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SUBJECT CODE NO: - Y-2003

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (PATTERN-2013) T.Y. (SEM V)

Examination April / May - 2024

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 question.
2) figure to the right indicate full marks.

Q.1 (A) Derive Schrodinger wave equation. Give significance of ψ and ψ^2 **10**

(B) Derive an expression for energy of rigid rotor.
Calculate reduced mass of HCI molecule (mass of hydrogen = 1 and mass of chlorine = 35.5, Avogadro's number N = 6.023×10^{23}) **10**

OR

(C) State and explain de-Broglie's hypothesis. Calculate de-Broglie's wavelength of an electron moving with velocity 3.1×10^8 cm/s. (mass of electron = 9.1×10^{-28}gm, plank's constant h = 6.62×10^{-27} erg.sec) **10**

(D) Describe basic component of Spectrometers. **10**

Q.2 (A) State and explain stark- Einstein's law. When a substance was exposed to light 0.003 mole of it reacted in 30 minutes. In the same time it absorbs 3×10^6 Photons of Light per second, calculate quantum yield of the reaction. (Avogadro's number, N = 6.023×10^{23}) **10**

(B) What is dipole moment? How it is measured by temperature method **10**

OR

Write short notes on any four of the following. **20**

(A) Photoelectric effect:
(B) Born - Oppenheimer approximation
(C) Photosensitised reaction
(D) Application of dipole moment in determination of molecular structure.
(E) Physical Vapour Deposition method.
(F) Synthesis of nanomaterial by Using micro-organisms.

Q.3 Select and write the correct answer of the following. **10**

1. Azimuthal quantum number is denoted by symbol _____

A) n B) l C) m D) s

2. Probability of finding electrons is denoted by _____

A) Ψ B) Ψ^2 C) ϕ D) ϵ

3.The phenomenon of ejection of electron from metal surface when light falls on it is Called _____.

A) Compton effect B) Photoelectric effect. C) Raman effect.. D) None of these

4. Unit of wavelength is _____

A) A^o B) mm C) nm D) All of above

5. Rotational spectra is caused by _____

A) Microwave radiation B) X-ray radiation C) IR radiation D) UV radiation

6. Which of the following acts as photosensitizer in photosynthesis reactions.

A) H_2O B) CO_2 C) Chlorophyll pigment- D) Sunlight

7 Which of the following is radiative transition

A) Fluorescence B) Phosphorescence C) Both a and b D) None of these

8. Paramagnetic property is due to presence of _____

A) Pair electron B) Unpaired electron C) Both a and b D) None of these

9. The compound which rotate the plane polarised light toward left (anticlockwise)

A) Leorotatory B) Dextro rotatory C) Racemic mixture D) None of these

10. 1nm = _____.

A) $1A^o$ B) $10A^o$ C) $0.1A^o$ D) 0.001 A^o