PHYSICS

BOOKS - BITSAT GUIDE

GAUSS LAW AND ELECTRIC POTENTIAL THEORY

Practive Exercise

1. A surface$s = 10\hat{j}$ is kept in an electric field. $E = 2\hat{i} + 4\hat{j} + 7\hat{k}$. How must electric flux will come out through the surface ?

A. 40 units

B. 50 units

C. 30 units

D. 20 units

Answer:

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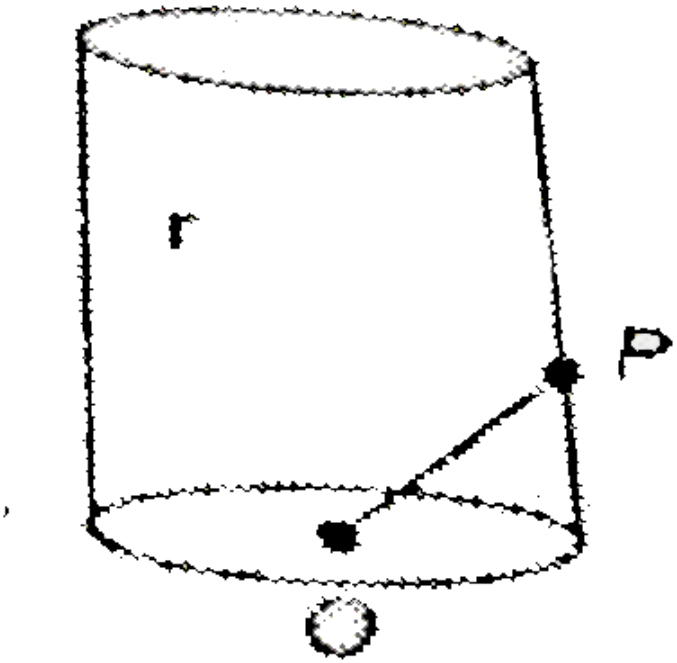
2. Electric field at point P is gives by $E = rE_0$. The total flux through the given cylinder of radius R and height h is



A. $E_0\pi R^2 h$

B. $2E_0\pi R^2 h$

C. $3E_0\pi R^2 h$

D. $4E_0\pi R^2 h$

Answer:

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3. A point charge Q is placed at the centre of a hemisphere. Find the electric flux passing through flat surface of hemisphere.

A. $\frac{Q}{\varepsilon_0}$

B. Zero

C. $\frac{Q}{2}\varepsilon_0$

D. None of these

Answer:

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4. A point charge Q is placed at the centre of a hemisphere. Find the ratio of electric flux passing through curved andplane surface of the hemisphere.

A. $1:1$

B. $1:2$

C. $2\pi:1$

D. $4\pi:1$

Answer:

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5. If a point charge q is placed at one corner of a cube, what is the flux linked with the cube?

A. $\frac{q}{\varepsilon_0}$

B. $\frac{q}{2}\varepsilon_0$

C. $\frac{q}{3}\varepsilon_0$

D. $\frac{q}{8}\varepsilon_0$

Answer:

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6. An electric dipole is placed at the centre of a sphere. Find the electric flux passing through the sphere.

A. $\frac{1}{\varepsilon_0}$

B. $\frac{2}{\varepsilon_0}$

C. Zero

D. None of these

Answer:

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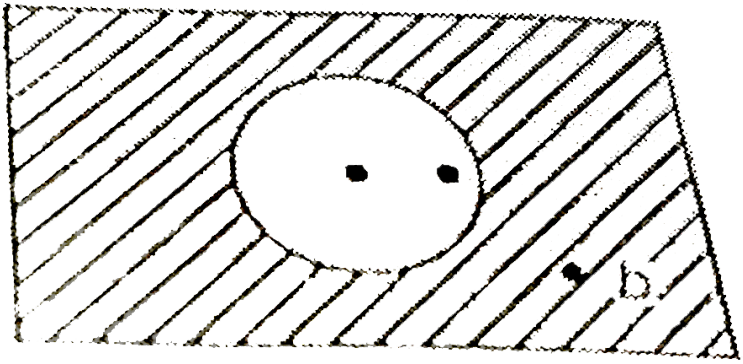
7. A point charge q=2×10^{-7}C is placed at the centre of a spherical cavity of radius 3 cm in a metal place. A and B are at distances 1.5 cm and 4.5 cm respectively from the centre of cavity.

