\text{SO}_2$

Or

- (b) Explain lattice energy calculation of NaCl by constructing Born Haber cycle.

18. (a) Describe Band theory and how it accounts for conduction, semi-conduction and non-conduction

Or

- (b) Explain the types and effects of non stoichiometric defects in crystals

19. (a) Give a comparative account of electron, neutron and X-ray diffraction methods.

Or

- (b) Discuss the significance of radius ratio rule and how will you calculate limiting radius for trigonal and octahedral sites.

20. (a) Discuss the spectral and magnetic properties of lanthanides

Or

- (b) Give an account of the common and uncommon oxidation states of actinides.

