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PHYSICS

ALLEN

TEST PAPER 3

Physics

1. Find the ratio of de Broglie wavelength of a proton and as α-particle which have been

accelerated through same potential difference.

A. 2

B. $2\sqrt{2}$

C. $\frac{1}{2\sqrt{2}}$

D. $\sqrt{2}$

Answer: B

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2. The ratio of de Broglie wavelengths of a proton and a neutron moving with the same velocity is nearly-

A. 1

B. $\sqrt{2}$

C. $\frac{1}{\sqrt{2}}$

D. none of the above

Answer: A

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3. In a TV tube the electron are accelerated by a potential difference of 10 kV. Then, their deBroglie wavelength is nearly-

A. 1.2Å

B. 0.12Å

C. 12Å

D. 0.01Å

Answer: D

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4. The group velocity of the de Broglie wave packet associated with a particle moving with velocity v is-

A. equal to v

B. less than v

C. greater than v

D. equal to speed of light

Answer: D

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5. If kinetic energy of an electron is increases by 69% then what is the percentage in its de-broglie wavelength :-

A. Decreases by 23.07%

B. Decreases by 15%

C. Increases by 40%

D. Decreases by 70%

Answer: A

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6. An α-particle moves in a circular path of radius 0.83 cm in the presence of a magnetic field of $0.25 Wb/m^2$. The de-Broglie wavelength associated with the particle will be

A. $10Å$

B. $1Å$

C. $0.1Å$

D. $0.01Å$

Answer: B

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7. A redioctive nucleus decays as follows :

$$X \xrightarrow{\alpha} X_1 \xrightarrow{\beta} X_2 \xrightarrow{\alpha} X_3 \xrightarrow{\alpha} X_4$$

If the atomic number and the mass number of X are 72 and 180 then the mass number and atomic number of X_4 are-

A. $172, 70$

B. $171, 69$

C. $172, 69$

D. $172, 68$

Answer: B

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8. If the atomic number and the mass number of X are 72 and 180 then the mass number and atomic number of X4 are-

A. 0.375 gm

B. 0.6 gm

C. 0.9 gm

D. 1 gm

Answer: A

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9. If 20 gm of a radioactive substance due to radioactive decay reduces to 10 gm in 4 minutes, then in what time 80 gm of the same substance will reduce to 10 gm-

A. 8 minutes

B. 12 minutes

C. 16 minutes

D. 20 minutes

Answer: b

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10. A radioactive nucleus X converts into nucleus Y by emitting B^+. If atomic masses of X and Y are M_X and M_Y then Q value of reaction will be :-

A. $Q = M_x C^2$

B. $Q = (M_X - M_Y - M_e)C^2$

C. $Q = (M_X - M_Y)C^2$

D. $Q = (M_X - M_Y - 2m_e)C^2$

Answer: A

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11. In the given radioactive disintegration series

$$\cdot{}^{235}_{92}U \rightarrow {}^{207}_{82}Pb$$

Calculate difference between number of α and number of β particles emitted in this series.

A. $6\alpha, 5\beta^-$

B. $7\alpha, 4\beta^-$

C. $7\alpha, 6\beta^-$

D. $4\alpha, 3\beta^-$

Answer: B

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12. The initial count rate for a radioactive source was found to be 1600 count/sec.and t = 8 sec this rate was 100 count/sec. What was the count rate at t = 6 [in counts/sec]-

A. 4000

B. 300

C. 200

D. 150

Answer: C

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13. 1 gram of a radioactive element reduces to $\frac{1}{3}$ gram at the end of 2 days. Then the mass of the element remaining at the end of 6 days is- [gram]

A. $\frac{1}{12}$

B. $\frac{1}{27}$

C. $\frac{1}{6}$

D. $\frac{1}{9}$

Answer: C

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14. The radius of the nucleus of ${}_8O^{16}$ is $3x \times 10^{-15}$ m. Its density in kg/m^3 will be about-

A. 2.35×10^{-17}

B. 2.35×10^{14}

C. 10^{14}

D. 2.35×10^{17}

Answer: D

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15. The ratio of the radii of the nuclei $._{13} Al^{27}$ and $._{52} Te^{125}$ is approximately

A. $3:5$

B. $13:52$

C. $40:177$

D. $14:73$

Answer: B

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16. 200 MeV of energy may be obtained per fission of U^{235}. A reactor is generating 100 kW of pwer. The rate of nuclear fission in the reaction is

A. 1000

B. 2×10^8

C. 3.125×10^{16}

D. 931

Answer: B

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17. The binding energy per nucleon of $.^{16}O$ is $7.97\ \mathrm{MeV}$ and that of $.^{17}O$ is $7.75\ \mathrm{MeV}$. What is the energy in MeV required to remove a neutron from $.^{17}O$?

