



A Charutar Vidya Mandal's Institution
V.P. & R.P.T.P. SCIENCE COLLEGE
(AUTONOMOUS) (Grant-in-Aid)
Affiliated to Sardar Patel University
VALLABH VIDYANAGAR-388120



Bachelor of Science (Semester IV) External Examination - 2026
US04MAPHY01
ELECTROMAGNETIC THEORY & SPECTROSCOPY

Date: 24-03-2026, Tuesday

Time: 1:45 PM to 04:15 PM

Total marks: 50

Q-1 Write the most appropriate answer from the following multiple-choice questions. [10]

- (1) The electrostatic field (**E**) is.....vector.
(a) solenoidal (b) irrotational (c) linear (d) none of these
- (2) A surface over which the potential is constant is called.....
(a) zero potential (b) dual potential (c) null potential (d) equipotential
- (3) The equation $\nabla \times \vec{B} = \mu_0 \vec{J}$ is called.....
(a) Ampere's law (b) Gauss's law (c) Coulomb's law (d) Stoke's law
- (4) The divergence of the magnetic field (**B**) is equal to.....
(a) infinite (b) zero (c) one (d) None of these
- (5) Which coupling is prominent in atoms of lighter elements.
(a) j-j (b) j-s (c) L-S (d) j-L
- (6) The unit of wave number in spectroscopy is.....
(a) cm (b) cm^{-1} (c) cm.s (d) cm/s
- (7) The splitting of spectral lines in magnetic field is known as..... effect.
(a) Paschen-Back (b) Stark (c) Auger (d) Zeeman
- (8) X-ray was invented by.....
(a) Roentgen (b) stark (c) Zeeman (d) Bragg
- (9) The X-rays are emitted whenever matter is bombarded by high velocity.....
(a) protons (b) photons (c) neutrons (d) electrons
- (10) The screening constant (b) forspectrum line is 1.
(a) L_α (b) K_α (c) K_β (d) L_β



Long Questions:

- Q-2 (a) Derive Gauss's law in differential and integral form. [06]
(b) State and explain Coulomb's law. [04]

OR

- Q-2 (a) Define electric potential and derive its expression in differential form. [06]
(b) Explain the curl of electrostatic field. [04]
- Q-3 (a) Discuss divergence and curl of $\mathbf{B}$ by using Biot-Sawart law and deduce Ampere's law. [06]
(b) Define current and explain volume current density. [04]

OR

- Q-3 Explain Lorentz force law. Derive expression for cyclotron formula and state its applications. [10]
- Q-4 (a) Explain the different quantum numbers with their physical interpretation. [06]
(b) What is importance of vector atom model? List the main concept of this model. [04]

OR

- Q-4 (a) Discuss the classical interpretation of normal Zeeman effect. [06]
(b) Write a short note on Paschen back effect. [04]
- Q-5 (a) Define X-rays and explain any one production method of X-rays. [06]
(b) Derive the Bragg's law for X-ray diffraction. [04]

OR

- Q-5 (a) Explain characteristics X-ray spectrum with diagram. [06]
(b) Discuss the applications of Moseley's law. [04]

