Total No. of Printed Pages: 3

SUBJECT CODE NO: - Y-2003
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. T.Y (Sem-V)
Examination March / April - 2023
Chemistry Paper – XIII (Physical Chemistry)

[Time: 1:30 Hours] **[Max. Marks: 50]**

Please check whether you have got the right question paper.

N. B
1. Attempt all questions.
2. Figures to the right indicate full marks.

Q1 a) State and explain postulates of Bohr's theory. Give its limitations. 10

b) Derive an equation for moment of inertia of diatomic rigid rotator. The rotational spectra of diatomic molecule consists of equidistant lines with a spacing of 20 cm^{-1}. Calculate the bond length of a molecule if its reduced mass is 2.8×10^{-24} gm. 10

OR

c) Derive de Broglie's equation. Calculate de Broglie's wavelength of an electron moving with velocity 2.44×10^{8} cm/s. (mass of electron = 9.1×10^{-28} gm, Planck's constant, $h = 6.62 \times 10^{-27}$ erg sec) 10

d) Describe basic components of spectrometer. 10

Q2 a) State and explain laws of photochemistry. Calculate quantum yield when 0.04 mole of substance was exposed to light for 15 minutes and absorbs 2×10^{6} photons per second. 10

b) What is optical activity? How it is measured? 10

OR

Write short notes on any four of the following. 20

a) Principal and Azimuthal quantum number
b) Regions of electromagnetic spectrum
c) Photosensitised reactions
d) Application of dipole moment in determination of molecular structure
e) High energy ball milling method
f) Synthesis of nano material by micro emulsion method.

Q3 Select and write the correct answer of the following. 10

1) The wavelength of maximum intensity of radiation is inversely proportional to absolute temperature of black body this statement is known as ----------
   a) Wein's law
   b) Stephens law
   c) Planck's law
   d) Boyle's law

2) When spectrum kept in magnetic field then lines of a spectrum get split into number of closely spaced lines. This phenomenon is known as
   a) Stark effect
   b) Zeeman effect
   c) Raman effect
   d) Compton effect

3) Rotational spectroscopy is observed in ---------- molecules.
   a) Polar
   b) Non polar
   c) Homo atomic
   d) None of these

4) De Broglie's equation states the ----------
   a) Particle nature of light
   b) Wave nature of light
   c) Dual nature of light
   d) None of these

5) Which of the following examples of photochemical reaction?
   a) Photosynthesis
   b) Formation of ammonia
   c) Formation of NaOH
   d) None of these

6) The reaction caused by heat and absence of light is called as ---------- reactions.
   a) Photochemical
   b) Reversible
   c) Irreversible
   d) Dark

7) Dipole moment of benzene is ---------- Debye.
   a) Zero
   b) One
   c) Two
   d) Three

8) The substance which rotates plane polarised light is called ----------
   a) Optically active
   b) Optically in active
   c) Both a & b
   d) None of these

9) The size of nano particles lies in between ---------- nanometer.
   a) 100 to 1000
   b) 0.1 to 10
   c) 1 to 100
   d) 0.01 to 1

10) Leaves of Germanium plants are used in synthesis of ------- nano-particles.
   a) Cu
   b) Au
   c) Zn
   d) Ag