The electric field intensities at a and b are



A. 8×10^{6}N/C and zero

B. zero and zero

C. zero and 8.9×10^{5}N/C

D. None of these

Answer:

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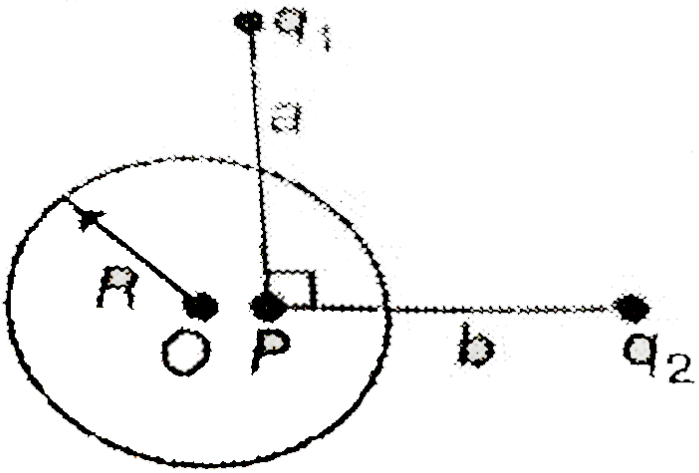
8. In the given figure, two point chrges q_1 and q_2 are placed at distances a and b from centre of a metallic sphere having charge Q.Find electric felds due to the metallic sphere at the point P.



A. $\frac{1}{4\pi\varepsilon_0}\sqrt{\left(\frac{q_1}{a^2}\right)^2+\left(\frac{q_2}{b^2}\right)^2}$

B. $\frac{1}{4\pi\varepsilon_0}\frac{Q}{R^2}$

C. $\frac{1}{4\pi\varepsilon_0}\sqrt{\left(\frac{Q}{R^2}\right)^2+\left(\frac{q_1}{a^2}+\frac{q_2}{b^2}\right)^2}$

D. None of these

Answer:

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9. Find the minimum surface denstily of charge on the plate, so that a body of mass 2 kg/m^2 may just be lifted.

A. $2.84 \times 10^{-9} C/m^2$

B. $2.25 \times 10^{-9} C/m^2$

C. $1.86 \times 10^{-9} C/m^2$

D. None of these

Answer:

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10. Find the surface density of electric charge at a place on the earth's surface, where the rate of fall of potential is 2.5 V.

A. $2.0 \times 10^{-9} C/m^2$

B. $2.21 \times 10^{-9} C/m^2$

C. $3.36 \times 10^{-9} C/m^2$

D. $3.5 \times 10^{-9} C/m^2$

Answer:

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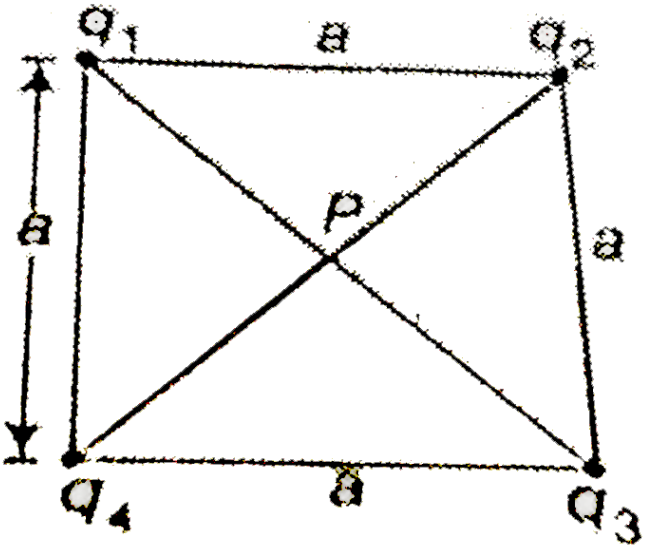
11. Four point charges q_1, q_2, q_3 and q_4 are placed at the corners of the squares of side a,as shown in figure.Calculate the potential at the centre



of the square.

