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ఆదివారం 19 ఏప్రిల్ 2020 ■ email: help@eenadupratibha.net
ప్రతిభ

The magnetic flux linked with..

Electrodynamics

1. In a regular polygon of n sides, each corner is at a distance r from the centre. Identical charges are placed at (n – 1) corners. At the centre, the intensity is E and the potential is V. Then the magnitude of $\frac{V}{E}$ is

1) r n 2) r (n – 1) 3) $\frac{(n-1)}{r}$ 4) $\frac{r(n-1)}{n}$

2. Four charges $q_1 = 1\mu C$, $q_2 = 2\mu C$, $q_3 = -3\mu C$ and $q_4 = 4\mu C$ are kept on the vertices of a square of side 1 m. Find the electric potential energy of this system of charges.

1) -1.69×10^{-9} J 2) -7.62×10^{-9} J
3) -7.62×10^{-2} J 4) 1.69×10^{-2} J

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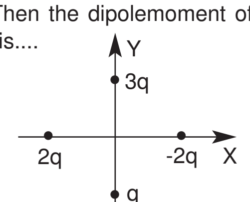
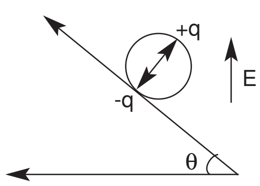
3. 4 Charges are placed each at a distance 'a' from the origin. Then the dipolemoment of the configuration is....

1) $q a\hat{j}$
2) $2q a\hat{j}$
3) $3 qa\hat{j}$
4) $4 qa\hat{j}$



4. A wheel having mass m has charges +q and –q on diametrically opposite points. It remains in equilibrium on a rough inclined plane in the presence of a uniform vertical electric field E. The value of E is

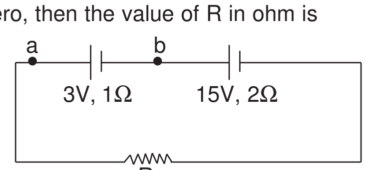
1) O
2) $\frac{mg}{q}$
3) $\frac{mg}{2q}$
4) $\frac{2mg}{q}$



5. A solid conducting sphere having a charge Q is surrounded by an uncharged concentric conducting hollow spherical shell. Let the potential difference between the surface of the solid sphere and that of the outer surface of the hollow shell be V. If the shell is now given a charge of –3Q, the new potential difference between the same two surfaces is

1) V 2) 2V 3) 4V 4) –2V

6. Two batteries one of the emf 3V, internal resistance 1 ohm and the other of emf 15V, internal resistance 2 ohm are connected in series with a resistance R as shown. If the potential difference between a and b is zero, then the value of R in ohm is



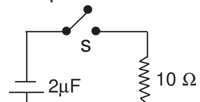
1) 1 2) 3 3) 5 4) 7

7. Power generated across a uniform wire connected across a supply is P. If the wire is cut into n equal parts and all the parts are connected in parallel across the same supply, the total power generated in the wire is

1) nP 2) $\frac{P}{n}$ 3) $\frac{P}{n^2}$ 4) n^2P

8. In the R–C circuit, the total energy of 3.6×10^{-3} J is dissipated in the 10Ω resistor when the switch S is closed. Then the initial charge on the capacitor is

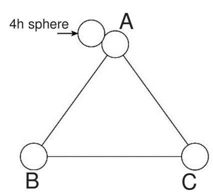
1) 60 μC
2) 120 μC
3) 180 μC
4) 240 μC



9. 1 m long metallic wire is broken into two un equal parts P and Q. P part of the wire is uniformly extended into another wire R. Length of R is twice the length of P and the resistance of R is equal to that of Q. Find the ratio of the resistance of P and R?

1) 1 : 4 2) 1 : 3 3) 1 : 2 4) 1 : 1

10. 3 identical metallic uncharged spheres A, B and C each of radius r, are kept at the corners of an equilateral triangle of side a (a>>r) as shown in the figure.



A fourth sphere (of radius r), which has a charge q, touches A and is then removed to a position far away. B is earthed and then the earthed connection is removed. C is then earthed. Then the charge on C is...

