CLASS: IMSC   SEMESTER: VI
BRANCH: CHEMISTRY   SESSION : SP/2020

SUBJECT : IMC6001 PHYSICAL CHEMISTRY II

TIME: 1.5 HOURS   FULL MARKS: 25

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.
6. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q1   (a)   What is Compton wavelength?   [2]
     (b)   Prove that de Broglie wavelength λ of electrons of kinetic energy E is given by $\lambda = \frac{h}{\sqrt{2meV}}$.   [3]

Q2   (a)   What is photoelectric effect?   [2]
     (b)   A photon of wavelength 4000Å strikes a metal surface, the work function of the metal   [3]
           being 2.13 eV. Calculate (i) the energy of the photon in eV (ii) the kinetic energy of the
           emitted photoelectron and (iii) the velocity of the photoelectron. (mass of electron =
           9.109×10^{-31}kg)

Q3   (a)   What is Hamiltonian operator Ĥ?   [2]
     (b)   Write an operator equation for an observable *A* and show that it is an *eigenvalue*   [3]
           equation?

Q4   (a)   Explain the IR active and IR inactive molecule with principle and example.   [2]
     (b)   Explain Electromagnetic radiation and write its properties. Write the microwave region,   [3]
           Radio frequency region in terms of frequency, Energy change and associated processes
           only.

Q5   (a)   Derive basic equation of wave motion describing Sine curve in terms of circular motion   [2]
           in the form of frequency and wavelength.
     (b)   What is quantization of energy? What do you mean by an energy of 10cm^{-1}? Show the   [3]
           rotation of a polar molecule, HCL with fluctuation in dipole moment.

Q6   (a)   Classify & explain molecules according to their shapes with suitable example. Explain   [2]
           linear molecule, symmetric tops.
     (b)   Explain spherical tops molecule, Asymmetric tops molecules with conditions and   [3]
           examples.

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