

B. Sc. 3rd Semester (Honours) Examinations, 2020-2021

CHEMISTRY

Course ID: 31412

Course Code: SHCHE/302/C-6

Course Title: Inorganic Chemistry II

Time: 1 Hour 15 Minutes

Full Marks: 25

*The figures in the right hand side margin indicate full marks.
Candidates are required to give their answers in their own words
as far as practicable*

1. Answer *any five* of the following questions. 1×5 = 5
- (a) Draw the structure of a compound having μ -bond.
 - (b) State the hybridization of S atom in SF₆.
 - (c) Compare with reason the ionic Character of SnCl₂ and SnCl₄.
 - (d) Complete the following radioactive reaction:
$${}_{15}\text{P}^{30} \rightarrow \text{_____} + \text{_____}$$
 - (e) Calculate the formal charge of nitrogen in ammonium ion.
 - (f) Write down the bond order of CO and CN⁻.
 - (g) What is metal excess defect in ionic solids? Cite example.
 - (h) Why dipole moment value is zero in BF₃?
2. Answer *any two* of the following questions: 5×2 = 5
- (a) Explain why;
 - (i) Different melting points of o-nitrophenol and p-nitrophenol?
 - (ii) Different bond angles of NF₃ and NH₃? 2.5 + 2.5 = 5
 - (b) (i) Calculate the limiting radius ratio in a tetrahedral lattice.
 - (ii) Radius of Be²⁺, Ba²⁺, Zn²⁺ and O²⁻ are 0.59 Å⁰, 1.49 Å⁰, 0.88 Å⁰ and 1.26 Å⁰ respectively. Explain why they adopt different structures although they are all oxides? 3+2 = 5
 - (c) (i) The half-life of radium is 1590 years. How long will it take for 1 gm of the element to lose 0.1 gm?

- (ii) Define spallation reaction. Cite an example. 3+2 = 5
- (d) (i) Draw the MO energy diagram of H₂O. Calculate its bond order.
- (ii) Compare the stability order of NO, NO⁺ and NO⁻ with reference to bond order. 3+2 = 5
3. Answer *any one* of the following questions: 10×1 = 10
- (a) (i) 'NH₃, BCl₃ and BrF₃ have comparable molecular formulae but their shapes are different', explain from VSEPR Theory.
- (ii) State Bent's rule and explain the structure of PCl₂F₃.
- (iii) Calculate electron affinity of iodine from Born-Haber cycle with the help of following data (given in Kcal/mol): $(\Delta H_{\text{for}})_{\text{NaI}} = -68.8$, $(\Delta H_{\text{sub}})_{\text{Na}} = 25.9$, $\frac{1}{2} (\Delta H_{\text{diss}})_{\text{Iodine}} = 25.5$, $(\Delta H_{\text{IP}})_{\text{Na}} = 118.4$, $(U)_{\text{NaI}} = -165.4$. 4+3+3 = 10
- (b) (i) Discuss briefly the characteristics of nuclear binding force.
- (ii) Calculate the binding energy per nucleon in MeV of ${}_{26}\text{Fe}^{56}$; where mass of ${}_{26}\text{Fe}^{56}$, proton and neutron are 55.9349u, 1.00727u and 1.00866u respectively.
- (iii) What is Madelung constant? Cite the values of Zinc blende and fluorite.
- (iv) Compare with example 2c-2e and 3c-2e bonds. 3+2+2+3 = 10