Reg. No. : ....

Name : ....

Third Semester M.Sc. Degree Examination, January 2020

Chemistry/Polymer Chemistry

CH/CL/CM/CA/PC 233 : PHYSICAL CHEMISTRY – III

(Common for Chemistry (2016 Admission Onwards) and Polymer Chemistry (2018 Admission)

Time : 3 Hours   Max. Marks : 75

PART – A

Answer **any two** among **A**, **B** and **C** of each question. Each sub question carries **2** marks.

1. (A) State variation theorem.

    (B) Draw the MO diagram of HF.

    (C) Calculate the bond order of O_2, F_2 and CO.

2. (A) Explain the terms in 6 – 31 ++ G*.

    (B) Differentiate between RHF, ROHF and URHF.

    (C) Write any two drawbacks of MM method.

3. (A) Define nuclear resonance.

    (B) What are the requirements of Mossbauer spectroscopic analysis?

    (C) State the principle of NQR spectroscopy.

4. (A) What are the limitations of Einstein's theory of heat capacity of solids?

   (B) Explain Dulong and Petit's law.

   (C) Explain the significance of principle of equipartition of energy.

5. (A) Explain Calomel electrode.

   (B) What is the principle behind coulometry?

   (C) What are the applications of AAS?

(2 × 10 = 20 Marks)

PART – B

Answer either **A** or **B** of each question. Each question carries **5** marks.

6. (A) Apply variation theorem for particle in ID box and calculate the ground state energy.

   (B) Apply HMO method to benzene and explain the bonding.

7. (A) Write the Z-matrix of CH_3CHO and NH_3.

   (B) Explain Hohenberg-Kohn theorem of DFT calculations.

8. (A) Explain briefly the instrumentation of NMR spectroscopy.

   (B) Explain Kramer's degeneracy.

9. (A) Derive statistically the relation between probability and entropy.

   (B) Derive the expressions for molecular partition functions.

10. (A) How can you find the pH of a solution by using glass electrode?

    (B) Explain the principle of polarography.

(5 × 5 = 25 Marks)

PART – C

Answer **any three** questions. Each question carries **10** marks.

11. Explain quantum mechanical treatment of sp^3 hybridization for alkanes.

12. What are basis sets and explain different types of basis sets.

13. How can you differentiate (i) low spin and high spin complexes and (ii) oxy and deoxy hemoglobin by Mossbauer spectroscopy?

14. Express the thermodynamic properties in terms of partition functions.

15. How can you estimate the mass of copper from copper sulphate solution by using electrogravimetry?

(3 × 10 = 30 Marks)

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