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Grade : XII	Subject : Physics	Chapter – 1,2,3,4
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- General instructions:

i. The question paper comprises of two sections A and B.
ii. Question no 1 to 27 in section A are one marks questions.
iii. **Proper method employed to reach the solution has to be mentioned in the answer sheet.**

$c = 3 \times 10^8$ m/s

$e = 1.6 \times 10^{-19}$ C

$\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$ Nm^2C^{-2}

Mass of electron = 9.1×10^{-31} kg

SECTION A

1. The force acting between two-point charges is F. What is the force if the magnitudes are halved and the distance between them is doubled?
   (a) F (b) 4F (c) 8F (d) 0.5F
2. An electric dipole is placed in a uniform field. The resultant force acting on it will……..
   (a) Always be zero.
   (b) Depends on its relative position.
   (c) Never be zero.
   (d) Depends on its dipole moment.
3. The electric force acting between two point charges kept in vacuum at a certain distance is K. If these charges are kept in a medium of dielectric constant Y, what is the force acting between them?
   (a) F (b) YF (c) Y^2F (d) 0.5YF
4. The distance between two point charges -q and 4q is 'r'. A third charge Q is placed at their midpoint. The resultant force acting on –q is zero. Then Q = ?
   (a) –q (b) q (c) 0 (d) NOTA
5. The linear charge density on the circumference of a circle with radius 'a' varies as $\lambda = \lambda_0 \cos\theta$. The total charge on it is……
   (a) zero (b) ∞ (c) $\pi a\lambda_0$ (d) $2\pi a$
6. When a charge of 10μC is enclosed by a closed surface, the flux passing through the surface is ϕ. Now another charge of -10μC charge is placed inside the closed surface, then the flu passing through the surface is …….
   (a) 2ϕ (b) ϕ (c) 4ϕ (d) 0
7. The liquid drop has a mass 'm' and a charge 'q'. What should be the magnitude of the electric field E to balance this drop?
   (a) mg/q (b) E/m (c) mgq (d) mq/g
8. A charge Q is placed at the center of a cube. The electric flux passing through any one surface of the cube is…….
   (a) Q/ε_0 (b) $Q/2\varepsilon_0$ (c) $Q/4\varepsilon_0$ (d) $Q/6\varepsilon_0$
9. The dimension of permittivity of free space is ……..
   (a) $M^{-1}L^{-3}T^2C^2$ (b) $M^{-1}L^2T^{-3}C^{-1}$ (c) $M^0L^0T^0C$ (d) NOTA
10. An electric dipole is placed at the center of a sphere. The flux passing through the surface of the sphere is ……
    (a) ∞ (b) 0 (c) can't say (d) between and ∞.

11. For a uniform electric field **E** = E_0(**i**), if the electric potential at x = 0 is zero, then the value of electric field at x = +x will be……

    (a) x E_0 (b) -x E_0 (c) x^2 E_0 (d) $-x^2$ E_0

12. The line integral of an electric field along the circumference of a circle of radius r, drawn with a point charge Q at the center will be……..

    (a) kQ/r (b) $Q/2\varepsilon_0 r$ (c) zero (d) $2\pi Qr$

13. a particle with mass 1 g and electric charge 10^{-8} C travels from a point A having an electric potential of 600V to a point B having zero potential. What is the change in its kinetic energy?

    (a) -6×10^{-6} J (b) -6×10^{6} J (c) 6×10^{-6} J (d) -6×10^{6} J

14. A particle having mass m and charge q is at rest. On applying a uniform electric field E on it, it starts to move. What is the KE when it travels a distance y in the direction of force?

    (a) qE^2y (b) qEy^2 (c) qEy (d) q^2Ey

15. A parallel plate capacitor is charged and then isolated. Now a dielectric slab is introduced in it which of the following will remain constant?

    (a) Electric Charge (b) Potential Difference (c) Capacitance (d) Energy

16. A moving electron approaches other electron. What will happen to the potential energy of the system?

    (a) Remains Constant (b) Increases (c) Decreases (d) NOTA

17. Energy of a charged capacitor is U. Now it is removed from the battery and connected to anther identical uncharged capacitor in parallel. What will be the energy of each capacitor now?

