BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: IMSC **SEMESTER: VI**
BRANCH: CHEMISTRY **SESSION : SP/2019**

SUBJECT : IMC6003 PHYSICAL CHEMISTRY III

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.

Q1 (a) What is an actinometer? Mention how a uranyl oxalate actinometer is used. [2]
(b) A system absorbs 3×10^{18} quanta of light per second. Upon irradiation for 20 mins, 0.003 mole of the reactant was found to have reacted. Calculate the quantum yield for the process. ($N=6.02\times10^{23}$) [3]

Q2 (a) Why is the process of phosphorescence slower when compared to the process of fluorescence? [2]
(b) Draw and explain the *Jablonski* diagram. [3]

Q3 (a) What is one electron volt of energy? [2]
(b) What is the energy in kcal of one mole of photons of 2573 Å wavelength? [3]

Q4 (a) Why does the vapour pressure of a solvent decrease when a nonvolatile solute is added to it? [2]
(b) Calculate the mole fraction of benzene in solution containing 30% by mass in carbon tetrachloride. [3]

Q5 (a) What is activity of a solution? [2]
(b) Define ideal solution in terms of activity. Calculate the effective concentration of a 0.099 M solution of NaCl at 25^{o}C for which activity coefficient is 0.782. [3]

Q6 (a) When ethanol and cyclohexane are mixed, the vapour pressure is more than expected from Raoult's law. Why? [2]
(b) Explain graphically the vapour pressures of an ideal binary solution of two components A and B having different mole fractions. [3]

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