(Given,

$q_1 = 1 \times 10^{-8} C, q_2 = -2 \times 10^{-8} C, q_3 = 3 \times 10^{-8} C, q_4 = 2 \times 10^{-8} C$ a

)

A. 507 V

B. 607 V

C. 550 V

D. 650 V

Answer:

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12. Over a thin ring of radius R a charge q is distributed none-uniformly. Calculate the work done of the force field in displacing a point charge q' from centre of the ring to infinity.

A. $\frac{qq'}{4\pi\varepsilon_0 R}$

B. $\frac{qq'}{2\pi\varepsilon_0 R}$

C. $\frac{qq'}{\pi\varepsilon_0 R}$

D. None of these

Answer:

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13. Two drop of water each with a charge of $3 \times 10^{-9} C$having surface potential 500 V form a single drop.What is the surface potential of the new drop?

A. 794 v

B. 1000 v

C. 250 v

D. 750 v

Answer:

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14. Calculate the earth's potential. Assume earth has a surface charge density of $1ectron/metre^2$.(Given,the electronic charge = $-1.6 \times 10^{-19}C$, earth's radius $= 6.4 \times 10^6 m$, $e_0 = 8.9 \times 10^{-12} c^2 / Nm$)

A. $-0.115V$

B. 0.215 v

C. $-0.225v$

D. 0.185 v

Answer:

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15. An electron is released from rest at one point in uniform field and moves a distance of 10c cm in 10^{-7} s. What is the voltage between the points?

A. 10 v

B. 7 v

C. 11.4 v

D. 8 v

Answer:

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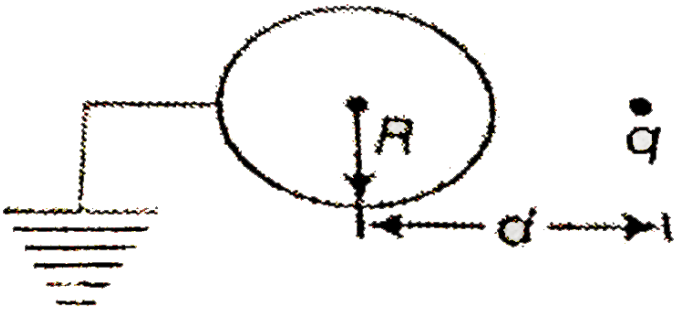
16. In the figure, the charge appears on the sphere is



A. q

B. $\frac{qd}{r}$

C. $-\frac{qr}{d}$

D. 0

Answer:

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17. At the eight corners of a cube of side 10 cm, equal charge each of value 10 C are placed. Calculate the potebtial at the centre of the cube.

A. $83.14 \times 10^{11} v$

B. $16.62 \times 10^{11} v$

C. $1.66 \times 10^{11} v$

D. $166.7 \times 10^{11} v$

Answer:

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18. Calculate the work required to bring a unit positive charge from infinity to a mid-point between two charges $20\mu C \text{ and } 10\mu C$ separated by a distance of 50 m.

A. $10.8 \times 10^4 J$

B. `10.8xx10^(3)J

C. `10.8xx10^(8)J

D. `0.54xx10^(5)J

Answer:

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19. Two charge _q and -3q are placed at a distance of 1 m apart.Find out the points on the line joing two charges, where electric potential is zero.

