PHYSICS

AAKASH INSTITUTE ENGLISH

Mock Test 25: PHYSICS

Example

1. Three charges 2 μC , -4 μC and 8 μC are places at the three vertices of an equilateral

triangle of side 10 cm. The potential at the centre of triangle is

A. 14×10^4 J/C

B. 9×10^4 J/C

C. 54×10^4 J/C

D. $54\sqrt{3} \times 10^4$ J/C

Answer: D

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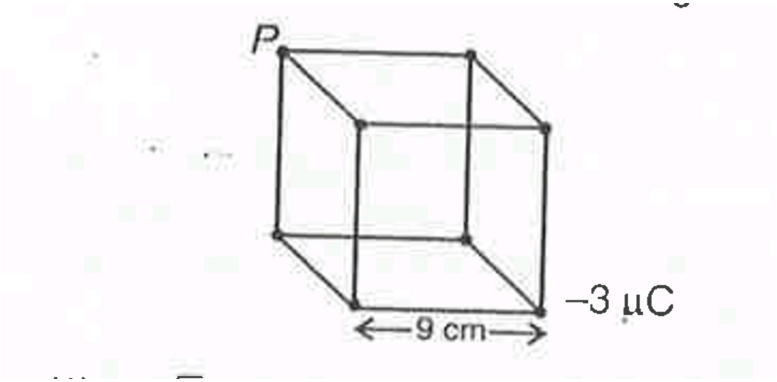
2. A charge -3 μC is placed at one corner of cube of side 9 cm . The potential at a point P which diagonally opposite as shown in fugure is



A. $-\sqrt{3} \times 10^5$ J/C

B. $2\sqrt{3} \times 10^4$ J/C

C. $-9\sqrt{3} \times 10^5$ J/C

D. $4\sqrt{3} \times 10^4$ J/C

Answer: A

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3. Two charges -4 μC and 8 μC are 27 cm apart. The distance from the first charge on line of joining between two charges where electric potential would be zero is

A. 10 cm

B. 9 cm

C. 20 cm

D. 21 cm

Answer: B

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4. An electric field $\overrightarrow{E} = 20y\hat{j}$ exist in space . The potential at (5 m, 5 m) is taken to be zero. The potential at origin is

A. 500 V

B. 250 V

C. 125 V

D. Zero

Answer: B

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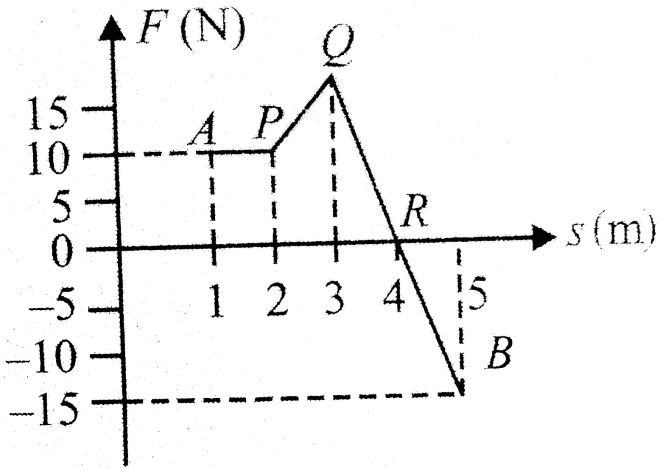
5. A body moves from point A to B under the action of a force, varying in magnitude as shown in figure. Obtain the work done. Force is expressed in newton and displacement in

meter.



A. 1×10^5 J

B. 3×10^5 J

C. 9×10^5 J

D. 12×10^5 J

Answer: C

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6. Potential of electric ield vector is given by V= 9 $\left(x^3 - y^3\right)$, (where , xand y are cartesian Co-ordinates). The electric field strenth vector is

A. $-27x^2\hat{i} + 27y^2\hat{j}$

B. $27x\hat{i} + 27y\hat{j}$

C. $27x^2y\hat{i} + 27xy^2\hat{j}$

D. $-27xy\hat{i} + 27xy\hat{j}$

Answer: A

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7. In the figure given below , the zero potential is taken at infinity. The work done in moving a unit charge from A to B is , Where $V_Arightarrow$ potential at point A, $V_Brightarrow$ potential at point B 

A. $V_B - V_A$

B. $V_B + V_A$

C. Zero

D. infinity

Answer: A

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8. The electric field strenth vector is given by E=$2.5x\hat{I} + 1.5y\hat{}$.The potential at point (2,2,1) is (considering potential at origin to be zero)

A. -2 V

B. -4 V

C. -6 V

D. -8 V

Answer: D

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9. Two point charges $4\mu C$ and $-2\mu C$ are separated by a distance of 1m in air. Calculate at what point on the line joining the two charges is the electric potential zero ?

