

C. U. SHAH UNIVERSITY

Winter Examination-2021

Subject Name : Electricity and Magnetism

Subject Code : 4SC03ELM1

Branch: B.Sc. (Chemistry, Physics)

Semester: 3

Date: 20/12/2021

Time: 02:30 To 05:30

Marks: 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

Q-1 **Attempt the following MCQs:** (14)

- a) The absolute permittivity(ϵ_0) = _____
 (A) $8.854 \times 10^{-12} \text{ F/m}$ (B) $8.854 \times 10^{12} \text{ Fm}$
 (C) $8.458 \times 10^{-12} \text{ F/m}^2$ (D) $8.458 \times 10^{12} \text{ Fm}^2$
- b) The absolute permeability(μ_0) = _____
 (A) $4\pi \times 10^7 \text{ H/m}$ (B) $4\pi \times 10^{-7} \text{ Hm}$
 (C) $4\pi^2 \times 10^{-7} \text{ H/m}$ (D) $(\pi/4) \times 10^{-7} \text{ Hm}^2$
- c) Unit of Electric field (\vec{E}) = _____ & Unit of Electric flux (ϕ_E) = _____
 (A) N/m & Nm^2/C (B) Vm & Nm^2
 (C) N/C & Nm^2/C (D) NC & $\text{Nm}^2 \cdot \text{C}$
- d) The unit of inductance is _____
 (A) Henry (B) Vs/A
 (C) None of these (D) Both (A) and (B)
- e) The relation amongst Capacitance (C), Potential (V) and Charge (Q) = _____
 (A) $C = Q/2V$ (B) $V = QC$
 (C) $Q = C/V$ (D) $C = Q/V$
- f) The work of a capacitor is to store _____.
 (A) Electric charge (B) Potential energy
 (C) Both (A) and (B) (D) None of these
- g) The unit of capacitance is _____, which is the ratio of _____ to _____.
 (A) Coulomb, Volt, Farad, (B) Farad, Coulomb, Volt
 (C) Farad, Volt, Coulomb (D) Farad, Resistance, Volt
- h) What is the unit of magnetic susceptibility?
 (A) Unitless (B) Tesla
 (C) Weber/meter² (D) A/m



- i) Which of the following material is not the ferromagnetic?
 (A) Aluminium (Al) (B) Nickle (Ni)
 (C) Cobalt (Co) (D) Iron (Fe)
- j) What happens when a ferromagnetic material is heated above its Curie temperature?
 (A) It becomes diamagnetic (B) It becomes paramagnetic.
 (C) It turns antiferromagnetic. (D) It becomes ferromagnetic.
- k) In a bar magnet, the magnetic field lines
 (A) go from S- to N- pole (B) are not present.
 (C) go from N- to S- pole (D) depend on its dimensions.
- l) Tesla (T) and Weber/meter² (Wb/m²) are the two different units of _____magnetic quantity.
 (A) Magnetic field (B) Magnetic induction
 (C) Magnetic flux density (D) All
- m) Which of the following is ferromagnetic?
 (A) All metals and alloys (B) Glass and Polymers
 (C) Quartz and Ceramics (D) Cobalt and Nickel
- n) The electromagnetic waves are
 (A) Acoustical waves (B) Mechanical waves
 (C) Transverse waves (D) Longitudinal waves

Attempt any four questions from Q-2 to Q-8

- Q-2 Attempt all questions (14)
 (A) Explain electric field strength and derive $\vec{E} = \frac{1}{4\pi \epsilon_0} \int \frac{1}{r^2} dq \hat{r}$ 07
 (B) Discuss electric flux (ϕ) and Electric flux density (D) 07
- Q-3 Attempt all questions (14)
 (A) State Gauss theorem and explain any one of its applications. 06
 (B) What do you mean by a capacitor and its capacitance? 08
 Give the equations of potential and electric field of dipole (1) on the axial line and (2) on the bisector of the dipole.
- Q-4 Attempt all questions (14)
 (A) Write a brief account of diamagnetism and diamagnetic materials. 07
 (B) Write a brief account of paramagnetism and paramagnetic materials. 07
- Q-5 Attempt all questions (14)
 (A) Write a brief account of ferromagnetism and ferromagnetic materials 07
 (B) Derive the relationship between: 07



Relative magnetic permeability (μ_r) and Magnetic susceptibility (χ)

- Q-6 Attempt all questions (14)
- (A) Define Hall effect with necessary figure. 10
Derive necessary expressions for the Hall voltage, Hall coefficient and Mobility of charge carriers.
- (B) Discuss in short magnetic field due to a solenoid carrying current. 04
- Q-7 Attempt all questions (14)
- (A) Draw and narrate each phase of a hysteresis curve for a ferromagnetic material. 07
- (B) Write a short note on “Self-Induction and Self-Inductance of a solenoid”. 07
- Q-8 Attempt all questions (14)
- (A) Define the following terms with figure and giving unit of each: 08
(01) Magnetic Field (Induction) (\vec{B}) (02) Magnetic line of forces
(03) Magnetic Flux (ϕ) (04) Magnetic Susceptibility (χ)
- (B) Write a short note on the transverse nature of the EM waves. 06

