SAINIK SCHOOL GOPALGAN
SUB: PHYSICS
Class: XII

ASSIGNMENT - 3

Electrostatics

I .Multiple Choice Questions:

1. When 10^{19} electrons are removed from a neutral metal plate through some process, the electric charge on itis

(a) –1.6 C (b) +1.6C
(c) 10^{+19}C (d) 10^{-19}C

2. A Copper sphere of mass 2g contains about 2 × 10^{22} atoms. The charge on the nucleus of each atom is 29e. What fraction of the electrons must be removed from the sphere to give it a charge of +2 μC?

(a) 1.08 × 10^{-11} (b) 2.16 × 10^{-11}
(c) 3.24 × 10^{-11} (d) 4.32 × 10^{-11}

3. In one gram of a solid, there are 5 × 10^{21} atoms. If one electron is removed from every one of 0.01 % of atoms of the solid, charge gained by the solid wouldbe

(a) 0.08C (b) 0.8 C (c) –0.08C (d) –0.8 C

4. A conductor has 14.4 × 10^{-19}coulomb positive charge. The conductor has (Charge on electron = 1.6 × 10^{-19} coulomb)

(a) 9 electrons in excess.
(b) 27 electrons in short.
(c) 27 electrons in excess.
(d) 9 electrons in short.

5. Two spheres carrying charges +6 μ Cand+9 μ C, separated by a distance d, experience a force of repulsion F. When a charge of –3 μC is given to both the sphere and kept at the same distance as before, the new force of repulsionis

(a) F/3 (b) F (c) F/9 (d)3F

6. Two electrons are separated by a distance of 1Å. What is the coulomb force betweenthem?

(a) 2.3 × 10^{-8}N
(b) 4.6 × 10^{-8}N
(c) 1.5 × 10^{-8}N
(d) 2.8 × 10^{-8}N

7.The force between two charges 0.06 m apart is 5 N. If each charge is moved towards the other by 0.01m, then the force between them will become

(a) 7.20N (b) 11.25N (c) 22.50N (d) 45.00N

8.In figure two positive charges q_2 and q_3 fixed along the y-axis, exert a net electric force

in the + x-direction on a charge q_1 fixed along the x-axis. If a positive charge Q is added at (x , 0), the force onq_1.

(a) shall increase along the positivex-axis.
(b) shall decrease along the positivex-axis.
(c) shall point along the negativex-axis.
(d) shall increase but the direction changes

because of the intersection of Q with q_2 andq_3.

9. If charge q is placed at the centre of the line joining two equal charges Q, the system of these charges will be in equilibrium if q is

(a) –4Q (b) –Q/4
(c) –Q/2 (d) +Q/2

10.Three charges each equal to 1 □C are placed at the corners of an equilateral triangle. If force between any two charges is F, then thenet force on either will be

(a) 3 F (b) F/3
(c) √3F (d) √2F

11. Charge q_1= + 6.0 nC is on Y-axis at y = + 3 cm and charge q_2 = – 6.0 nC is on Y-axis at y = – 3 cm. Calculate force on a charge q_0 = 2 nC placed on X-axis at *x* = 4 cm.

(a) $-51.8\hat{j}$□N (b) $+51.8\hat{j}$□N
(c) $-5.118\,\hat{j}$□N (d) $+5.18\,\hat{j}$□N

12. The difference in the effective capacitance of two equal capacitors when joined in parallel and series is 3 □F. The value of each capacitor is

(a) 1□F (b) 2□F
(c) 3□ (d) 4□F

13.If n drops, each of capacitance C and charged to a potential V, coalesce to form a big drop, the ratio of the energy stored in the big drop to that in each small drop willbe

(a) n:1 (b) $n^{4/3}$:1
(c) $n^{5/3}$:1 (d) n^2 :1

14. A particle of mass m and charge +q is midway between two fixed charged particleseach having a charge +q, and at a distance 2L apart. The middle charge is displaced slightly along the line joining the fixed charges and released. The time period of oscillation is proportional to

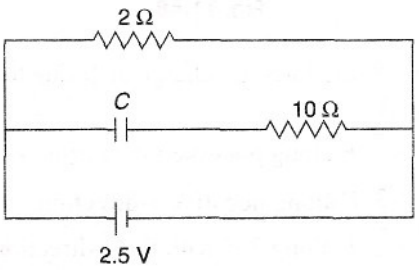
(a) (A) $L^{1/2}$ (b) L
(c) $L^{3/2}$ (d) L^2

15. The electric potential V (in volt) varies with x (in metre) according to the relation F = 5 + $4x^2$Theforce experienced by a negative charge of 2 × 10^{-6} C located at x = 0.5 mis

