

Yashwantrao Chavan College of Science Karad

B.Sc. -I

Physics Paper III: Electricity and Magnetism-I

Question Bank - 2023-2024

Q.1 Select the most correct alternative.

- The divergence of a vector field $\vec{\nabla} \cdot \vec{V}$ is
(a) a unit vector (b) a vector (c) a scalar (d) a constant
- The curl of a vector field is quantity.
(a) a vector (b) a scalar (c) physical (d) chemical
- A The gradient of scalar function ($\vec{\nabla} \phi$) is
(a) a scalar (b) a vector (c) used to represent equipotential surface
(d) always zero
- The curl of a vector is denoted as..
(a) $\vec{\nabla} \cdot \vec{V}$ (b) $\vec{\nabla} \times \vec{V}$ (c) $\vec{\nabla} \cdot \vec{\nabla}$ (d) $\vec{\nabla} \times \vec{\nabla}$
- The vector differential operator is called operator.
(a) alpha (b) beta (c) delta (d) del
- If vector is called solenoidal vector then
(a) $\text{div. curl } V = 0$ (b) $\text{div } V = 0$ (c) $\text{curl } V = 0$ (d) $\text{grad } = 0$
- If ϕ is scalar point function, then $d\phi = \dots\dots\dots$
(a) $\text{grad } \phi \cdot d\mathbf{r}$ (b) $\text{grad } \phi \text{ div } V$
(c) $\text{curl } V$ (d) $\text{grad } \phi$
- Del operator is also called as operator. (a) alpha (b) beta (c) delta (d) nabla
- Two point charges q_1 and q_2 are at distance r . The force acting between them is given by $F =$
The constant 'K' depends upon....
(a) only on the system of units (b) only on medium between charges
(c) on both (a) and (b) (d) neither (a) nor (b)
- A spherical shell of charge does not produce an electric field at any
(a) interior point (b) outer point (c) surface point (d) centre
- If electric field is uniform, then the electric lines of forces are.....

- (a) divergent (b) convergent (c) circular (d) parallel
12. A solid sphere is uniformly charged. The magnitude of electric field due to sphere from its centre.
- (a) increases (b) remains constant (c) decreases (d) discontinuous at surface
13. Gauss's law is valid for.....
- (a) any closed surface (b) any open surface
(c) both closed and open surfaces (d) only regular closed surface
14. The total number of electric lines of force passing through given area in unit time is called
- (a) electric field (b) electric flux (c) electric potential (d) electric charge
15. The relation among flux (ϕ), electric field (E) and surface area (S) is given as
- (a) $\phi = E/S$ (b) $\phi = E \times S$ (c) $\phi = E.S$ (d) $\phi = E - S$
16. The amount of work done to bringing a charge from infinity to a given point against the direction of electric field is called
- (a) electric potential (b) electric flux (c) electric force (d) electric field
17. Electric potential due to dipole
- (a) falls inversely proportional to the square of distance (b) falls inversely proportional to the distance
(c) falls inversely proportional to the square root of the distance
(d) it does not change with distance
18. The capacitance of isolated spherical capacitor of radius R is.....
- (a) $C = 4\pi \epsilon_0 R$ (b) $C = \frac{\epsilon_0 A}{d}$ (c) $C = 2\pi \epsilon_0 R$ (d) $C = \frac{4\pi\epsilon_0}{R}$
19. The energy stored in capacitor having capacitance 'C' and potential difference V is given as
- (a) $\frac{1}{2} C^2 V^2$ (b) $\frac{1}{2} C^2 V$ (c) $\frac{1}{2} C V^2$ (d) $\frac{1}{2} C V$
20. Energy stored per unit volume in electrostatic field is
- (a) $U = \frac{1}{2} \epsilon_0 E^2$ (b) $U = \frac{1}{2} \epsilon_0 E$ (c) $U = \epsilon_0 E^2$ (d) $U = \epsilon_0 E$

Q.2 Long Answer Type Questions

1. Define gradient of scalar field. Obtain grad in terms of $\nabla \cdot \phi$.

2. What is the divergence of a vector field? Explain the physical significance divergence of a vector field with neat diagram.
3. Derive the expression for the potential due to uniformly charged spherical shell at a point from the center of spherical shell (i) outside the spherical shell (ii) on the surface of spherical shell (iii) inside the spherical shell
4. Derive an expression for the capacitance of a capacitor consisting of two co-axial cylinders.
5. Derive an expression for the energy stored by a charged capacitor.

Q.3 Short Answer Type Questions

1. Obtain Greens symmetrical theorem from Gauss divergence theorem.
2. Explain the terms in short:
 - i) Divergence of a vector field (ii) Curl of a vector field.
3. Define:
 - (i) Line integral (ii) Surface integral
4. if $\phi(x, y, z) = x^2y^2 + y^2z^2 + z^2x^2$ find $\nabla \cdot \phi$ at the point (1, 2, -2)
5. State Stokes' theorem in vector field.
6. Define electric flux. What are its units and dimensions? 2. Explain electric lines of force.
7. Explain three electric vectors E, P and D. What is the relation between them?
8. A 12-pf capacitor is connected to 50 V battery. How much electrostatic energy is stored in the capacitor?
9. Derive electric potential as line integral of electric field?
10. What do you mean by polarization of dielectric?