A. 3.52

B. 3.64

C. 4.23

D. 7.8

Answer: A

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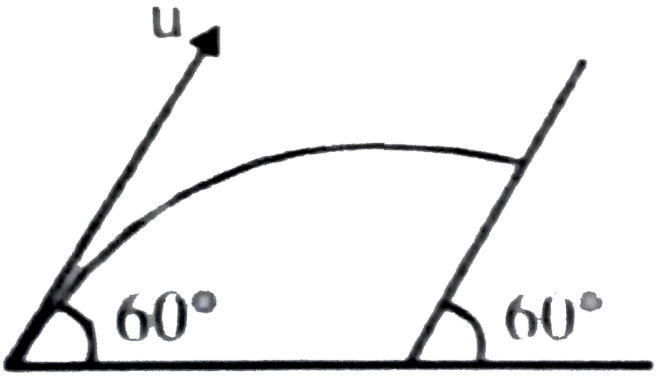
18. A particle is projected at an angle 60° from Horizon from ground with speed u. after some time it collides with a wall inclined at an angle 30° from horizon. At the time of collision

velocity of particle is perpendicular to the wall.

Find speed of the particle at the time of collision :-



A. u

B. $\frac{u}{\sqrt{3}}$

C. $\frac{2u}{\sqrt{3}}$

D. $2u$

Answer: B

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19. Find the angle of projection of a projectile for which the horizontal range and maximum height are equal.

A. 45°

B. $\theta = \tan^{-1}(0.25)$

C. $\theta = \tan^{-1}(4)$

D. 60°

Answer: C

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20. A particle is projected from ground with velocity $3\hat{i} + 4\hat{j}$ m/s. Find range of the projectile :-

A. $1.2m$

B. $3.6m$

C. $2.4m$

D. $10m$

Answer: D

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21. Two particles are projected with speeds u_1 and u_2 in mutually opposite directions from top of a tower horizontally. Find the time after which their velocity becomes perpendicular to each other.

A. $t = \frac{\sqrt{u_1 u_2}}{g}$

B. $t = \frac{u_1 u_2}{g}$

C. $t = \frac{u_1 g}{u_2}$

D.

Answer: A

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22. An aeroplane flying 490 m above the ground level at 100 m/s, releases a block. How far on the ground will it strike-

A. $0.1km$

B. $1km$

C. $2km$

D. none of the above

Answer: B

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23. When a negatively charged rod is brought near the cap of a gold leaf electroscope whese case is earthed then

(1) Leaves will have induced positive charge

(2) Positive charge is induced on one leat and negative on the other

(3) No charge is induced on the leaves

(4) The leaf has an induced negative charge

A. no charge is induced in the leaves

B. positive charge is induced in both the leaves

C. negative charge is induced in both the leaves

D. positive charge is induced in one leaf and negative in the other

Answer: C

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24. When a soap bubble is charged it

A. it contracts

B. it expands

C. It does not undergo any change

D. it bursts

Answer: B

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25. A charge q_1 exerts some force on a second charge q_2 If a third charge q_3 is brought near q_2, then the force exerted by q_1 on q_2

A. will increase

B. will decrease

C. will remain unchanged

D. will increase if Q_3 is of the same sign as Q_1 and will decrease if Q_3 is of opposite

sign

Answer: C

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26. Two particles A and B, each having a charge Q are placed a distance d apart, Where should a particle of charge q be placed on the perpendicular bisector of AB so that it experiences maximum force? What is the magnitude of this maximum force?

A. $x = d/\sqrt{2}$

B. $x = d/2$

C. $x = \frac{d}{2\sqrt{2}}$

D. $x = d/3\sqrt{2}$

Answer: C

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27. An infinite number of charges, each of magnitude q, are placed along x-axis at x = 1m, 2m, 4m, 8m, 16m and so on but the

consecutive charges are of opposite sign starting with +q at x = 1m. A point charge q_0 , kept at the origin, experiences a force of magnitude :

