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BR—178—2016

FACULTY OF SCIENCE

M.Sc. (Second Year) (Fourth Semester) EXAMINATION

OCTOBER/NOVEMBER, 2016

(Revised Course)

PHYSICAL CHEMISTRY

Paper XVIII (CH-542/3)

(Photochemistry)

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

Time—3 *Hours* *Maximum Marks*—50

N.B. :— (*i*) Use of calculator is allowed.

(*ii*) Attempt *All* questions.

1. Solve any *four* of the following : 10

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

(*b*) Explain in brief types of photochemical reaction.

(*c*) Explain fluorescence and its structure.

(*d*) Define the terms :

(*i*) Photosynthesis

(*ii*) Phosphorescence.

(*e*) Write a short note on photo-oxygenation reaction.

(*f*) Explain photosynthesis in plants.

P.T.O.

2. Solve any *five* of the following : 10

(*a*) How is electromagnetic radiation related with matter.

(*b*) Define :

(*i*) Photodissociation

(*ii*) Gas phase photolysis.

(*c*) Write a short note on non-radiative transition.

(*d*) Define kinetic collision and optical collision.

(*e*) Write a note on photoreduction reaction.

(*f*) Write a short note on delayed fluorescence.

(*g*) Write a short note on Actinometry.

(*h*) Explain in brief emission property and electronic configuration.

3. Solve any *two* of the following : 10

(*a*) Explain in brief Jablonski diagram with radiative and non-radiative transition.

(*b*) Explain collision in solution. Derive an expression for Stern-Volumer equation.

(*c*) Write a note on solar energy conversion and storage.

A system absorbs 3×10^{16} quanta of light per second on irradiation for 20 min, 3×10^{-3} mole of reactant was found to have reacted. Calculate quantum yield of reaction.

4. Solve any *two* of the following : 10

(*a*) Derive :

$F = \Delta_f I_0$ 2.303 Gcl.

(*b*) Write an account of cycloaddition reaction.

(*c*) Obtain an expression for rate constant and life time of reaction energy state for unimolecular reaction.

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

(*i*) $CH_3COH_3 \xrightarrow{h\mu} CO+C_2H_6$ is an example of ..... quantum yield.

(*a*) low (*b*) high

(*c*) zero (*d*) none of these

(*ii*) The dipole moment introduced by light wave is known as ..... .

(*a*) permanent dipole moment (*b*) transition moment

(*c*) simply dipole moment (*d*) none of these

(*iii*) Deoxygenated solutions of eosin in glycerol and ethanol at room temperature shows ..... .

(*a*) F-type delayed fluorescence (*b*) P-type delayed fluorescence

(*c*) B-phosphorescence (*d*) B-fluorescence

(*iv*) Energy of an Einstein of radiation of wavelength 253.7 nm is ..... .

(*a*) 471.9 kJ (*b*) 47.19 kJ

(*c*) 4.719 kJ (*d*) 4719 kJ

(*v*) The effective cross-section for optical collision is ..... .

(*a*) $\sigma = \pi R_{AB}^2$ (*b*) πR_{AB}

(*c*) $\pi^2 R_{AB}^2$ (*d*) $\pi^4 R_{AB}^2$

P.T.O.

where R_{AB} is the distance over which excited molecule interact with another molecule to bring about a physical or chemical change.

(B) Write short notes on any *two* of the following : 5

(*a*) State diagram

(*b*) Chemiluminescence

(*c*) Quenching by foreign substances.