A. $9a \times 10^{-3}$ V

B. $a \times 10^{-3}$ V

C. $3a \times 10^{-9}$ V

D. $3a \times 10^{-3}$ V

Answer: A

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10. Two electric dipoles are placed parallel to each other as shown in figure. The potential at apoint P is 

A. $K\frac{2q}{(r_1)^2}$

B. $K\frac{5q}{(r_1)^2+(r_1)^2}$

C. $K\frac{3q}{(r_2)^2}$

D. Zero

Answer: D

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11. The potential due to a short electric field dipole moment2×10^{-6} C-m along its axis

point 4 m from dipole is

A. $\left(\frac{9}{8}\right) \times 10^{3}$ V

B. $\left(\frac{9}{8}\right) \times 10^{-3}$ V

C. $\left(\frac{8}{9}\right) \times 10^{2}$ V

D. Zero

Answer: A

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12. Six charges , $q_1 = +1\ \mu$C , $q_2 = +3\ \mu$C , $q_3 = +4\ \mu$C , $q_4 = -2\ \mu$C , $q_5 = -3\ \mu$C and $q_6 = -3\ \mu$C are placed on a sphee of radius 10 cm. The potential at centre of sphere is

A. 27×10^5 V

B. Zero

C. 2.7×10^5 V

D. $0.27 \times 10^5 V$

Answer: B

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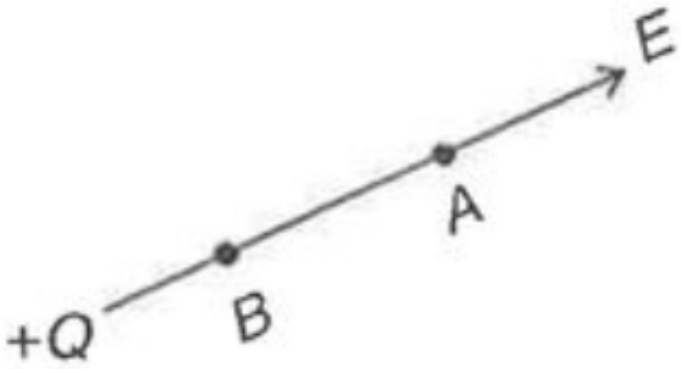
13. A test charge q is taken from point A to B in electrostatic field of other charge Q as shown in figure. The reletion between potetial energy and potential (between points A and B) is



A. $(P.E)_AB = V_A - V_B$

B. $(P.E)_AB = -(V_A - V_B)q$

C. $(P.E)_AB = (V_A + V_B)q$

D. Information given is insufficient

Answer: B

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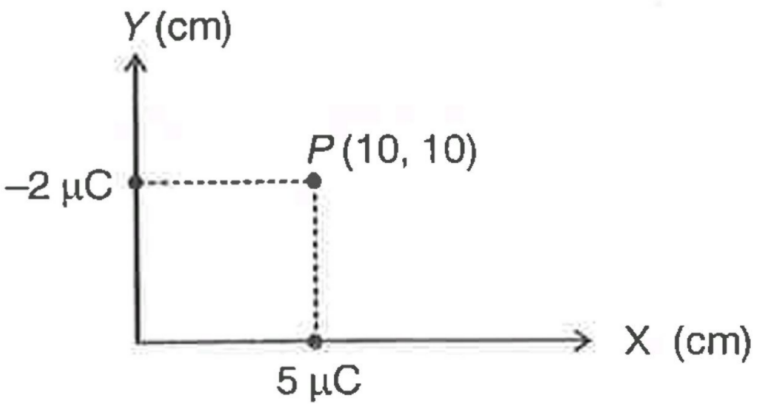
14. Two charges are placed s shown in figure below. The potential at point P is



A. 27×10^4 V

B. 2.7×10^4 V

C. 0.27×10^4V

D. Zero

Answer: B

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15. Two Charges 5 μC and 20 μC are placed on two concentric circes of radius 10 cm and 20 cm respectively lying in x-y plane . The potential at centre is

A. 1.35×10^4 V

B. 13.5×10^4 V

C. 135×10^4V

D. Zero

Answer: C

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16. Three charges $2q, -q, -q$ are located at the vertices of an equilateral triangle. At the centre of the triangle,