A. 0.25 m, 0.5 m

B. 1 cm, 0.50 m

C. 0.35 cm, 24 cm

D. None of these

Answer:

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20. Two point are at distance r_1 and $r_2(r_1 < r_2)$from a long string having charge per unit length σ. The potential difference between the points is proportional to

A. σ

B. $\log\left(\frac{r_2}{r_1}\right)$

C. $\frac{1}{\sigma}$

D. $\frac{r_2}{r_1}$

Answer:

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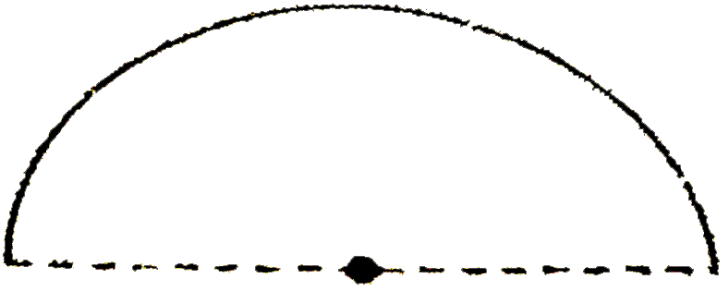
21. A semicirxular wire of radius a having λas charge per unit length Is shown in the figure. Find the electric potential at the centre of the semicircular wire.



A. $\frac{\lambda}{4\varepsilon_0}$

B. $\frac{\lambda}{4\pi\varepsilon_0 R}$

C. $\frac{\lambda}{4\varepsilon_0}$

D. none of these

Answer:

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22. If a charge particle starts from rest from one conductor and reaches the other conductor with a velocity of $10^9 cm/s$, then calculate the potential differnce between the two conductor. The mass of the charge particle is 9×10^{-28} g and charge is 4.8×10^{-10}asu.

A. 0.94 stat volt

B. 1 stat volt

C. 1.2 stat volt

D. 0.2 stat volt

Answer:

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23. A charge Q is uniformly distributed over the surface of two conducting concentric spheres of radii R and r (Rgtr). Then, potential at common centre of these spheres is

A. $\frac{KQ(R+r)}{Rr}$

B. $\frac{KQ(R+r)}{R^2+r^2}$

C. $\frac{KQ}{\sqrt{R}^2+r^2}$

D. $KQ\left(\frac{1}{R}-\frac{1}{r}\right)$

Answer:

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24. If a chargedd particle states from rest from one conductor and reaches the other condutor with a velocity 10^9 cm/s, if the potential difference between the two conductors is 0.94 stat volt, then calcualte the charge of the charged particle.

(Given, mass of charged particle=9×10^{-28} g)

A. 5.8×10^{-10} esu

B. 4.8×10^{-10} esu

C. 3.8×10^{-10} esu

D. 2.75×10^{-10} esu

Answer:

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25. Calculate the potential of the big drop, if eight charged of 10^{-10} C merge into a single drop.

A. 3200 v

B. 4000 v

C. 3600 v

D. 4200 v

Answer:

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26. A charge $q = 2\mu C$ is moved by same external force from infinity to a point where electric potential is 10^4 V .Calculate the work done by external force.

A. $1 \times 10^{-2} J$

B. $2 \times 10^{-2} J$

C. $0.2 \times 10^{-2} J$

D. $12 \times 10^{-2} J$

Answer:

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27. Find the electric protential energy of electron-proton system of hydrogen atom.(Given, the radius of electron orbit =0.53 A, electronic charge = 1.6×10^{-19C})

A. $-24.17eV$

B. $-20.18eV$

C. 36.55 eV

D. None of these

Answer:

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28. Three charges Q, 2Q, 8Q are to be placed on a line whose length is R metre. Lacate the positive where these charges should be placed such that the potential energy of the system is minimum.

