C/2050
PHYSICAL CHEMISTRY
(COMMON FOR B.Sc. BIO TECHNOLOGY)-III
SEMESTER-VI

TIME ALLOWED 2 Hrs   **M.M.26**

I.   Explain Raman Effect on the basis of polarizability of molecules. How is the rotational
     spectrum observed experimentally?   **4**

II. a) Explain the relative intensities of the lines obtained in a pure rotational spectrum.

     b) Are the lines in the rotational Raman spectra equally spaced? Elaborate your answer.

                                                                        2, 2

III. a) What are the selection rules for transitions in electronic spectroscopy of molecules?

     b) Briefly explain Franck-Condon Principle.   **2, 2**

IV. a) Derive Bragg's equation for X-ray Diffraction by crystals.

     b) At What angles will X-rays of wavelength 1.542×10^{-10} m undergo first order and
     second order reflections by planes separated by 3.54×10^{-10} m.   **2, 2**

V.   Describe the theory of photochemistry of vision and color.   **4**

VI. State and explain first and second law of Photochemistry. What do you understand by
     'one Einstein' of energy? How is its value calculated in CGS units and in SI units?   **4**

VII. a) Calculate the value of Einstein in kiloJoules for orange light with $\lambda = 600$nm.

     b) Draw the Jablonski diagram depicting various processes.   **2, 2**

VIII.   What is Photosensitization? Illustrate and explain with three examples along with their
         mechanism.   4

IX.   a) The crystallographic axes of a unit cell are $\vec{a}, \vec{b}$ & $\vec{c}$. Draw a plane of which Miller
       indices are (221). Can there be more than one plane with the same Miller indices.

       b) Define Auger effect. What is the main advantage of powder method over Bragg's
       method? How is interplanar spacing calculated from X-ray diffraction pattern of a
       powder sample?

       c) On the basis of mechanism, how can you justify tat quantum efficiency of photolysis
       of HI is 2.

       d) Out of CO_2, C_2H_6, H_2O, NO, N_2O which will exhibit pure rotational spectra?

       e) In the electronic band spectrum, which transition out of $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ will give
       greater intensity and why? What happens if an acid is present?   2x 5= 10