A. $\frac{qq_0}{4\pi\varepsilon_0}$

B. $\frac{qq_0}{5\pi\varepsilon_0}$

C. $\frac{qq_0}{3\pi\varepsilon_0}$

D. $\frac{qq_0}{2\pi\varepsilon_0}$

Answer: B

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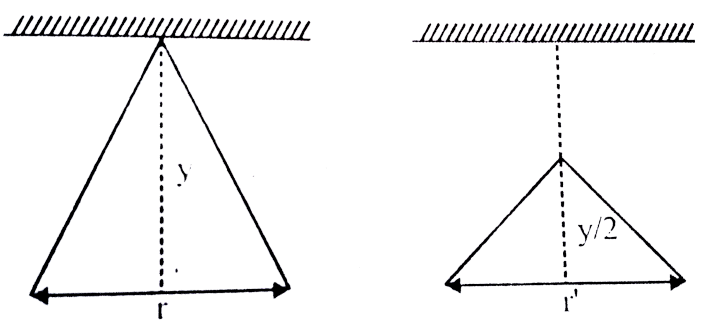
28. Two pitch balls carrying equal charges are suspended from a common point by strings of equal length, the equilibrium separation between them is r. Now the strings are rigidly clamped at half the height. The equilibrium separation between the balls now become



A. $\left(\frac{2r}{3}\right)$

B. $\left(\frac{r}{\sqrt{2}}\right)^2$

C. $\left(\frac{r}{\sqrt[3]{2}}\right)$

D. $\left(\frac{2r}{\sqrt{3}}\right)$

Answer: C

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29. Two very small spheres A and B are charged with $+10$ and $+20$ coulomb respecitvely and separated by a distance of 80 cm.The electric

field at point on the line joining the centres of the two spheres will be zero at almost how much distance from A ?

A. $20cm$

B. $33cm$

C. $45cm$

D. $60cm$

Answer: B

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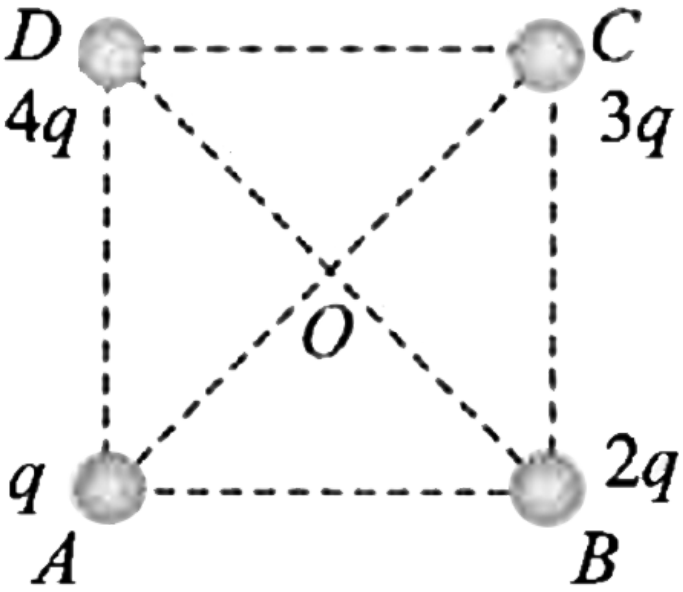
30. Charges q, 2q, 3q and 4q are placed at the corners A, B, C and D of a square as shown in the following figure. The direction of electric field at the centre of the square is along



A. CB

B. AB

C. BD

D. CD

Answer: D

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31. A charged oil drop is suspended in uniform field of $3 \times 10^4 Vm^{-1}$ so that it neither falls nor rises. The charge on the drop will be ... (mass of the charge =9.9×10^{-15} kg

A. $3.2 \times 10^{-19} C$

B. $3.2 \times 10^{-18} C$

C. $1.6 \times 10^{-18} C$

D. $4.8 \times 10^{-18} C$

Answer: A

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32. The electric field at a distance $\frac{3R}{2}$ from the centre of a charged conducting spherical

shell of radius R is E. The electric field at a distance $\frac{R}{2}$ from the centre of the sphere is -

