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D-6345

M.Sc. (IVth Semester) Examination, 2020

CHEMISTRY

(Inorganic Photochemistry)

Time Allowed : Three Hours

Maximum Marks : 70

SECTION - A

Note : Attempt any ten questions. Each question carries one mark. **10**

Q. 1. Objective type.

Fill in the blanks :

(i) In photochemical reactions absorption of _____ radiations takes place.

(ii) Ozone is formed by _____ dissociation of molecular oxygen into individual oxygen atoms.

(iii) Franck-Condon principle is associated with _____ transition.

(iv) In _____ reactions, molecules absorbing light do not themselves react but induce other molecules to react.

(v) Medicine bottles are often made with darkened glass to prevent the drug from _____.

Multiple choice type :

(vi) Which of the following are the principal laws of photochemistry :

(a) Grothus-Droper and Stark-Einstein law

(b) Roult's law and Dalton's law

(c) Roult's and Henry's law

(d) Lambert's and Beer's law

(vii) Photolysis of water is caused by :

(a) PS-I

(b) PS-II

(c) PS-I and PS-II

(d) None of the above

(viii) Photosynthesis is considered as an oxidation reaction because :

(a) CO_2 is oxidised

(b) H_2O is oxidised

(c) O_2 is released

(d) CH_2O is oxidised

(ix) The fact that the fluorescence wavelength is often much longer than the irradiation wavelength (Stokes shift) is a consequence of :

(a) Low extinction coefficients (Beer Lambert's law)

(b) Vertical transition (Kasha's rule)

(c) High ISC rates (El Sayed rule)

(d) Franck Condon principle

(x) Which of the following instruments is used to measure the energy of monochromatic radiation most accurately :

(a) Photoelectric cell

(b) Thermopile

(c) The potential detector

(d) The chemical actinometer

(xi) Which of the following is an incorrect statement ?

(a) First step in photochemistry is photoexcitation

(b) Photochemical reactions are caused by absorption of UV light only

(c) When a molecule or atom in the ground state (S_0) absorbs light, one electron is excited to a higher energy level

(d) It is possible for the excited state (S_1) to undergo spin inversion

(xii) Which of the following requires no enzyme ?

(a) Light reaction

(b) Photolysis of water

(c) Dark reaction

(d) Carboxylation

SECTION - B

Note : Attempt any five questions. Each question carries two marks. **10**

Q. 2. Very short answer type (25-30 words) :

(1) Define quantum yield.

(2) Write statement of Franck-Condon principle.

(3) What do you mean by charge transfer transition ?

(4) Define photosensitization.

(5) What is photosubstitution reaction ? Give an example of photosubstitution reaction.

(6) Write Stark's and Einstein's law of photochemistry.

(7) What do you mean by zero spectroscopic energy ?

SECTION - C

Note : Attempt any five questions. Each question carries 4 marks. **20**

Q. 3. Short answer type (250 words) :

(1) Explain primary and secondary processes involved in the photochemical reactions.

(2) Compare excited state of metal complexes with organic compounds.

(3) Explain lability in ligand field photochemistry.

(4) Illustrate oxidising and reducing character of Ruthenium (II) (bipyridyl) complex.

(5) Explain water photolysis.

(6) Explain photosubstitution reaction with an example.

(7) Describe the applications of photochemical reactions.

SECTION - D

Note : Attempt any three questions. Each question carries 10 marks. **30**

Q. 4. Essay type (more than 500 words) :

(1) What do you mean by charge transfer spectra in electronically excited states of metal complexes and give methods for obtaining charge transfer spectra.

(2) Explain photooxidation and photoreduction in detail.

(3) What are the applications of redox processes of electronically excited states of metal complexes for catalytic purpose.

(4) Explain nitrogen fixation or carbondioxide reduction by using metal complex sensitizers in detail.