A. The field is zero but potential is non-zero

B. The field is non-zero but potential is zero

C. Both field and potential are zero

D. Both field and potential are non-zero

Answer: B

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17. Three concentric spherical shells have radii a, b and $c(a < b < c)$ and have surface charge densities $\sigma, -sigam$ and σ respectively. If V_A, V_B and V_C denote the potentials of the three shells, then for $c = a + b$, we have

A. $V_C = V_A \neq V_B$

B. $V_C = V_B \neq V_A$

C. $V_C \neq V_B \neq V_A$

D. $V_C = V_B = V_A$

Answer: A

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18. Two charges +6 'mu'C and -6 'mu'C are placed 15 cm apart as shown . At what distance from A to its right, the electrostatic potential is zero (distance in cm) 

A. 4,9,60

B. 9,45,infinity

C. 20,45,infinity

D. 9,15,45

Answer: B

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19. The electric potential at a point (x,y,z) is given by $V = -x^2y - xz^3 + 4$ The electric field E at that points is

A. $\vec{E} = (2xy + z^3)\hat{i} + x^2\hat{j} + 3xz^2\hat{k}$

B. $\vec{E} = 2xy\hat{i} + (x^2 + y^2)\hat{j} + (3xz - y^2)\hat{k}$

C. $\vec{E} = z^3\hat{i} + xyz\hat{j} + 3^2\hat{k}$

D. vec E= (2xy-z^3)hat i+xy^2 hat j+3z^2 x hat k'

Answer: A

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20. The electric field in a certain region is given by $E = 5\hat{i} - 3\hat{j}kv/m.$ The potential difference $V_B - V_A$ between points a and B having coordinates (4, 0, 3) m and (10, 3, 0) m respectively, is equal to

A. 21 kV

B. '-21' kV

C. 39kV

D. -39 kV

Answer: B

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21. Twenty seven drops of mercury are charged simultaneously to the same potential of 10V. What will be the potential if all the charge drops are made to combine to form one large drop? Assume the drops to be spherical.

A. 90

B. 40

C. 160

D. 10

Answer: A

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22. Two charged spheres of radii R_1 and R_2 having equal surface charge density. The ratio of their potential is

A. $\frac{R_1}{R_2}$

B. $\frac{R_2}{R_1}$

C. $\left(\frac{R_1}{R_2}\right)^2$

D. $\left(\frac{R_2}{R_1}\right)^2$

Answer: A

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23. Four electric charges $+q, +q, -q$ and $-q$ are placed at the corners of a square of side $2L$. The electric potential at point A, midway between the two charges $+q$ and $+q$ is

A. Zero

B. $\left(\frac{1}{4}\pi\varepsilon_0\right)\left(2\frac{q}{L}\right)(1+\sqrt{5})$

C. $\frac{1}{4}\pi\varepsilon_0\Big)\left(2\frac{q}{L}\right)\left(1+\left(\frac{1}{\sqrt{5}}\right)\right)$

D. $\left(\frac{1}{4}\pi\varepsilon_0\right)\left(2\frac{q}{L}\right)\left(1-\left(\frac{1}{\sqrt{5}}\right)\right)$

Answer: D

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24. Equipotential surfaces associated with an electric field which is increasing in magnitude

along the x-direction are

A. Planes parallel to xz planes

B. Planes parallel to xy planes

C. Planes parallel to yz planes

D. Coaxial cylinders of increasing radii the x axis

Answer: C

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25. A regular hexagon of side a has a charge Q at each vertex. Potential at the centres of hexagon is (k= $\left(\frac{1}{4}\pi\varepsilon_0\right)$)

A. Zero

B. $k\frac{Q}{a}$

C. $12\frac{kQ}{a}$

D. $6\frac{kQ}{a}$

Answer: D

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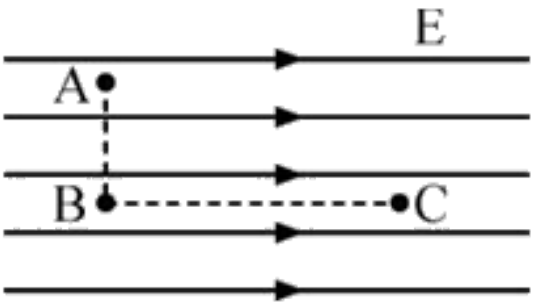
26. Figure shows three points A, B and C in a region of uniform electric field $\overrightarrow{E}$. The line AB is perpendicular and BC is parallel to the field lines. Then which of the following holds good?



