12. (a) Compare Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistics. (10)

Or

(b) Write notes on :

(i) Flash photolysis.

(ii) Hydrated electron. (5 + 5)

UNIT V

13. (a) What is a branched polymer? (2)

(b) What is copolymerisation? (2)

14. (a) Write a note on industrial polymers. (6)

Or

(b) Explain gel permeation chromatography. (6)

15. (a) Discuss the kinetics of free radical polymerisation. (10)

Or

(b) Give any two methods of determining molecular weight of polymers. (10)

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Paper VII — PHYSICAL CHEMISTRY — II

Time : Three hours Maximum : 100 marks

Answer ALL questions.

UNIT I

1. (a) What is an abelian group? (2)

(b) How many C_3 and C_2 are present in methane? (2)

2. (a) Explain the similarity transformation. (6)

Or

(b) Identify the point groups of the following : (i) hydrogen peroxide (ii) chloroform (iii) methyl chloride (iv) phenol. (6)

3. (a) State and explain the great orthogonality theorem. Write and explain the rules. (10)

Or

(b) Deduce and discuss the character table of C_{2v} point groups. (10)

UNIT II

4. (a) What are overtones? (2)

(b) Name the reference used in ESR spectra. Give its structure. (2)

5. (a) The average spacing between successive rotational absorption lines in CO molecule is 3.8626 cm^{-1}. Calculate the moment of inertia and bond length. (6)

Or

(b) Write a note on NOE. (6)

6. (a) What is an anhormonic oscillator? Show that it leads to overtones. (10)

Or

(b) List the differences between IR and Raman spectroscopies. (10)

UNIT III

7. (a) What is reverse micelle? (2)

(b) Why is heat of adsorption of the first layer different from the rest in the BET model? (2)

8. (a) Write briefly the Langmuir theory of adsorption. Under what condition the Langmuir adsorption isotherm reduces to Freundlich adsorption isotherm? (6)

Or

(b) Write the BET adsorption isotherm. How is surface area determined by BET method? (6)

9. (a) Write the principle of ESCA. Give its applications. (10)

Or

(b) Compare Langmuir-Hinshelwood and Langmuir-Rideal mechanisms of surface catalysis. (10)

UNIT IV

10. (a) What is resonance fluorescence? (2)

(b) What is G-value? (2)

11. (a) Calculate the vibration partition function for N_2 gas at 27° C if the vibrational frequency is 2370 cm^{-1}. (6)

Or

(b) Draw Forster's cycle for PK and PK* and explain. (6)