    (a) 3U/2 (b) U (c) U/4 (d) U/2

18. The measurement of an unknown resistance R is to be carried out using Wheatstone bridge. Two students perform an experiment in two ways. The first students takes R2 = 10 Ω and R1 = 5 Ω. The other student takes R2 = 1000 Ω and R1 = 500 Ω. If both take R3 = 5 Ω, find the unknown resistance.

    (a) 50 Ω (b) 500 Ω (c) 10 Ω (d) 1000 Ω

19. Two concentric rings are kept in the same plane. Number of turns in both the rings are 20. Their radii are 80 cm and 40 cm and they carry currents of 0.6 A and 0.4 A respectively, in opposite directions. The magnitude of the magnetic field produced is……μ_0 T.

    (a) 4 (b) 2 (c) 10/4 (d) 5/4

20. A particle of mass ‘m’ has a charge ‘q’. It is accelerated at a potential difference ‘V’ and then entered normally in a uniform magnetic field B. It performs a circular motion of radius ‘R’. The charge to mass ratio is …….

    (a) $2V/B^2R^2$ (b) V/2BR (c) VB/2R (d) mV/BR

21. An electron performs circular motion of radius ‘r’, perpendicular to a uniform magnetic field B. The kinetic energy gained by the electron in half revolution is……..

    (a) ½ mv^2 (b) ¼ mv^2 (c) 0 (d) πrBev

22. Two parallel thin wires each carrying current I are kept at a separation ‘r’ from each other. Hence the magnitude of force per unit length of one wire due to the other wire is……..

    (a) $\frac{\mu_0 I^2}{r^2}$ (b) $\frac{\mu_0 I^2}{2\pi r}$ (c) $\frac{\mu_0 I}{2\pi r}$ (d) 0

23. A long wire has a steady current. When it is bent in a circular form, the magnetic field at it’s centre is B. Now if this wire is bent in a loop of ‘n’ turns, what is the magnetic field at the centre?

    (a) nB (b) n^2B (c) 0 (d) nB^2

24. The A resistance R is to be measured using a meter bridge. Student chooses the standard resistance S to be 100 ohms. He finds the null point at $l1$ = 2.9 cm. He is told to attempt to improve the accuracy. Which of the following is a useful way?

    (a) He should measure $l1$ more accurately.
    (b) He should change S to 1000 ohms and repeat the experiment.
    (c) He should change S to 3 ohms and repeat the experiment.
    (d) He should give up hope of a more accurate measurement with a meter bridge.

25. The capacitance of a parallel plate capacitor formed by the circular plates of diameter 4 cm is equal to the capacitance of a sphere of diameter 200 cm. find the distance between the two plates.

    (a) 2×10^{-4} m (b) 1×10^{-4} m (c) 3×10^{-4} m (d) 4×10^{-4} m

26. If a capacitor of 600 μF is charged at a uniform rate of 50 μC/s, what is the time required to increase its potential by 10 Volts.

(a) 500 s (b) 6000 s (c) 12 s (d) 120 s

27. The area of every plate shown in the fig. is A and the separation between the successive plates is d. What is the capacitance between points a and b?

(a) $\varepsilon_0 A/d$ (b) $2\,\varepsilon_0 A/d$

(c) $3\,\varepsilon_0 A/d$ (d) $4\,\varepsilon_0 A/d$.

SECTION B

1. A 12pF capacitor is connected to a 50V battery. How much electrostatic energy is stored in the capacitor?

2. Derive the equation of potential energy of an electric dipole in an external electric field.

3. Derive the equation for electric field of an electric field for a point on its axis.

4. An electric dipole with dipole moment 4×10^{-9} C m is aligned at 30° with the direction of a uniform electric field of magnitude 5×10^{4} NC^{-1}. Calculate the magnitude of the torque acting on the dipole. Derive the equation for a dipole in a uniform magnetic field.

5. Derive the gyromagnetic ratio.

6. Derive the equation for electric field due to an electric dipole, for the points lying on the equatorial plane.

7. Derive the equation for force due to multiple charges.

8. Write a note on Van De Graff generator.

9. Derive the equation for the magnetic Field on the Axis of a Circular Current Loop

10. a) Explain and derive the equation for a potentiometer.
b) Derive the equation for internal resistance of a cell.

11. a) Derive the equation for capacitance.
b) Write a note on effect of dielectric on capacitance.

12. a) Write a note on drift velocity.
b) Write a note on Mobility.