A. E

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

C. $\frac{E}{2}$

D. Zero

Answer: D

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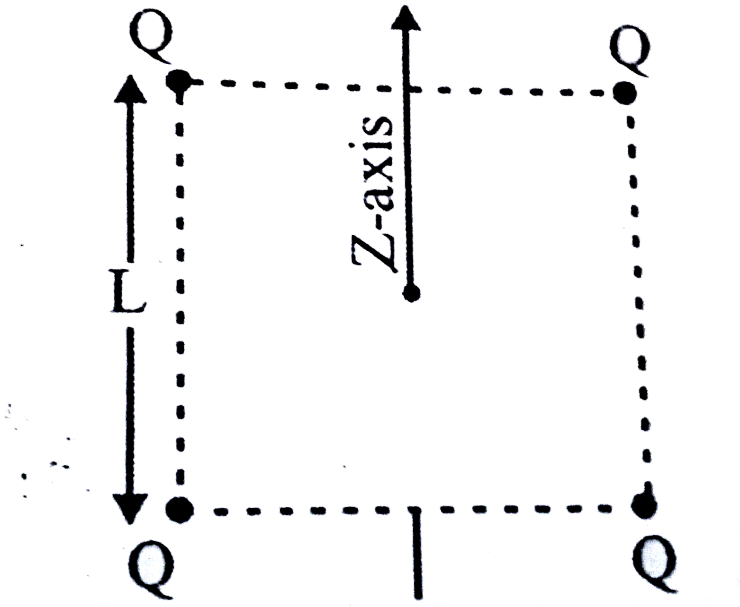
33. Four point +ve charges of same magnitude (Q) are placed at four corners of a rigid square frame as shown in fig.The plane of the frame is perpendicular to Z-axis. If a –ve point charge is placed at a distance z away from the above frame then :



A. –ve charge oscillates along the Z-axis

B. it moves away from the frame

C. it moves slowly towards the frame and stays in the plane of the frame

D. It passes through the frame only one

Answer: A

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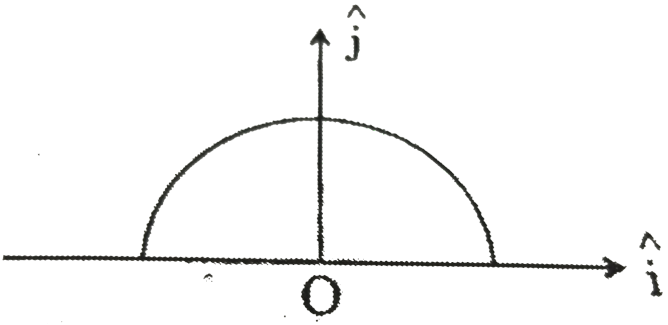
34. A thin semi-circular ring of radius r has a positive charge q distributed uniformly over it. The net field $\overrightarrow{E}$ at the centre O is



A. $\frac{q}{2\pi^2\varepsilon_0 r^2}\hat{j}$

B. $\frac{q}{4\pi^2\varepsilon_0 r^2}\hat{j}$

C. $-\frac{q}{4\pi^2\varepsilon_0 r^2}\hat{j}$

D. $-\frac{q}{4\pi^2\varepsilon_0 r^2}\hat{j}$

Answer: A

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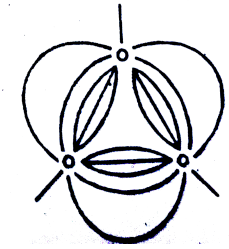
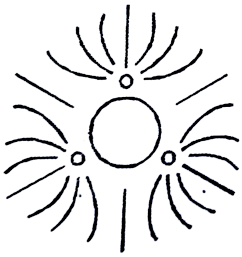
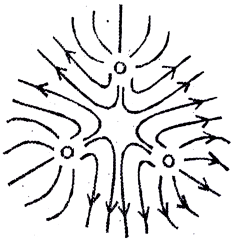
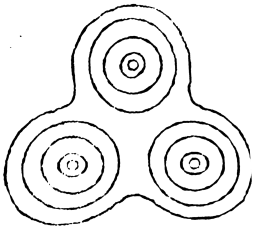
35. Three positive charges of equal value q are placed at the vertices of an equilateral triangle. The resulting lines of force should be sketched as in

A. 

B. 

C. 

D. 

Answer: B

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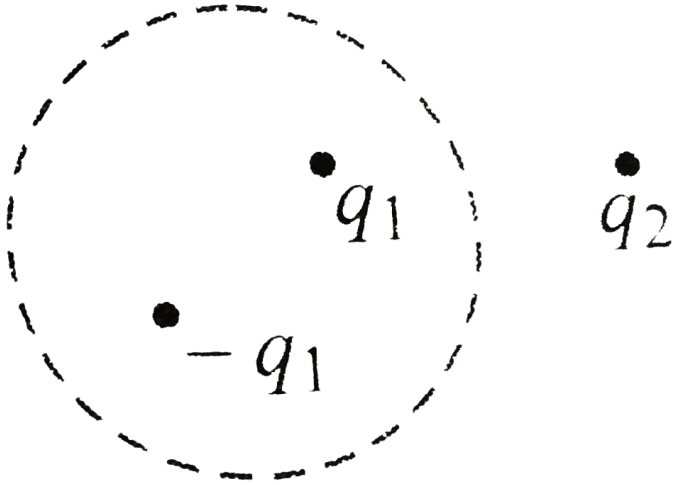
36. A Gaussian surface in figure is shown by dotted line. The electric field on the surface will be



