the srijan school

REVESION WORKSHEET-2018-19

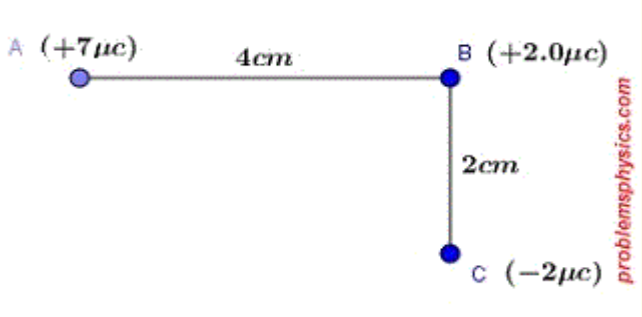
CLASS-XII

SUBJECT-PHYSICS

UNITS- ELECRTOSTATICS & CURRENT ELECTRICITY

ELECRTOSTATICS

1. Write Coulomb's law in vector form. Also show that it obeys Newton's third law of motion.
2. When is electric flux said to be positive and negative?
3. Trace the path of an electron and a proton, if both enter a uniform electric field, with the same velocity, perpendicular to the field.
4. What is the net force and its direction that the charges at the vertices A and C of the right triangle ABC exert on the charge in vertex B?



[1.20×10^2 N, 48.8°]

5. A positive charge q exerts a force of magnitude - 0.20 N on another charge - 2q. Find the magnitude of each charge if the distance separating them is equal to 50 cm.

   [$q = 1.66 \times 10^{-6}$ C , $-2q = -3.23 \times 10^{-6}$ C]
6. Two identical objects, separated by a distance d, with charges equal in magnitude but of opposite signs exert a force of attraction of - 2.5 N on each other. What force do these objects exert on each other if the distance between them becomes 2d?

   [- 0.625 N]
7. A charge of $q = -4.0 \times 10^{-6}$ is placed in an electric field and experiences a force of 5.5 N [E]
   a) What is the magnitude and direction of the electric field at the point where charge q is located?
   b) If charge q is removed, what is the magnitude and direction of the force exerted on a charge of - 2q at the same location as charge q?

   [1.375×10^6 N / C, 11 N]
8. When a glass rod is rubbed with a silk cloth, charges appear on both. A similar phenomenon is observed with many other pairs of bodies. Explain how this observation is consistent with the law of conservation of charge.
9. Two charges ±10 μC are placed 5.0 mm apart. Determine the electric field at (a) a point P on the axis of the dipole 15 cm away from its centre O on the side of the positive charge, as shown in Fig. (a), and (b) a point Q, 15 cm away from O on a line passing through O and normal to the axis of the dipole, as shown in Fig

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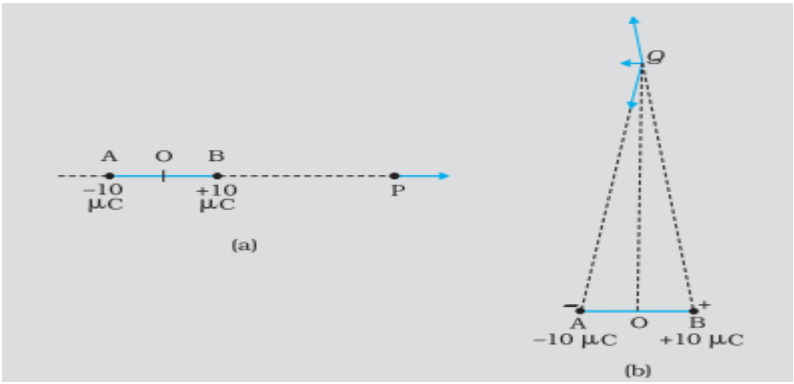


[1.33 × 105 N C^{-1}]

10. A system has two charges $q_A = 2.5 \times 10^{-7}$ C and $q_B = -2.5 \times 10^{-7}$ C located at points A: (0, 0, –15 cm) and B: (0,0, +15 cm), respectively. What are the total charge and electric dipole moment of the system?

[$7.5x10^{-8}$ C m]

11. 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.

[10^{-4} N m]

12. A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of 80.0 $\mu C/m^2$. (a) Find the charge on the sphere. (b) What is the total electric flux leaving the surface of the sphere?

[1.45×10^{-3} C, 1.6×10^8 Nm^2/C]

13. An infinite line charge produces a field of 9×10^4 N/C at a distance of 2 cm. Calculate the linear charge density.

[10×10^{-6} C/m]

14. A comb run through one's dry hair attracts small bits of paper. Why? What happens if the hair is wet or if it is a rainy day? (Remember, a paper does not conduct electricity.)
15. Ordinary rubber is an insulator. But special rubber tyres of aircraft are made slightly conducting. Why is this necessary?
16. Vehicles carrying inflammable materials usually have metallic ropes touching the ground during motion. Why?
17. A bird perches on a bare high power line, and nothing happens to the bird. A man standing on the ground touches the same line and gets a fatal shock. Why?
18. Two charges 5×10^{-8} C and -3×10^{-8} C are located 16 cm apart. At what point(s) on the line joining the two charges is the electric potential zero? Take the potential at infinity to be zero.

[10 cm]

19. A regular hexagon of side 10 cm has a charge 5 μC at each of its vertices. Calculate the potential at the centre of the hexagon.