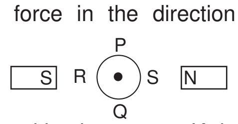
1) $\frac{qr}{2a}\left(\frac{2a-r}{2a}\right)$ 2) $\frac{qr}{2a}\left(\frac{2a-r}{a}\right)$
3) $\frac{-qr}{2a}\left(\frac{a-r}{a}\right)$ 4) $\frac{2qr}{a}\left(\frac{a-r}{2a}\right)$

11. A galvanometer has resistance 100Ω and it requires a current 100μA for full scale deflection. A resistor 0.1Ω is connected to make it an ammeter. The smallest current required in the circuit to produce the full scale deflection is

1) 1000.1 mA 2) 1.1 mA
3) 10.1 mA 4) 100.1 mA

12. A straight current carrying conductor is placed in such a way that the current in the conductor flows in the direction out of the plane of the paper. The conductor is placed between two poles of two magnets, as shown in the figure. Then the conductor will experience a force in the direction towards

1) P 2) Q
3) R 4) S



13. An electron having kinetic energy K is moving in a circular orbit of radius R perpendicular to a uniform magnetic induction $\vec{B}$. If kinetic energy is doubled and magnetic induction tripled, then the radius will become

1) $\sqrt{\frac{2}{9}}R$ 2) $\sqrt{\frac{9}{2}}R$ 3) $\sqrt{\frac{4}{3}}R$ 4) $\sqrt{\frac{3}{4}}R$

14. A particle with a specific charge 's' is fired with a speed 'V' towards a wall at a distance 'd', perpendicular to the wall. What minimum magnetic field must exist in this region for the particle not to hit the wall?

1) $\frac{V}{sd}$ 2) $\frac{2V}{sd}$ 3) $\frac{V}{2sd}$ 4) $\frac{V}{3sd}$

15. The current 'I' flows through a square loop of a wire of side 's'. The magnetic induction at the centre of the loop is

1) $\frac{\sqrt{2}\mu_0 I}{\pi s}$ 2) $\frac{2\sqrt{2}\mu_0 I}{\pi s}$
3) $\frac{\sqrt{2}\mu_0 I}{s}$ 4) $\frac{\sqrt{2\pi}\mu_0 I}{s}$

16. An electron of mass m_e, initially at rest, moves through a certain distance in a uniform electric field in time t_1. A proton of mass m_p, also initially at rest, takes time t_2 to move through an equal distance in this uniform electric field. The ratio $\frac{t_2}{t_1}$ is nearly equal to.. (neglect the effect of gravity)

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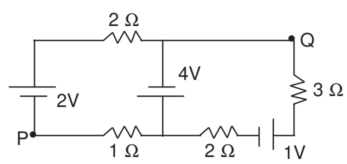
Physics

1) 1 2) $\sqrt{\frac{m_p}{m_e}}$ 3) $\sqrt{\frac{m_e}{m_p}}$ 4) 1836

17. In the circuit shown, what is the potential difference V_{PQ}?



1) +2 V 2) –2 V 3) +3 V 4) –3 V

18. A moving coil galvanometer of resistance 10 Ω produces full scale deflection, when a current of 25 mA is passed through it. To convert this galvanometer into a voltmeter reading upto 120 V, find the value of the resistance to be connected?

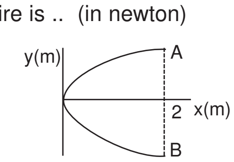
1) 10 Ω resistance in series
2) 4790 Ω resistance in series
3) 10 Ω resistance in parallel
4) 4790 Ω resistance in parallel

19. A 0.5m long solenoid has 500 turns and has a flux density of 2.52×10^{-3} T at its centre. Find the current in the solenoid? (Given, $\mu_0 = 4\pi \times 10^{-7}$ Hm^{-1})

1) 1 A 2) 2 A 3) 3 A 4) 4 A

20. A conducting wire bent in the form of a parabola $y^2 = 2x$ carries a current i = 2A. This wire is placed in a uniform magnetic field $\vec{B} = -4\hat{K}$ Tesla. Then the magnetic force on the wire is .. (in newton)

1) $-16\hat{i}$
2) $32\hat{i}$
3) $-32\hat{i}$
4) $16\hat{i}$



21. The ratio of the energy required to set up in a cube of side 10 cm a uniform magnetic field of 4 Wb/ m^2 and a uniform electric of 10^6 V/m is

