

# RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, DECEMBER 2015

FIRST YEAR [BATCH 2015-18]

CHEMISTRY [Gen]

Date : 17/12/2015

Time : 11 am – 1 pm

Paper : I

Full Marks : 25

[Answer one question from each Unit]

## Unit - I

1. a) Define electron affinity of an atom. The first electron affinity of oxygen atom is positive, but the second electron affinity of oxygen is negative. Explain. [1+2]  
b) Electron affinities of noble gases are zero. Comment. [1]  
c) What are the defects of Bohr's theory on hydrogen like atom? [2]  
d) What do you mean by nuclear binding energy? From binding energy curve how can you explain nuclear fission and fusion reactions. [1+3]  
e) Arrange the following ions in decreasing order of their ionic radii :  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{O}^{2-}$ ,  $\text{N}^{3-}$ ,  $\text{F}^-$ . Give reasons. [3]
2. a) Give a comparative study of hydrides of N, P and As. [3]  
b) Calculate nuclear binding energy per nucleon of  ${}^{56}_{26}\text{Fe}$ .  
Given  $m({}^{56}_{26}\text{Fe}) = 55.9349 \text{ u}$ ,  $m(\text{p}) = 1.007825 \text{ u}$ ;  $m(\text{n}) = 1.008665 \text{ u}$ . [3]  
c) "Ionic radius of  $\text{K}^+$  and  $\text{Cl}^-$  are not equal though they are isoelectronic" — Explain. [2]  
d) Give the IUPAC name of the atom having atomic number 108. [1]  
e) Distinguish between nuclear fission and nuclear fusion with examples (one example each). [2+2]

## Unit - II

3. a) Discuss the structure and shape of the following compounds using VSEPR theory :  $\text{PCl}_5$ ,  $\text{XeF}_2$ ,  $\text{ClF}_5$  [3]  
b) What is hybridisation? On the basis of hybridisation of orbitals mention the shape of  $\text{PCl}_5$ ,  $\text{SF}_6$  and  $\text{NH}_3$  molecules. [1+3]  
c) What do you mean by perfect and imperfect complex, Give one example of each. [3]  
d) Dipole moment of  $\text{BF}_3$  is zero, but  $\text{NF}_3$  has dipole moment. [2]
4. a) Give a brief introduction of Werner theory (postulates) regarding coordination complex. [3]  

**Or,**

Give IUPAC names of the following :  $\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}]$ ,  $[\text{Co}(\text{NH}_3)_5(\text{H}_2\text{O})]\text{Cl}_3$ ,  $[\text{PtCl}_4(\text{NH}_3)_2]$ .

  
b) What is metal chelate? Give an example. [2]  
c) Arrange the following compounds in the order of their increasing melting points  
i)  $\text{LiF}$ ,  $\text{LiCl}$ ,  $\text{LiBr}$ ,  $\text{LiI}$   
ii)  $\text{LiCl}$ ,  $\text{NaCl}$ ,  $\text{KCl}$ ,  $\text{RbCl}$ ,  $\text{CsCl}$ , Give reasons [2+2]  
d) What is radius ratio rule? Mention its limitations. [2]  
e) Using VSEPR theory comment on the shape of  $\text{I}_3^-$ . [1]