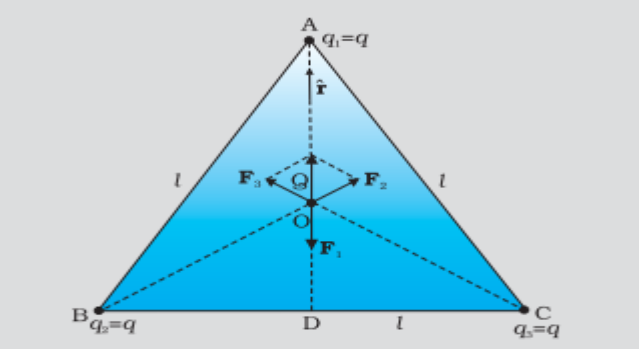
[$2.7x10^6$V]

20. A parallel plate capacitor with air between the plates has a capacitance of 8 pF (1pF = 10^{-12} F). What will be the capacitance if the distance between the plates is reduced by half, and the space between them is filled with a substance of dielectric constant 6?

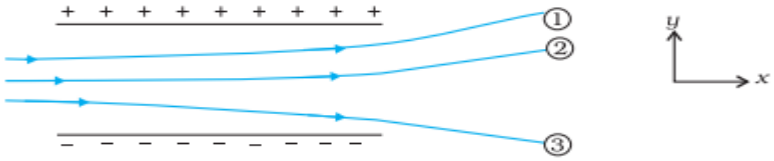
[96pF]

21. A metal plate is introduced between the plates of a charged parallel plate capacitor. What is its effect on the capacitance of the capacitor?
22. A 12pF capacitor is connected to a 50V battery. How much electrostatic energy is stored in the capacitor? [$1.5 x10^{-8}$J]

23. Consider three charges q_1, q_2, q_3 each equal to q at the vertices of an equilateral triangle of side l. What is the force on a charge Q (with the same sign as q) placed at the centroid of the triangle, as shown in Fig.



24. Following figure shows tracks of three charged particles in a uniform electrostatic field. Give the signs of the three charges. Which particle has the highest charge to mass ratio?



CURRENT ELECTRICITY

25. A battery of emf 10 V and internal resistance 3 Ω is connected to a resistor. If the current in the circuit is 0.5 A, what is the resistance of the resistor? What is the terminal voltage of the battery when the circuit is closed?

[17Ω, 8.5 V]

26. A negligibly small current is passed through a wire of length 15 m and uniform cross-section 6.0×10^{-7} m^2, and its resistance is measured to be 5.0 Ω. What is the resistivity of the material at the temperature of the experiment?

[$2x10^{-7}$ Ωm]

27. A heating element using nichrome connected to a 230 V supply draws an initial current of 3.2 A which settles after a few seconds to a steady value of 2.8 A. What is the steady temperature of the heating element if the room temperature is 27.0 °C? Temperature coefficient of resistance of nichrome averaged over the temperature range involved is 1.70×10^{-4} $°C^{-1}$.

[867.35°C]

28. A storage battery of emf 8.0 V and internal resistance 0.5 Ω is being charged by a 120 V dc supply using a series resistor of 15.5 Ω. What is the terminal voltage of the battery during charging? What is the purpose of having a series resistor in the charging circuit?

[11.5V]

29. In a potentiometer arrangement, a cell of emf 1.25 V gives a balance point at 35.0 cm length of the wire. If the cell is replaced by another cell and the balance point shifts to 63.0 cm, what is the emf of the second cell?

[2.25 V]

30. Choose the correct alternative:
(a) Alloys of metals usually have (greater/less) resistivity than that of their constituent metals.
(b) Alloys usually have much (lower/higher) temperature coefficients of resistance than pure metals.
(c) The resistivity of the alloy manganin is nearly independent of/ increases rapidly with increase of temperature.

(d) The resistivity of a typical insulator (e.g., amber) is greater than that of a metal by a factor of the order of ($10^{22}/10^{3}$).

31. What are the ohmic and non-ohmic resistors? Give one example of each.
32. How does the resistivity of a conductor depends upon:
    (i) Number density of free electrons and
    (ii) Relaxation time?
33. Explain the effect of temperature on the resistivity of pure semiconductors and conductors?
34. Draw the V-I graph for a metallic wire at two different temperatures T_1 & T_2 ($T_1>T_2$).
35. Establish a relation between drift velocity of electrons and the electric field applied to the conductor.
36. What do you understand by electrical resistivity? Express it in mass, charge, number density & relaxation time.
37. When a battery of emf E and internal resistance r is connected to a resistance R, a current I flows through it. Drive a relation between E, I, r and R.
38. A battery of e.m.f. 10 V and internal resistance 3 Ω is connected to a resistor. If the current through the circuit is 0.5A, what is the resistance of the resistor?
    What is the terminal voltage of the battery, when the circuit is closed?

    (17 Ω, 8.5V)
39. The e.m.f. of a cell is 1.5V. On connecting a 14 Ω resistance across the cell, the terminal potential difference falls to 1.4 V. calculate the internal resistance of the cell.

    (1 Ω)
40. Two poles of a cell of an e.m.f. 1.5V are connected to the end of 10 Ω coil. If current in the circuit is 0.1A, calculate the internal resistance of the coil.

    (5 Ω)
41. The e.m.f. of Daniel cell is 1.09V and internal resistance is 2 Ω. If the terminals of the cells are joined by a wire of resistance of 18 Ω, find the potential difference recorded by a high resistance voltmeter also connected to the terminals of the cell.

    (0.981 V)
42. Draw the colour code scheme of 42 kΩ + 10% carbon resistance.

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