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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) Internal Examination - 2026**  
**US04MAPHY01: ELECTROMAGNETIC THEORY & SPECTROSCOPY**

**Date: 07-03-2026**

**Time: 2:45 pm to 4:15 pm**

**Day: Saturday**

**Total marks :30**

**Note: Figures to the right indicate marks of the question.**

- Q-1 Write the most appropriate answer from the following multiple-choice questions. [06]
- 1 A surface over which the potential is constant is called  
(a) zero potential (b) dual potential  
(c) null potential (d) equipotential
  - 2 The Coulomb force between two charges separated by distance  $r$  is  
(a)  $1/r^3$  (b)  $1/r^2$   
(c)  $1/r$  (d)  $r^2$
  - 3 In Magnetostatics,  $\nabla \cdot \vec{B}$  is equal to  
(a) 0 (b) 1  
(c)  $\mu_0 \vec{J}$  (d)  $\rho/\epsilon_0$
  - 4 By putting the sodium vapors in the path of continuous light, how many lines are obtained on the bright background.  
(a) 2 (b) 3  
(c) 4 (d) 5
  - 5 Which coupling is prominent in atoms of lighter elements.  
(a) j-j (b) j-s  
(c) L-S (d) j-L
  - 6 The law which shows the relation between wavelength and the interplanar spacing (d) is known as....  
(a) Duane-Hunt law (b) Bragg's law  
(c) Plank's law (d) Moseley's law
- Q-2 Define electric potential and derive its expression in differential form. [06]  
OR
- Q-2 Define divergence, and curl. Discuss the divergence and curl of electrostatic fields. [06]
- Q-3 Discuss different types of magnetic materials. Explain the effect of magnetic field on atomic orbits. [06]  
OR
- Q-3 Define Ampere's law. Using this law, find out magnetic field at a distance  $s$  from a long straight wire carrying a steady current  $I$ . [06]
- Q-4 Explain the different quantum numbers and their physical interpretation. [06]  
OR
- Q-4 Define spin-orbit interaction. Discuss the L-S and j-j coupling with suitable diagrams. [06]
- Q-5 Explain diffraction of X-rays and derive Bragg's law. [06]  
OR
- Q-5 State and explain Moseley's law and discuss its applications. [06]



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Bachelor of Science (Semester IV) Quiz - 2026

**US04MAPHY01: ELECTROMAGNETIC THEORY & SPECTROSCOPY**

Date: 07-03-2026

Day: Saturday

Time: 20 minutes

Total marks :15

Q-1 Fill in the blanks with appropriate answer given in the bracket.

[08]

- (i) \_\_\_\_\_ potential is potential energy per unit charge. (magnetostatic, electrostatic)
- (ii) \_\_\_\_\_ is the SI unit of Electric flux. (Nm<sup>2</sup>/C, N/C)
- (iii) For Magnetic forces, work done is \_\_\_\_\_. (zero, infinite)
- (iv) Biot-Savart law is analogous to \_\_\_\_\_ law. (Ampere's, Coulomb's)
- (v) Greater is the wavelength \_\_\_\_\_ will be the diffraction of light. (greater, smaller)
- (vi) The ground state of single electron system is always \_\_\_\_\_. (singlet, triplet)
- (vii) The X-radiations are \_\_\_\_\_ (visible, invisible)
- (viii) The short wavelength limit is \_\_\_\_\_ to potential applied across the tube terminals.  
(proportional, inversely proportional)



Q-2 Whether the following statement is true or false. Write your answer in the box

[07]

- (i) In regions with no charge, Poisson's equation becomes Laplace's equation. [      ]
- (ii) In electrostatics,  $\nabla \times \mathbf{E} = 0$ . [      ]
- (iii) Currents in opposite directions attract. [      ]
- (iv) Direction of  $\mathbf{B}$  is given by Fleming's right-hand rule. [      ]
- (v) The positronium exists in two states depending upon the state of spin orientation. [      ]
- (vi) The effect of electric field on the spectrum is known as Zeeman Effect. [      ]
- (vii) The X- radiations show dual nature. [      ]