1. Which one the following is a scalar quantity?

a.Displacement

b.Force

c.Density

d.Torque

2. Which one of the following is a vector quantity?

a.Mass

b.Temperature

c.Speed

d.Velocity

3. How many types of vector multiplications are there?

a.1

b.2

c.3

d.4

4. When two vectors are perpendicular, their

a) Dot product is zero

b) Cross product is zero

c) Both are zero

d) Both are not necessarily zero

5. The cross product of the vectors $3i + 4j – 5k$ and $–i + j – 2k$ is,

a) $3i – 11j + 7k$

b) $-3i + 11j + 7k$

c) $-3i – 11j – 7k$

d) $-3i + 11j – 7k$

6. The work done of vectors force F and distance d, separated by angle θ can be calculated using,

a) Cross product

b) Dot product

c) Addition of two vectors

d) Cannot be calculated

7. Gradient of a scalar quantity,

A.Is a scalar quantity
B.Is a vector quantity
C.Can be both scalar or vector
D.Always Zero

8. Temperature gradient tells us,

A. Rate of change of temperature with respect to spatial coordinates (x,y,z).
B. Rate of change of temperature with respect to time.
C. Temperature of a place in previous day.
D. None of the above

9. Suppose you calculate the divergence of a vector quantity, your final result would be a,

A.Scalar quantity
B.A vector Quantity

10. You are standing in the middle of a storm. You want to calculate how fast and which direction the wind in blowing. Which of the following vector operations could be most helpful to you? (Consider the wind direction as straight line motion)

A. Curl
B. Divergence
C. Gradient
D. Projection of a vector

11. You are enjoying a roller coaster ride, holding an instrument which can measure your tangential velocity every second and generate a function out of the data it collects, very accurately. After coming home, you decided to calculate the curl of that function. What would be your result?

A.Zero
B.A non-zero vector function
C.A non-zero scalar function
D. None of the above

12. If $\phi(x, y, z) = xy^2 + 4yz^2$ **Calculate,**

$\vec{\nabla}\phi$ **at the position (2,1,0)**

A. $\hat{\imath} + 4\hat{\jmath} + 7\hat{k}$

B. $2\hat{\imath} + 4\hat{\jmath} + 10\hat{k}$

C. $-\hat{\imath} + 2\hat{\jmath} - \hat{k}$

D. $\hat{\imath} + 4\hat{\jmath}$

E. $-2\hat{\imath} - 4\hat{\jmath}$

13. Which of the following is not true? Where A, B and C are vectors

a) A(B . C) = Vector

b) A . (B x C) = scalar value

c) A (B . C) = scalar value

d) A x (B x C) = vector value

14. Find the projection of A on B. Given A = 10j + 3k and B = 4j + 5k.

a) 66.23

b) 60.25

c) 45.5

d) None of the above

15. The divergence of xi + yj + zk is

a) 0

b) 1

c) 2

d) 3

16. Determine the divergence of $F = 30\,i + 2xy\,j + 5xz^2\,k$ at (1,1,-0.2) and state the nature of the field.

a) 1, solenoidal

b) 0, solenoidal

c) 1, divergent

d) 0, divergent

17. Divergence of electric field very near to a negative charge is,

A.Zero
B.Always positive
C.Always negative
D.None of the above

18. Which one of the following physical quantities can be obtained, if we calculate negative rate of change of electro-static potential with resect to spatial variable (x,y,z),

A.Temperature
B.Magnetic field
C.Change of electric field
D.Electric field

19. You are given an electric field function $(\vec{E})$. You decided to calculate the curl of that function $\nabla X \vec{E}$. What would you get?