(a) 2×10^{-6}N (b) 4 ×10^{-6}N (c) 6 ×10^{-6}N (d) 8 ×10^{-6}N

16.A capacitor of capacitance C = 2 □F is connected as shown in Fig. If the internal resistance of the ceil is 0.5 O, the charge on the capacitor platesis

(a) zero (b)2□C (c)4 □C (d) 6 □C



17.Two equal point charges are fixed at x = - a and x = + a on the x-axis. Another point charge Q is placed at the origin. The change in the electrical potential energy of Q, when it is displaced by a small distance x along the x-axis, is approximately proportional to

(a)x (b)x^2 (c)x^3 (d)1/x

18. There is a uniform electric field of strength 10^3 Vm^{-1} along the y-axis. A body of mass 1 g and charge 10^{-6} C is projected into the field from the origin along the positive x-axis with a velocity of 10 ms^{-1}. Its speed (in ms^{-1}) after 10 second will be (neglect gravitation)

(a)10 (b)5 √ 2 (c)10 √2 (d)20

19. Two identical charges are placed at the two corners of an equilateral triangle. The potential energy of the system is U. The work done in bringing an identical charge from infinity to the third vertex is

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

20. A capacitor of capacitance 4 □F is charged to 80 V and another capacitor of capacitance 6 □F is charged to 30 V. When they are connected together, the energy lost by the 4 □F capacitor is

(a)7.8mJ (b)4.6 mJ (c)3.2mJ (d) 2.5mJ

21. . The flux of electric field E = 200 i NC^{-1} through a cube of side 10 cm, oriented so that its faces are parallel to the co-ordinate axes is

(a) zero (b) 2$NC^{-1}m^2$ (c) 6$NC^{-1}m^2$ (d)12$NC^{-1}m^2$

22. A particalof mass m and charge + q is midway between two fixed charged particles, each having a charge + q and at a distance 2L apart. The middle charge is displaced slightly along the line joining the fixed charges and released. The time period of oscillation is proportionalto.

(a)$L^{1/2}$ (b)L (c)$L^{3/2}$ (d) L^2

23. Two fixed point charges + 4q and + q units are separated by a distance 'x'. Where should a third point charge □ q_0 be placed for it to be in equilibrium?

(a) Midwaybetweenthecharges+4qand + q.
(b) At a distance 2x from the charge +4q.
(c) At a distance 2x/3 from the charge +4q.
(d) At a distance x/3 from the charge +4q.

24. Two point charges placed at a certain distance r in air exert a force F on each other. Then the distance r□ at which these charges will exert the same force in a medium of dielectric constant k is givenby

(a) r (b) r /k (c)r/ √K (d) r/√k

25. Two positive point charges are 3 m apart and their combined charge is 20 □C. If the force between them is 0.075 N, then the charges are

(a) 10 □C,10□C (b) 15 □C, 5 □C (c) 12 □C,8□C (d) 14 □C, 6□C

26. 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

27. A total of 7.50 micro coulomb change is distributed on two metal spheres. When the spheres are 6.00 cm apart, they feel the repulsive force of 20.0 N. Find the charge on each sphere.

28. Three charges, each of 1.0 micro coulomb are placed on vertices A, B and C of a square. Calculate the charge located at point D so that the net force acting on the charge at B becomes zero.

29. Three point charges are placed on the x-axis. A charge of 3 micro coulombs are placed at the origin. A charge of -5 micro coulomb is placed at 20.0 cm and the charge of 8.0 micro coulomb is placed at 35.0 cm. Find the force acting on charge at the origin.

30. -10 micro coulomb change is located at the origin. Calculate the y component of electric field at point P (4cm,5cm).

31. A 500 mC charge is placed at the centre of the square of side 10.0 cm. Find the work done in moving a charge of 10 mC between two diagonally opposite point of the square.

32. Write two characteristics of equipotential surface. Draw the equipotential surface of an electric dipole.

33. A metal plate is introduced between the plates of a charged parallel plate capacitor. What will be the effect of it on the capacitance of the capacitor?

34. The two plates of a parallel plate capacitor are 4 mm apart. A dielectric slab of constant 3 and thickness 3 mm is inserted between the plates. The distance between the plates is so adjusted that the new capacitance becomes 2/3 of the original value. Find the new distance between the plates.

35. A capacitor of 200 pF is charged by a battery of 300 V. The battery is disconnected and the charged capacitor is connected to another uncharged capacitor of 100 pF. Calculate the difference between the energy stored in the system and initial energy of the single capacitor.

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