1) 1.4×10^6 2) 1.4×10^7
3) 1.4×10^{-6} 4) 1.4×10^{-7}

22. A proton, a deuteron and an α – particle having the same kinetic energy are moving in circular trajectories in a constant magnetic field. If r_p, r_d and r_α denote respectively the radii of trajectories of these particles, then

1) $r_\alpha = r_p < r_d$ 2) $r_\alpha > r_d > r_p$
3) $r_\alpha = r_d > r_p$ 4) $r_p = r_d = r_\alpha$

23. A metal rod of length 2m in rotating with an angular velocity of 100 rad/s in a plane perpendicular to a uniform magnetic field of 0.3T. Then the potential difference between the ends of the rod is....

1) 30 V 2) 40 V 3) 50 V 4) 60 V

24. An un charged parallel plate capacitor having a dielectric of dielectric constant K is connected to a similar air cored parallel – plate capacitor charged to a potential V_o. The two share the charge and the common potential becomes V. Then the dielectric constant K is

1) $\frac{V_o}{V} - 1$ 2) $\frac{V}{V_o} - 1$
3) $\frac{V_o}{V} + 1$ 4) $\frac{V}{V_o} + 1$

25. A Capacitor of capacitance C_o is charged to a potential V_o and then isolated. A small capacitor C is then charged from C_o, discharged and charged again; the process being repeated n times. Due to this, the potential of the larger capacitor is decreased to V. The value of C is

1) $C_o\left(\frac{V_o}{V}\right)^{1/n}$ 2) $C_o\left[\left(\frac{V_o}{V}\right)^{1/n} - 1\right]$
3) $C_o\left[\left(\frac{V}{V_o}\right) - 1\right]^n$ 4) $C_o\left[\left(\frac{V}{V_o}\right)^n + 1\right]$

26. A long string with a charge of λ per unit length passes through an imaginary cube of edge a. The maximum flux of the electric field through the cube will be

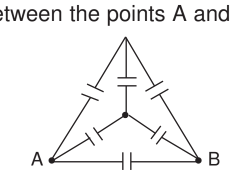
1) $\frac{a\lambda}{\varepsilon_o}$ 2) $\frac{2a\lambda}{\varepsilon_o}$ 3) $\frac{\sqrt{3}\,a\lambda}{\varepsilon_o}$ 4) $\frac{\sqrt{2}\,a\lambda}{\varepsilon_o}$

27. From a supply of identical capacitors rated 8μF, 250V; the minimum number of capacitors required to form a composite 16 μF, 1000V capacitor is

1) 4 2) 8 3) 16 4) 32

28. Each side of a Tetrahedral has a capacitor of capacitance C. What is the effective capacitance between the points A and B?

1) C
2) $\frac{C}{2}$
3) 2C
4) 3C



29. In a uniform magnetic field of induction B, a wire in the form of a semi circle of radius r rotates about the diameter of the circle with angular frequency ω. The axis of rotation is perpendicular to the field. If the total resistance of the circuit is R, the mean power generated per period of rotation is

1) $\frac{B\pi r^2\omega}{2R}$ 2) $\frac{(B\pi r\omega)^2}{2R}$
3) $\frac{(B\pi\omega^2)^2}{8R}$ 4) $\frac{(B\pi r^2\omega)^2}{8R}$

30. The magnetic flux linked with a stationary loop of resistance R varies w.r.t time during the time period T as follows: Φ = at(T – t). If the inductance of the coil is negligible, the amount of heat generated in the loop during that time is ....

1) $\frac{a^2T^3}{3R}$ 2) $\frac{a^3T^2}{3R}$
3) $\frac{a^2T^3}{2R}$ 4) $\frac{a^3T^2}{2R}$

ANSWERS

1-2; 2-3; 3-2; 4-3; 5-1; 6-2; 7-4; 8-2; 9-1; 10-3; 11-4; 12-2; 13-1; 14-1; 15-2; 16-2; 17-1; 18-2; 19-2; 20-3; 21-1; 22-1; 23-4; 24-1; 25-2; 26-3; 27-4; 28-3; 29-4; 30-1.