A. $\frac{R}{3}$

B. $\frac{2R}{3}$

C. $\frac{3R}{2}$

D. $\frac{4R}{3}$

Answer:

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29. A particle of mass $0.002kg$ and a charge $1\mu C$ is held at rest on a frictionless horizontal surface at a distance of 1m from a fixed charge of 1mC. If the particle is released, it will be repelled. The speed of the particle when it is at a distance of 10m from the fixed charge is -

A. 100 m/s

B. 90 m/s

C. 60 m/s

D. 45 m/s

Answer:

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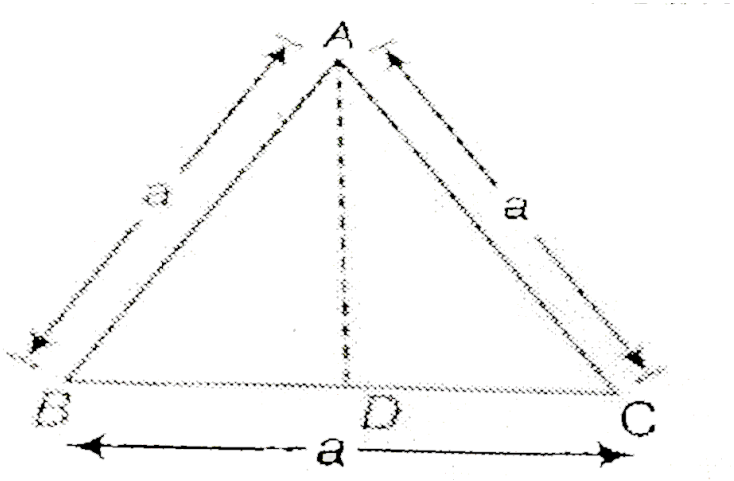
30. At the corners of an equilateral tringle of side a =1 m, three point charge are placed (each of 0.1 C). If this system is supplied energy at the

rate of 1 kW, then calculate the time required to move one of charges to the mid-point of the line joining the other two.



A. 50 h

B. 60 h

C. 48 h

D. 54 h

Answer:

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31. If Q charge is given to a sphere of radius R, the energy of the system is

A. $\frac{Q^2}{8\pi\varepsilon_0 R}$

B. $\frac{Q}{4\pi\varepsilon_0 R}$

C. $\frac{Q^2}{15\pi\varepsilon_0 R}$

D. None of these

Answer:

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32. Two balls with charges $5\mu C$ and $10\mu C$ are at a distance between them to 0.5 m, the amount of work to be performed is

A. 45 J

B. $0.45 \times 10^{-6} J$

C. $1.2 \times 10^{-4} J$

D. 0.45 J

Answer:

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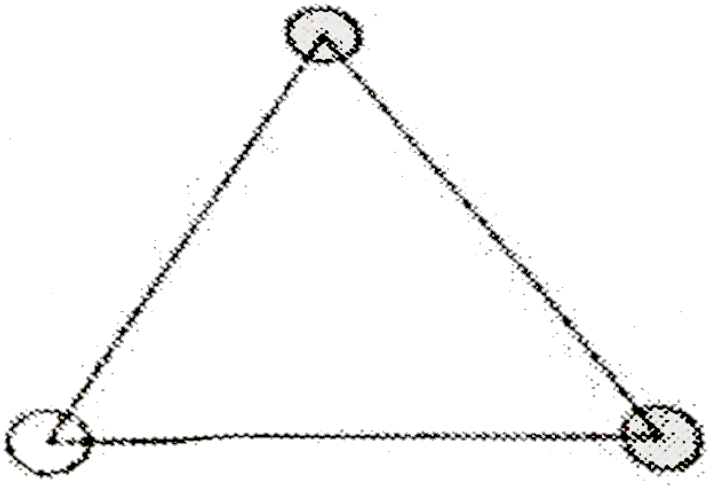
33. Three small conducting spheres each of radius a and charge q is placed at the corners of an equilateral triangle of side lenth /. The side lenth / is considerably larger than dimensions of the spheres. Find the electrical potential energy of system.



