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AG—116—2018

FACULTY OF SCIENCE

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

OCTOBER/NOVEMBER, 2018

(CBCS Pattern)

PHYSICAL CHEMISTRY

Paper XXI, CH–542/3

(Photochemistry)

(Thursday, 29-11-2018) **Time : 2.00 p.m. to 5.00 p.m.**

Time—3 *Hours* *Maximum Marks*—75

N.B. :— (*i*) Attempt *All* questions.

(*ii*) Use of log table and calculator is allowed.

(*iii*) Solve MCQs in one attempt only.

1. Solve any *three* out the five : 15

   (*a*) Explain in detail effect of light intensity on photochemical reaction.

   (*b*) Write a note on phosphorescence emission with suitable example.

   (*c*) Explain in detail collision in solution.

   (*d*) Write a note on transition metal complexes.

   (*e*) Explain in brief photosynthesis in plants.

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

   (*a*) How is the EMR related with matter ?

   (*b*) Explain in detail photodissociation and Gas phase photolysis.

   (*c*) Explain in brief kinetic and optical collision.

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

   (*e*) Write a note on delayed fluorescence.

3. (*a*) What are the types of photochemistry ? Derive an expression for photophysical kinetics of unimolecular reaction. 15

P.T.O.

(*b*) State the laws of photochemistry. A system is irradiated for 20 minutes 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 the quantum efficiency of the reaction.

Or

(*a*) Explain quenching by foreign substances.

(*b*) What is an actinometer ? Describe how a uranyl oxalate actinometer may be used.

4. (*a*) What is meant by photooxygenation ? Describe in brief cycloaddition reaction. 8

(*b*) Explain Lambert-Beer's law. What % of light will be transmitted through two cells put together in the path of light if their individual transmissions are 60% and 30% ? 7

Or

(*a*) Derive an expression for Stern Volmer equation.

(*b*) Explain in detail LASER and MASER.

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

(*i*) In photochemical reaction, the absorption of light takes place in .....

(*a*) Primary process only

(*b*) Secondary process only

(*c*) Either primary or secondary

(*d*) Both primary and secondary process

(*ii*) The substance which initiate a photochemical reaction but itself does not undergo any chemical is called .....

(*a*) Catalysis

(*b*) Fluorescent

(*c*) Sensitizer

(*d*) None of the above

(*iii*) The reaction which are caused by heat and in the absence of light are called .....

(*a*) Photochemical reaction

(*b*) Catalytic reaction

(*c*) Exothermic reaction

(*d*) Thermal and dark reaction

(*iv*) Photochemical decomposition of a substance is called .....

(*a*) Thermal dissociation

(*b*) Thermolysis

(*c*) Photolysis

(*d*) None of the above

(*v*) For a reaction, that obey Einstein law :

(*a*) $\phi = 1$

(*b*) $\phi > 1$

(*c*) $\phi < 1$

(*d*) $\phi = \alpha$

(*b*) Write notes on any *two* of the following : 10

(*i*) State diagram

(*ii*) Chemiluminiscence

(*iii*) Solar energy conversion.