

SEAT No. _____

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[24] Eng

[A-17]

Sardar Patel University
B.Sc.(Sem-4) Examination
Monday, 9th April, 2018
Subject: Physics
Course: US04CPHY01

Title: Electromagnetic Theory and Spectroscopy

Time: 10:00 AM to 01:00 PM

Total marks: 70

- N.B.: (i) All the symbols have their usual meanings
(ii) Figures at the right side of the question indicate full marks

Q-1. Multiple Choice Questions (Attempt All)

(10)

- (1) The SI unit of permittivity of free space (ϵ_0) is given by _____.
(a) $C^2/N\cdot m^2$ (b) cm/s^2
(c) $C/N\cdot m$ (d) $N\cdot m^2/C^2$
- (2) The curl of a gradient ($\nabla \times E$) is always _____.
(a) 1 (b) zero
(c) -1 (d) infinite
- (3) The value of permeability of free space is given by _____ N/A^2 .
(a) $4\pi \times 10^{-7}$ (b) $6\pi \times 10^{-7}$
(c) $10\pi \times 10^{-7}$ (d) $\pi \times 10^{-7}$
- (4) One Tesla (T) is equal to one _____.
(a) $N/A\cdot m$ (b) N/m
(c) Gauss (d) Joule/A
- (5) For spherical symmetry, Gaussian surface is _____.
(a) concentric (b) co-axial
(c) pill box (d) none of the above
- (6) In CGS system, the unit of wavenumber in spectroscopy is _____.
(a) cm^{-1} (b) m^{-1}
(c) km^{-1} (d) having no unit
- (7) In absorption spectra of Hydrogen, all the lines of _____ series are observed.
(a) Lyman (b) Balmer
(c) Paschen (d) Brackett
- (8) The splitting of energy level of an atom when it is placed in an electric field is known as _____.
(a) Stark Effect (b) Zeeman Effect
(c) Raman Effect (d) Rayleigh Effect
- (9) $n\lambda = 2d\sin\theta$ is known as _____.
(a) Mosley law (b) Bragg's law
(c) Gauss law (d) Ampere's law
- (10) The x-ray spectra are attributed to the transition of _____ electrons of an atom.
(a) innermost (b) outermost
(c) surface (d) none of the above.

[P.T.O.]

(1)

Q.2 Short Questions (Attempt any Ten)

(20)

- (1) State Coulomb's law.
- (2) State any two applications of Gauss's law.
- (3) Define electric potential.
- (4) Define Electrostatics and Magnetostatics
- (5) State Biot-Savart's law.
- (6) Write only equations of divergence and curl of electrostatic as well as magnetostatic field.
- (7) Explain temperature radiation method in brief.
- (8) State important features of line spectra.
- (9) What is orbital quantum number(l)?
- (10) What is fluorescence yield ?
- (11) What is Auger effect?
- (12) State Moseley's law.

Q.3 (a) Explain curl of electric field for spherical co-ordinate system. (06)

(b) Prove that electric field is a gradient of scalar potential. (04)

OR

Q.3 (a) Explain with necessary diagram Filed lines of an electric field and write properties of lines of force. (06)

(b) Derive an equation for amount of work done to move a charge in a given electric field. (04)

Q.4 (a) Obtain the relation $\nabla \times \mathbf{B} = \mu_0 \mathbf{I}$ for straight line currents. (06)

(b) Write applications of Ampere's law. (04)

OR

Q.4 (a) Define volume current density and derive continuity equation $\nabla \cdot \mathbf{J} = \frac{\partial \rho}{\partial t}$ (06)

(b) Derive the equation for magnetic force on a segment of current carrying wire. (04)

Q.5 Discuss in detail important characteristics of emission spectra and absorption spectra. (10)

OR

Q.5 Discuss Stark effect with its experimental set up and write its salient features. (10)

Q.6 (a) What are X-rays? Discuss methods for production of X-rays. (06)

(b) Write important uses of X-rays. (04)

OR

Q.6 (a) Explain Moseley's law. (06)

(b) Write characteristics of Auger electrons. (04)