A. $\frac{3q^2}{4\pi\varepsilon_0}\left(\frac{1}{2a}+\frac{1}{/}\right)$

B. `(3q^(2))/(4piepsi_(0)l)

C. $\frac{3q^2}{8\pi\varepsilon_0 a}$

D. None of these

Answer:

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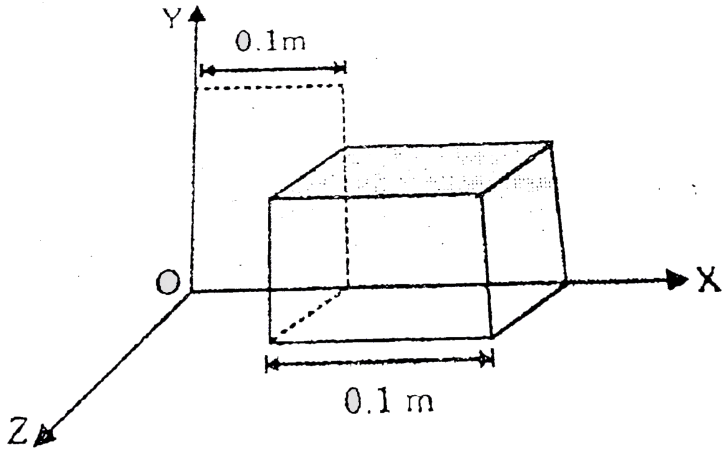
34. Due to a charge inside a cube the electric field is $E_x = 600x^{1/2}, E_y = 0, E_z = 0.$ The charge inside the cube is (approximately):



A. $600\mu C$

B. $60\mu C$

C. $7 \times 10^{-6} \mu C$

D. $6 \mu C$

Answer:

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35. What is the wlwctric field intensity at point at a distance 20 cm on line making an angle of 45° with the axis of the dipole of moment 10C-m?

A. 1.77×10^{13} V/m

B. 0.177×10^{13} V/m

C. 17.7×10^{13} V/m

D. 177×10^{13} V/m

Answer:

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36. What is the electric potential at a point distance 100 cm from the centre of an electric dipole of moment $2 \times 10^{-4} C - m$ on a line laking an angle of 60° ?

A. $7 \times 10^5 V$

B. $8 \times 10^5 V$

C. $9 \times 10^5 V$

D. $10 \times 10^5 V$

Answer:

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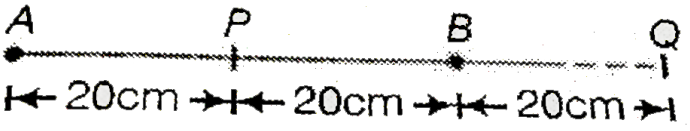
37. Two point charge $q_1 = -10 \times 10^{-6} C$ and $q_2 = 15 \times 10^{-6}$ are 40 cm apart as shown in figure. Find the potential difference between the



point P and Q.

A. -945×10^3 V

B. -1000×10^3 V

C. -880×10^3 V

D. None of these

Answer:

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38. An electric dipole made up of a positive and negative charge, each of 1 mC and placed at a distance 2 cm apart . If the dipole is placed in an electric field of 10^5N/C, then calculate the minimum torque which the field can exert can exert on the dipole , if it is turn from a positive $\theta = 0^\circ$ to $\theta = 180^\circ$.

A. 2×10^{-3} N-m

B. 3×10^{-3} N-m

C. 4×10^{-3} N-m

D. 2.8×10^{-3} N-m

Answer:

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39. What work must be done to rotate an electricdipole thurgh an angle θ with the electric field, if an electric dipole of moment P is placed in an uniform electric field E with P parallel to E ?