where and represent the electric potential at the points A, B and C respectively

A. $V_A = V_B = V_C$

B. $V_A = V_B > V_C$

C. $V_A = V_B < V_C$

D. $V_A > V_B = V_C$

Answer: B

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27. Two thin wire rings each having radius R are placed at distance d apart with their axes coinciding. The charges on the two are $+Q$

and $-Q$. The potential difference between the centre so the two rings is

A. Zero

B. $\left(\frac{q}{4}\pi\varepsilon_0\right)\left\{\left(\frac{1}{R}\right)-\left(\frac{1}{\sqrt{R^2+d^2}}\right)\right\}$

C. $q\frac{R}{4}\pi\varepsilon_0 d^2$

D. $\left(\frac{q}{2}\pi\varepsilon_0\right)\left\{\left(\frac{1}{R}\right)-\left(\frac{1}{\sqrt{R^2+d^2}}\right)\right\}$

Answer: D

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28. The work done to move a charge along an equipotential from A to B

A. Cannot be defined as $\int_A^B \vec{E} . d\vec{I}$

B. Must be defined as $\int_A^B \vec{E} . d\vec{I}$

C. Zero

D. Can have a non zero value

Answer: C

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29. Equipotentials at a great distance from a collection of charges whose total sum is not zero are approximately.

A. Spheres

B. Planes parallel to xy planes

C. Paraboloids

D. Elipsoids

Answer: A

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30. Figure shows ome equipotential lines distributed in space. A charged object is moved from point A to point B.

A. The wor done in Fig. (i) is the greatest

B. The work done in Fig. (ii) is least

C. The work done is the sme in Fig. (i), Fig. (ii) and Fig. (iii)

D. The work done in Fig. (iii) is greater than Fig. (ii) but equal to that in Fig (i)

Answer: C

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31. When the separation between two charges is increase the electric potential energy of the charges.

A. Increases

B. Decreases

C. Remain the same

D. May increase or decrease

Answer: D

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32. Mark the correct statement :.

A. A solid conducting sphere holds more charge than a hallow conducting sphere of the same radius

B. Two equipotential surface mat intersects

C. When a conductor is earthed, charge always flows from conductor to earth

D. No work is done in taking a possitive charge from one point to another point inside a negetively charged metallic sphere

Answer: D

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33. A negetive charge is moved by an external agent in the direction of electric field. Then 

A. Possitive work is done by the electric field

B. Potential energy of the charge increases

C. Potential energy of the charge decreases

D. Both (1) and (2)

Answer: B

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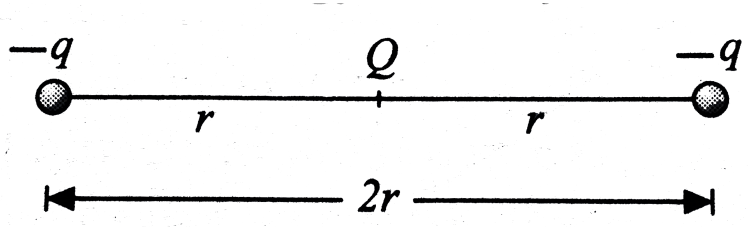
34. Charges $-q, Q,$ and $-q$ are placed at an equal distance on a straight liner. If the total potential energy of the system of three charges is zero, then find the ratio Q/q.



A. $\frac{1}{2}$

B. $\frac{1}{4}$

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

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

Answer: B

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35. An alpha particle is accelerated from rest through a potential difference of 100 volt. Its final kinetic energy is

A. 100 eV

B. 1000 eV

C. 200 eV

D. 400 eV

Answer: C

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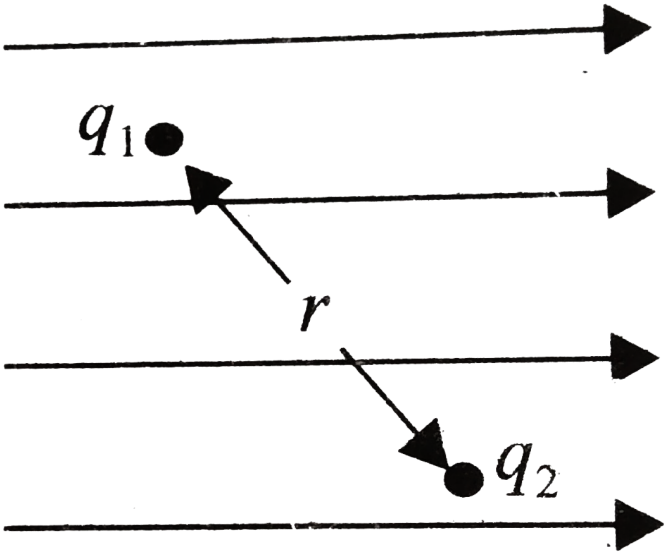
36. Two point charges q_1 and q_2 are placed in an external uniform electric field as shown in figure. The potential at the location of q_1 and q_2 are V_1 and V_2, i.e., V_1 and V_2 are potentials at location of q_1 and q_2 due to external unspecified charges only. Then electric potential energy for this configuration

