Roll No. ..... Total Pages : 4

10309/NH

CS/2110

PHYSICAL CHEMISTRY

Paper-C

Semester-V

Syllabus-(Dec-18)

Time allowed : 3 Hours] [Maximum Marks : 26

Note : The candidates are required to attempt two questions each from section A and B carrying 4 marks each and the entire Section C consisting of 5 short answer type questions carrying 10 marks. Attempt five questions in all.

SECTION-A

1. (i) Draw & discuss Black Body radiation curve. 2

   (ii) Discuss the postulates of Quantum mechanics. 2

2. (i) Derive an expression for Planck's Radiation law. 2

   (ii) Calculate the ground state energy of an electrons confined to move in a One-Dimensional box of length 2Å. 2

3. (i) Derive an expression for wave function ' '. Energy 'E' for a particle in One-Dimensional box. 2

   (ii) What are normalized, orthogonal & Orthonormal wave function ? 2

4. Derive an expression for Schrodinger wave equation for H-like atoms in spherical polar co-ordinates, separate it into R, & equations. 4

SECTION-B

5. (i) Show that the spacing between the spectral lines is constant and is equal to $2\overline{B}$ for rotational spectre of a diatomic molecules ? 2

(ii) Which of the following molecule will show rotational spectre and why ? 2

HCN, CO_2, HCl, O_2, NO.

6. (i) How the intensity and width of spectral lines is affected is spectroscopy ? 2

(ii) What are selection rules ? Discuss for IR and rotational spectroscopy ? 2

7. What do you understand by normal modes of vibration of polyatomic molecule ? Discuss the vibrateral modes for CO_2 and H_2O molecules ? 4

8. Discuss the following : 2×2=4

(i) Isotopic effect

(ii) Fundamental and overtone transitions.

SECTION-C

9. (i) Evaluate : $\left[\hat{x}, \frac{\hat{d}}{dx}\right]$

(ii) Find eigen value for the function = Sin x an operator $\frac{\hat{d}^2}{dx^2}$

(iii) Differentiate between atomic spectroscopy and Molecular spectroscopy ?

(iv) What will happen to the energy if length of one-dimensional box is increased.

(v) What do you mean by Zero point energy ?

5×2=10