A. $W = pE(1 - \cos\theta)$

B. $W = pE(1 + \cos\theta)$

C. $W = 2pE(1 - \cos\theta)$

D. None of these

Answer:

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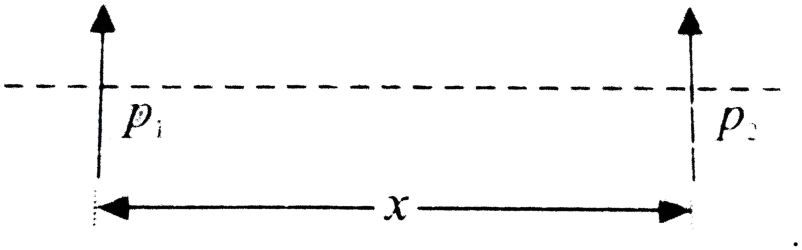
40. (Figure 3.118) shows two dipole moments parallel to each other and placed at a distance x apart. What is the magnitude of force of interaction ? What is the nature of force, attractive or repulsive ?



A. $\frac{3p_1p_2}{4\pi\varepsilon_0 X^4}$

B. $\frac{p_1p_2}{4\pi\varepsilon_0 X^4}$

C. $\frac{p_1p_2}{4\pi\varepsilon_0 X^4}$

D. $\frac{p_1p_2}{3\pi\varepsilon_0 X^4}$

Answer:

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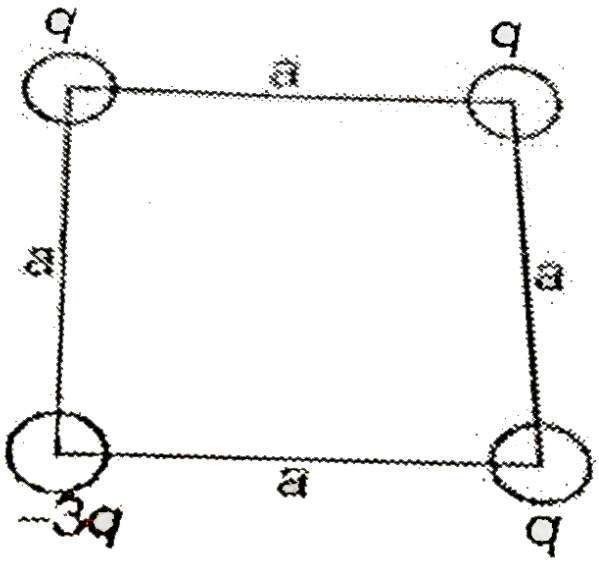
41. Electric dipole mament of combination shown in the figure is



A. $qa + qa\sqrt{2} + qa$

B. $2\sqrt{2}qa$

C. $\sqrt{2}qa$

D. $\left(\sqrt{2}+1\right)qa$

Answer:

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Bitstat Archives

1. The electric field in a region is given by $\vec{E} = \left(\frac{A}{x^3}\right)\vec{I}$. Write a suitable SI unit for A. Write an experssion for. the potential in the region assuming the potential at. infinity to be zero.

A. $\frac{M}{2x^2}$

B. Mx^2

C. $\frac{M}{3x^4}$

D. None

Answer:

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2. A charge (-q)and anther charge (+Q) are kept at two point A and B respectively, keeping the charge (+Q) fixed at B, the charge (-q)at A is

moved to another points C,such that ABC forms an equilateral triangle of side l. The net work done in moving the charge(-q) is

A. $\frac{1}{4\pi\varepsilon_0}\frac{Qq}{l}$

B. $\frac{1}{4\pi\varepsilon_0}\frac{Qq}{l^2}$

C. $\frac{1}{4\pi\varepsilon_0}Qql$

D. zero

Answer:

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3. Two charge +aq and -q are kept apart. Then , at any point on the right bisector of line joining the two charge

A. the electric field strength is zero

B. the electric potential is Zero

C. both electric potential and electric field strength are zero

D. None of these

Answer:

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4. The work done in carrying a charge q once round a circle of radius r with a charge Q at the centre is

A. $\frac{qQ}{4\pi\varepsilon_0 r}$

B. $\frac{qQ}{4\pi\varepsilon_0^2 r}$

C. $\frac{qQ}{4\pi\varepsilon_0 r^2}$

D. none of the above

Answer:

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