A. Zero
B. 1
C. Depends on the function
D. Can not be calculated

20. Which one of the following is known as continuity equation in electrostatics?

A. $\nabla . \vec{j} = - \frac{\partial \rho}{\partial t}$

B. $\nabla^2 V = - \frac{\rho}{\varepsilon_0}$

C. $\vec{J} = \rho \vec{V}$

D. $\nabla . \vec{E} = \frac{\rho}{\varepsilon_0}$

21. Mathematical expression of electric displacement vector ($\vec{D}$) is,

A. $\vec{D} = (\varepsilon_0 \vec{E} - \vec{P})$

B. $\vec{D} = (\vec{E} - \overrightarrow{\varepsilon_0 P})$

C. $\vec{D} = (\varepsilon_0 \vec{E} + \vec{P})$

D. $\vec{D} = (\vec{E} + \overrightarrow{\varepsilon_0 P})$

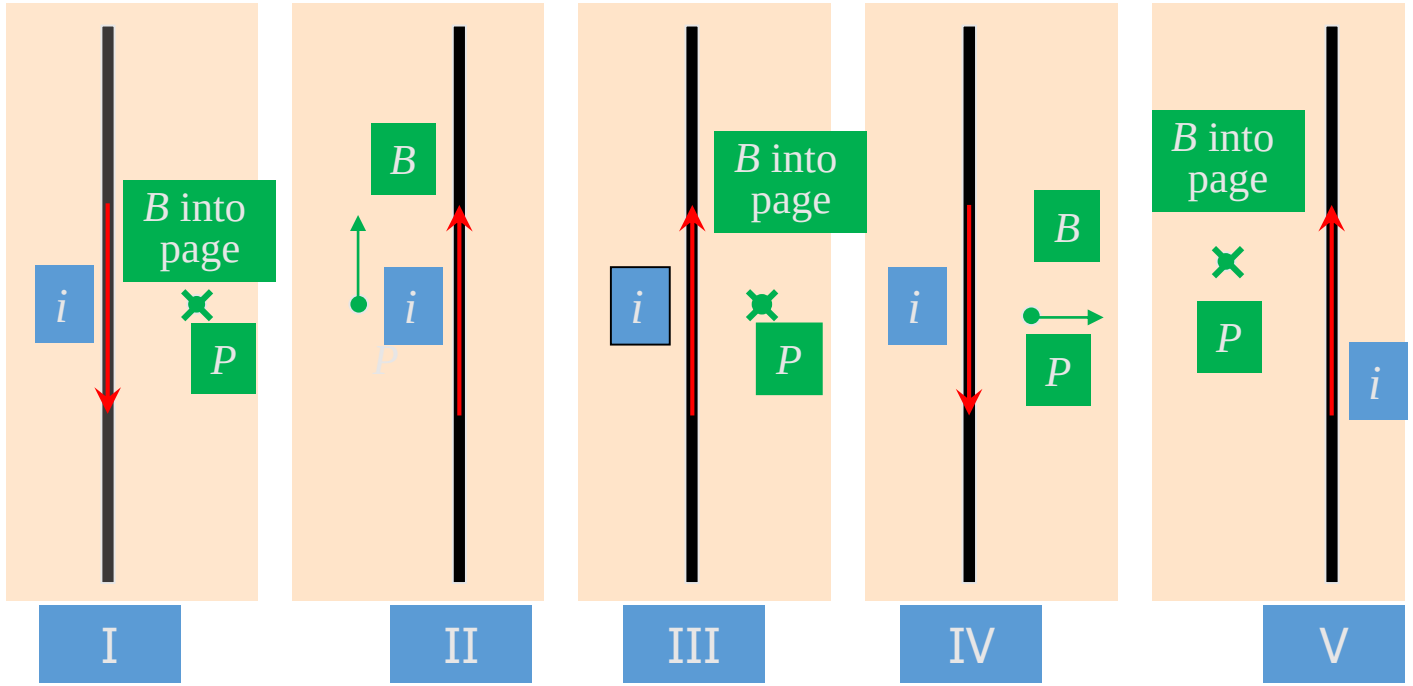
22. Dipole moment inside a dielectric material arises due to,

A.Free Charges
B.Bound charges
C.Both free and bound charges
D.None of the above

Direction of Magnetic Field

23. Which drawing below shows the correct direction of the magnetic field, *B*, at the point *P*?

A. I.
B. II.
C. III.
D. IV.
E. V



24. When the currents are parallel (same direction) in two current carrying wire placed near to each other, the two wires are pulled together.

A.True
B.False
C.The wires do not feel any force at all

25. When the currents are anti-parallel (opposite direction) in two current carrying wire placed near to each other, the two wires are pulled together.

A.True
B.False
C.The wires do not feel any force at all

26. The differential form of Ampere's circuital theorem is,

A. $\nabla \cdot \vec{B} = \mu_0 \vec{J}$

B. $\nabla \vec{B} = \mu_0 \vec{J}$

C. $\nabla \cdot (\nabla \times \vec{B}) = \mu_0 \vec{J}$

D. $\nabla \times \vec{B} = \mu_0 \vec{J}$

27. Which one of the following is the Maxwell's third equation electrodynamics?

A. $\nabla . \vec{E} = \frac{\rho}{\varepsilon_0}$

B. $\nabla X \vec{E} = \frac{\partial \vec{B}}{\partial t}$

C. $\nabla X \vec{E} = - \frac{\partial \vec{B}}{\partial t}$

D. $\nabla X \vec{B} = \mu_0 \vec{J}$