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BR—177—2016
FACULTY OF SCIENCE
M.Sc. (Second Year) (Fourth Semester) EXAMINATION
OCTOBER/NOVEMBER, 2016
(CBCS Course)
PHYSICAL CHEMISTRY
Paper (CH-542/3)

(Photochemistry)

(Saturday, 19-11-2016)   **Time : 2.00 p.m. to 5.00 p.m.**

Time—3 Hours   *Maximum Marks—75*

N.B. :—   (i)   *All* questions are compulsory.

(ii)   Use of calculator is allowed.

1.   Solve any *three* of the following :   15

(a)   In a certain photochemical reaction four reactants molecules are decomposed by the absorption of 80 photons of light in the same period. What is the quantum yield of reaction ?

(b)   Explain in brief types of photochemical reaction.

(c)   Explain delayed fluorescence.

(d)   Explain photosynthesis in plants.

(e)   Explain the following terms :

(i)   Kinetic collision

(ii)   Optical collision.

2.   Solve any *three* out of five :   15

(a)   Write short note on actinometry.

(b)   What is effect of light intensity on photochemical reaction ?

(c)   Write a note on photoreduction reaction.

(d)   Discuss interaction of electromagnetic radiation with matter.

(e)   Explain in brief emission property and electronic configuration.

P.T.O.

3. Solve the following :

    (a) Explain Jablonski diagram with the radiative and non-radiative transitions.   7

    (b) State laws of photochemistry. A system is irradiated for 20 min and is found to absorb 4×10^{18} quantum per second. If the amount decomposed is 3×10^{-3} mole and $N = 6.023 \times 10^{23}$, calculate quantum efficiency of radiation ?   8

Or

    (a) Explain Bimolecular collision in gases and vapours and also explain mechanism of fluorescence quenching.   7

    (b) Explain in detail LASER and MASER.   8

4. Attempt the following :

    (a) Explain Woodward-Hofmann rules for electronic reactions.   7

    (b) What is an actinometer ? Describe how uranyl oxalate actinometer may be used ?   8

Or

    (a) Explain quenching by foreign substance.   7

    (b) Define quantum yield. Explain factors affecting on low and high quantum yield. Calculate the number of moles of HCl (g) produced by absorption of one joule of radiant energy of wavelength 480 nm in the reaction $H_2(g) + Cl_2(g) \longrightarrow 2HCl(g)$ if quantum yield is 10^6.   8

5. (A) Select *correct* alternative from the following :   5

    (i) The phosphorescence is observed due to :

        (a) Singlet to triplet transition

        (b) Triplet to singlet transition

        (c) Vibration modes

        (d) Electron spin transition

(*ii*)   The deeper the glass the darker the blend the smaller amount of light at the end which law explain above phrase :

(*a*)   Lambert's Law (*b*)   Beer's Law

(*c*)   Stark-Einstein's Law (*d*)   Grothus-Droppe Law

(*iii*)   .... stops as soon as incident radiation is cut-off.

(*a*)   Fluorescence (*b*)   Phosphorescence

(*c*)   Both (*a*) and (*b*) (*d*)   None of these

(*iv*)   For reaction, to obey Einstein's law :

(*a*) $\phi = 1$ (*b*) $\phi < 1$

(*c*) $\phi > 1$ (*d*) $\phi = \alpha$

(*v*)   In some photochemical reaction, low quantum yield is obtained. It is due to :

(*a*)   deactivation of reacting molecules

(*b*)   occurrence of reverse primary reactions

(*c*)   recombination of dissociated fragments

(*d*)   all of the above

(B)   Solve any *two* of the following :   10

(*a*)   State diagram

(*b*)   Solar energy conversion and storage

(*c*)   Chemiluminescence.