[A-13] SEAT No._____ No. of Printed Pages : 02 SC

SARDAR PATEL UNIVERSITY

Fourth Semester B.Sc. EXAMINATION

(Under CBCS) 2010 Batch

Wednesday, 10th April-2019

Time: 10:00 am to 01:00 pm

PHYSICS - US04CPHY01

Optics, Spectroscopy, Electrostatics & Magnetism

N.B: Figures on the right indicate maximum marks. **Total Marks: 70**

Q.1 Answer the following MCQ by choosing correct option. **(10)**

1 The phenomenon in which vibrations of electric field vector of light are confined to one direction is known as ____.

(a) refraction (b) Polarization

(c) Diffraction (d) Reflection

2 ____is a positive crystal.

(a) Calcite (b) Quartz

(C) Sodium (d) lead

3 The phase difference between the components of linearly polarized light is ____.

(a) $\pi/2$ (b) $\pi/3$

(C) 0 (d) $\pi/4$

4 The half wave plate introduces the path difference of ____ between extra ordinary and ordinary ray.

(a) $\lambda/4$ (b) $\lambda/2$

(C) λ (d) $3\lambda/4$

5 In electromagnetic spectrum, the region of visible region is lying between _& __.

(a) microwave, IR (b) radiowave, Microwave

(C) Gamma rays, UV (d) UV, IR

6 Pure rotational spectra can be produced by ____.

(a) Molecules with permanent electric dipole (b) Any molecule

(C) Any atom (d) None of these

7 The splitting of energy level of an atom when it is placed in electric field is known as ____.

(a) Zeeman effect (b) Stark effect

(c) Raman effect (d) None of these

8 Electric lines of force about a negative point charge are ____.

(a) Circular, anticlockwise (b) Circular, clockwise

(C) Radial, inwards (d) Radial, outwards

9 The divergence of magnetic field B is ____.

(a) -1 (b) 1

(C) Zero (d) infinity

10 The materials which acquire magnetization opposite to the magnetic field are known as ____.

(a) Diamagnets (b) Ferromagnets

(c) Paramagnets (d) None of these

(1) (P.T.O)

Q.2 Give short answers to the following questions. **(Attempt any Six)** **(12)**

1 State the Brewster's laws.
2 Differentiate between quarter wave plates and half wave plates.
3 Which are different techniques used for the investigation of spectra?
4 What are X-rays? State any two properties of them.
5 Write the equation for electric field of the source charges.
6 State Coulomb's law and give the expression for Coulomb's force.
7 What are Stoke's and anti-Stoke's lines?
8 Classify different types of magnetic materials.

Q.3 (a) What is double refraction? Explain it with suitable example. [04]
(b) Explain in brief: Polarization by reflection. [04]

OR

Q.3 (a) Explain the construction and working of Nicol prism. [04]
(b) Differentiate between extra-ordinary and ordinary rays. [04]

Q.4 (a) Derive the equation for superposition of waves which are linearly polarized at right angles. [05]
(b) What are positive and negative crystals? Write their uses. [03]

OR

Q.4 (a) Discuss the experimental arrangement for production and detection of elliptically polarized light. [05]
(b) Give Huygens' explanation of double refraction in a uniaxial crystal. [03]

Q.5 (a) Give the classification of types of spectra and explain any one of them. [05]
(b) Explain any one method for production of X-rays. [03]

OR

Q.5 (a) State the Zeeman effect. Explain normal Zeeman effect. [05]
(b) Explain isotope effect in rotational spectra. [03]

Q.6 (a) State Raman effect. Mention its salient features. [04]
(b) Write a note on L-S coupling scheme. [04]

OR

Q.6 (a) What are spectra? Discuss various regions of molecular spectra. [04]
(b) Derive an expression for rotational energy of rigid rotator. [04]

Q.7 (a) State and explain Gauss's law in integral form. [05]
(b) Using Gauss's law in differential form, obtain Poisson's equation and Laplace equation. [03]

OR

Q.7 (a) Considering a point charge q at the origin show that curl of E is zero. [05]
(b) Define electric potential and give comments on it. [03]

Q.8 (a) Discuss divergence and curl of magnetic field using Biot-Sevart law. [05]
(b) Give the difference between magnetostatics and electrostatics. [03]

OR

Q.8 (a) Considering cylindrical co-ordinate system, write the equation for magnetic field and derive the equation for curl of it. [05]
(b) Write a note on hysteresis. [03]

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