

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MAY 2015**Second Semester****Core Course—THEORETICAL AND INORGANIC CHEMISTRY**

(Common for B.Sc. Chemistry Model I, Model II, B.Sc. Petrochemicals and
B.Sc. Chemistry Environment and Water Management)

[2013 Admission onwards]

Time : Three Hours

Maximum : 60 Marks

Part A

Answer all questions.

Each question carries 1 mark.

1. Why is ionization energy of sulphur is less than that of Phosphorous ?
2. If $n = 3$, what are the possible values of l . If $l = 2$. What are the m_l values possible ?
3. Mention the different types of weak chemical forces.
4. Write the M.O. electronic configuration of O_2 molecule and calculate its bond order.
5. Define half life period of a radioactive nuclei. How is it related to decay constant ?
6. How many α and β particles are emitted when ${}^{235}_{92}\text{U}$ changes to ${}^{206}_{82}\text{Pb}$?
7. AgCl is sparingly soluble in water while NaCl is soluble. Explain this from Lattice energy consideration.
8. What is radioactive equilibrium ? Explain.

(8 × 1 = 8)

Part B

Answer any six questions.

Each question carries 2 marks.

9. Show that the circumference of Bohr orbit is an integral multiple of de-Broglie wavelength λ .
10. State and explain Geiger-Nuttall rule.
11. What is Paulings electronegativity scale ? Explain.
12. Distinguish between intermolecular and intramolecular hydrogen bonding. Give example for each types.
13. What is N/P ratio ? How is it related to nuclear stability ?
14. Discuss the variation of atomic radii and ionic radii along a period.
15. Write the Schrödinger wave equation and explain the terms involved. Give the significance of ψ .

Turn over

16. Among Na and Mg, which would have the largest difference between First and Second ionization energies. Briefly explain your answer.
17. The Bond angle in NH_3 is 107° ; in water it is $104^\circ 28'$ though the state of hybridisation on both the molecule is SP^3 . Give reasons.
18. Calculate the wave length of the matter wave associated with a particle of mass 10 gm. moving with a velocity 1000 cm/s.

(6 × 2 = 12)

Part C

*Answer any four questions.
Each question carries 4 marks.*

19. Explain Born Haber cycle with an example.
20. Define Electron affinity. What are the factors affecting it ? Arrange the following elements in the increasing order of electron affinity F, Cl, Br, I.
21. Compare Valence bond theory and molecular orbital theory.
22. Discuss the decision of elements into s, p, d, f block in the periodic table.
23. What are transuranic elements ? Write a note on its method of preparation.
24. Explain the factors favouring the formation of ionic bond.

(4 × 4 = 16)

Part D

*Answer any two questions.
Each question carries 12 marks.*

25. (a) Discuss briefly on metallic bonds based on valence bond theory and band theory. How can these theory explain the metallic properties of metals ?
(b) Discuss the significance of principle and azimuthal quantum numbers.
26. (a) Derive Born Lande equation.
(b) Explain :
 - (i) Photoelectric effect.
 - (ii) Fajans rule.
 - (iii) Paulis exclusion principle.
27. (a) Outline the postulates of VSEPR theory and predict the shapes of ClF_3 , NH_4^+ and XeF_6 .
(b) Discuss Slater's rule.
28. (a) Give an outline of molecular orbital theory. Discuss the molecular orbital concept of CO and NO molecule.
(b) Write a note on :
 - (i) Nuclear fission reaction.
 - (ii) Nuclear fusion reaction.

(2 × 12 = 24)