A. due to q_1 and q_2 only

B. due to q_2 only

C. zero

D. due to all the charges

Answer: C

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37. A charge Q is kept at the corner of a cube. Electric flux passing through one of the those faces not touching that charge is

A. $\frac{Q}{6\varepsilon_0}$

B. $\frac{Q}{8\varepsilon_0}$

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

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

Answer: C

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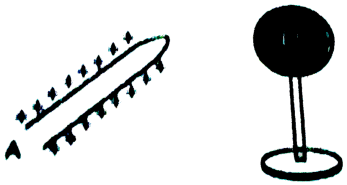
38. A positively charged body 'A' has been brought near a neutral brass sphere B mounted on a glass stand as shown in the

figure. The potential of B will be :



(B) Negative (C) Positive (D) Infinite

A. zero

B. negative

C. positive

D. infinite

Answer: C

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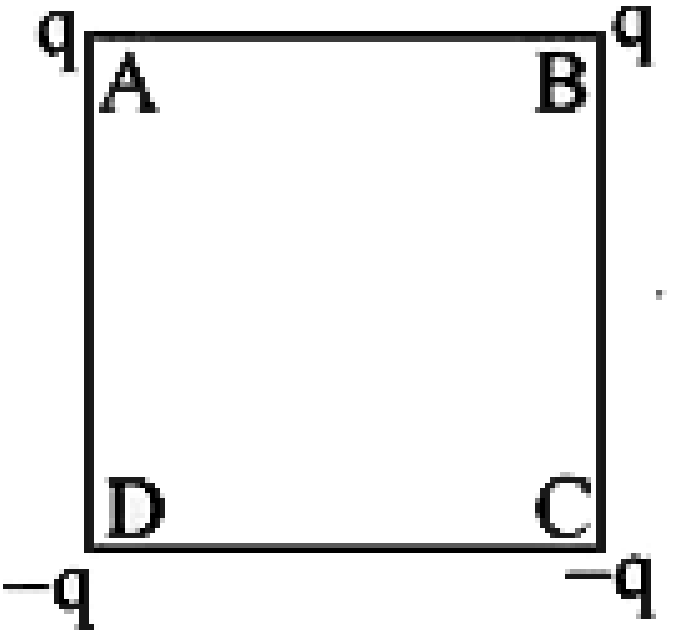
39. Charges are placed on the vertices of a square as shown in figure below. Let E be the electric field and V be the potential at the centre. If the charges on A and B are interchanged with those on D and C respectively, then :



A. $\vec{E}$ changes, V remains unchanged

B. $\vec{E}$ remains unchanged, V changes

C. Both $\vec{E}$ and changes

D. $\vec{E}$ and V remain unchanged

Answer: A

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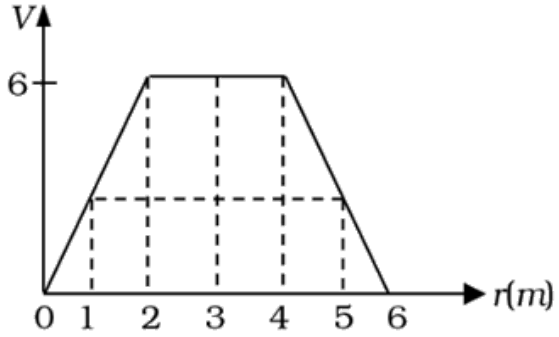
40. The variation of potential with distance r from a fixed point is shown in figure. The

electric field at r = 5m is:



A. $(2.5)V/cm$

B. $(-2.5)V/cm$

C. $(-2/5)V/cm$

D. $(2/5)V/cm$

Answer: A

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41. Three charge Q, $+q$ and $+q$ are placed at the vertices of a right angled isosceles triangle as shown. The net electrostatic energy of the configuration is zero, if Q is equal to

A. $\frac{-q}{1+\sqrt{2}}$

B. $\frac{-\sqrt{2}q}{1+\sqrt{2}}$

C. $-2q$

D. $+q$

Answer: C

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