

SUBJECT CODE NO:- B-2048
FACULTY OF SCIENCE
B.Sc. T.Y (Sem-V) Examination March/April 2018
Chemistry Paper – XIII
Physical Chemistry

[Time: 1:30 Hours]

[Max.Marks: 50]

- N.B Please check whether you have got the right question paper.
1. Attempt all questions.
2. Figures to the right indicate full marks.
- Q.1 a) Discuss in detail quantum numbers? 10
- b) Derive an expression for frequency of rotational spectral line for diatomic rigid rotator. 10
Moment of inertia of NO is $1.118 \times 10^{-40} \text{ gm cm}^2$. Calculate bond length of NO molecule (mass of N and O are 14 and 16 gm mol⁻¹ respectively;
 $N = 6.023 \times 10^{23}$, $h = 6.624 \times 10^{-27} \text{ erg sec}$, $e = 3 \times 10^{10} \text{ cm/ sec}$)
- OR**
- a) Explain radiative transition with the help of Jablonski diagram. When the substance was 10
exposed to light 0.002 mole of it reacted in 28 min. calculate quantum yield if substance absorbs 2.4×10^6 photons of light per second in the same time.
- b) Give the characteristics of diamagnetic and paramagnetic substances. Explain gouy balance 10
method for the measurement of magnetic property of the substance.
- Q.2 a) What is electromagnetic radiation? Give the regions of electromagnetic spectrum. 10
- b) State and explain Heisenberg's uncertainty principle. Calculate uncertainty product of 10
moving ball having mass 200 gm.
(given $h = 6.6256 \times 10^{-27} \text{ erg sec}$)
- OR**
- Write a short note on any four of the following. 20
- a) Compton effect
b) Rotational spectra of rigid rotator
c) Difference between thermal and photochemical process
d) Optical activity
e) Chemical vapour deposition method
f) Synthesis of nano materials using micro organisms

Q.3 Select and write the correct answer of the following.

10

1) The energy of Einstein is given as

- a) $E = \frac{hv}{N}$
- b) $E = Nh\nu$
- c) $E = h\nu$
- d) $E = \frac{hc}{\lambda}$

2) Kinetic energy of photoelectrons ejected from metal surface depends on

- a) Intensity
- b) Frequency
- c) Both a and b
- d) None of these

3) Which of the following molecule is microwave active

- a) CO
- b) HCl
- c) HF
- d) All of above

4) First spectral line of rotational spectra is obtained at 20.2 cm^{-1} . The value of rotational constant is

- a) 20.2 cm^{-1}
- b) 10.1 cm^{-1}
- c) 30.3 cm^{-1}
- d) 20.0 cm^{-1}

5) Which of the following is radiative transition

- a) Fluorescence
- b) Internal conversion
- c) Inter system crossing
- d) b and c

6) According to the Einstein's law. The ratio between number of molecules reacted and number of photons absorbed is

- a) 1:2
- b) 1:1
- c) 1:4
- d) 1:0

7) Which of the following is example of constitutive property

- a) Molar mass
- b) Optical activity
- c) Density
- d) All of the above

8) Dipole moment is given as

- a) $\mu = \frac{q}{r}$
- b) $\mu = q^2 r$
- c) $\mu = q \cdot r$
- d) $\mu = \frac{q^2}{r}$

9) Zero dipole moment of dichloro ethene indicates

- a) Cis-isomer
- b) Trans-isomer
- c) Both a and b
- d) None of these

10) One nano meter is equal to

- a) $1 \times 10^{-9} m$
- b) $0.1 \times 10^{-9} m$
- c) $10 \times 10^{-9} m$
- d) $0.01 \times 10^{-9} m$