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Reg. No. : .....

Name : .....

Third Semester M.Sc. Degree Examination, February 2021

Chemistry/Polymer Chemistry

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

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

Time : 3 Hours Max. Marks : 75

SECTION – A

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

1. (A) State perturbation theorem.

   (B) Draw the MO diagram of LiH.

   (C) Write the term symbol of outermost electron in sodium.

2. (A) Explain the terms in cc-p VTDZ.

   (B) Differentiate between MM and SE methods.

   (C) Write any two drawbacks of ab-initio method.

3. (A) What is the principle of ESR spectroscopy?

   (B) How many peaks are observed in the Mossbauer spectrum of $[Fe(H_2O)_6]^{2+}$?

   (C) What are ENDOR and ELDOR?

P.T.O.

4. (A) Explain Debye theory of heat capacity of solids.

(B) Explain law of mass action.

(C) Define Kopp's law.

5. (A) Explain Ag-AgCl electrode.

(B) What is the principle behind voltametry?

(C) What are the applications of amperometry?

(10 × 2 = 20 Marks)

SECTION – B

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

6. (A) Explain the MO theory of H_2^+.

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

7. (A) Write the differences between STOs and GTOs.

(B) Explain Huckel and extended Huckel model.

8. (A) Explain fine and hyperfine structures in ESR with an example.

(B) Explain Doppler effect and chemical shift.

9. (A) Derive the expression for the total partition function.

(B) Explain quantum theory of heat capacity of solids.

10. (A) How can you determine the concentration of a given alkali by potentiometric titrations?

(B) Explain the instrumentation of AAS.

(5 × 5 = 25 Marks)

SECTION – C

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

11. Explain quantum mechanical treatment of sp^2 hybridization for alkenes.

12. What are ab-initio and DFT methods?

13. How can you explain (a) spin crossover process and (b) iron complexes by Mossbauer spectroscopy.

14. Explain Einstein theory of heat capacity of solids.

15. Differentiate between cyclic and stripping voltametry.

(3 × 10 = 30 Marks)

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