SUBJECT CODE NO:- 2003
FACULTY OF SCIENCE AND TECHNOOGY
B.Sc. T.Y Sem. V
EXAMINATION JUNE / JULY 2022
Chemistry Paper – XIII
(Physical Chemistry)

[Time: 1:53 Hours]   [Max. Marks:50]

Please check whether you have got the right question paper.
N.B
      i.   Attempt all questions.
      ii.   Figures to the right indicate full marks.

Q.1   a) State the postulates of Bohr's theory. Give its defects.   10

       b) Discuss the rotational spectra of rigid diatomic molecule. Calculate the moment of inertia   10
of HCL molecule it its bond length is $1.27\ A^0$
(Atomic mass of H=1.008
Atomic mass of cl = 35.5
N = 6.023×10^{23})

OR

       c) Explain radiative transitions with the help of Jablonski diagram. When the substance was   10
exposed to light 0.002 moles of it reacted in 30 minutes. Calculate quantum yield if it
absorbs 2.3×10^6 photons per second.

       d) Explain diamagnetic and paramagnetic substances. How magnetic property is measured by   10
Guoy balance method?

Q.2   a) What is rigid rotator? Derive an expression for energy of rigid rotator.   10

       b) State the explain Heisenberg's uncertainty principle. Calculate the uncertainty in velocity   10
of an electron if uncertainty in position is $0.1\ A^0$.
(mass of $e = 9.1 \times 10^{-31}\ kg$,
$h = 6.626 \times 10^{-34}$ Jsec)

OR

Write short notes on any four of the following: 20
    a) Photoelectric effect
    b) Electromagnetic radiation
    c) Photosensitized reactions
    d) Application of dipole moment in structure determination

e) Physical vapor deposition method

f) Synthesis of nanomaterial by using plant extract

Q.3 Select and write correct answer of the following multiple choice questions   10

1) In Compton effect the change in wavelength is given by -----------

    a) $\Delta\lambda = \frac{2h}{mc}\sin\theta$ b) $\Delta\lambda = \frac{2h}{mc}\sin^2\theta$

    c) $\Delta\lambda = \frac{2h}{mc}\cos\theta$ d) $\Delta\lambda = \frac{2h}{mc}\cos^2\theta$

2) De Broglie's wavelength is given by -----------

    a) $\lambda = \frac{h}{m\vartheta}$ b) $\lambda = \frac{h^2}{m\vartheta}$

    c) $\lambda = \frac{h}{m\vartheta^2}$ d) $\lambda = \frac{h^2}{m^2\vartheta^2}$

3) In which region rotational energy changes are studies

    a) Ultraviolet   b) Visible

    c) Microwave   d) Infrared

4) In spectrometer the radiation sourse in UV region is ---------------

    a) Tungsten lamp   b) Hydrogen discharge lamp

    c) Heating filament   d) None of these

5) Photochemical reactions are ------------

    a) Selective   b) Non selective

    c) Both a and b   d) None of these

6) Rate of photochemical reactions depend upon ----------

    a) Intensity of light   b) Frequency of light

    c) Amplitude of light   d) Velocity of light

7) Racemic mixture is ---------

    a) Leavo rotatory   b) Dextro rotatory

    c) Optically inactive   d) None of these

8) Dipole moment in betronuclear diatomic molecule arises due to difference in ----------

    a) Ionization potential   b) Electro negativity

    c) Atomic size   d) None of these

9) 1 nanometer is equal to ---------

    a) $0.10\ A^0$ b) 1 millimicron

    c) 0.1 micro centimeter   d) All of these

10) Which of the following approach is used in high energy ball milling method -----------

    a) Top to bottom   b) Bottom to top

    c) Horizontal   d) None of these