of two charged particle is



A. $q_1V_1 + q_2V_2$

B. $\dfrac{q_1V_1 + q_2V_2}{2}$

C. $\left(q_1V_1 + q_2V_2 + \left(q_1\dfrac{q_2}{4}\pi\varepsilon_0 r\right)\right.$

D. $q_1\dfrac{q_2}{4}\pi\varepsilon_0 r$

Answer: C

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37. Just outside a sharp point on a conductor we will have a larger _____ than just outside gradually curving places on the conductor.

A. Electric field

B. Potential

C. Both (1) and (2)

D. None of these

Answer: A

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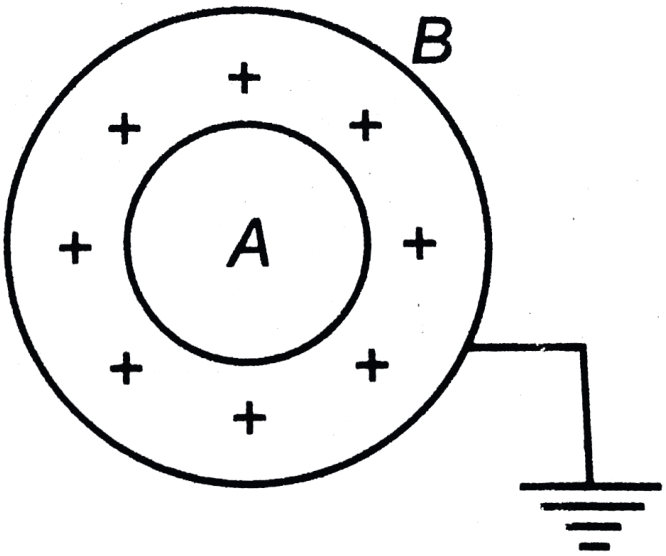
38. A and B are two concentric spherical shells.

If A is given a charge $+q$ while B is earthed as

shown in figure then



A. The charge on the outer surface of shell Q is zero

B. The charge on Q is equal and opposite to that of P

C. The field P is zero

D. All of these

Answer: D

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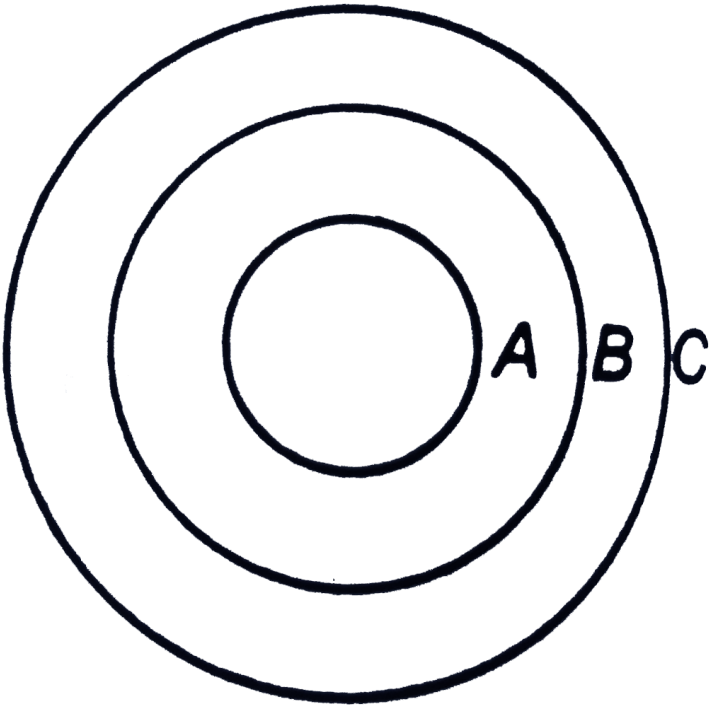
39. Charges Q, $2Q$, and $-Q$ are given to three concentric conducting sphereical shells A, B and C respectively as shown in figure. The ratio of charge on the inner and outer surface

of shell C will be



A. $3:3$

B. $2:3$

C. $3:2$

D. $2:2$

Answer: C

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40. Two parallel metallic pltes , each of tharea A are kept as shown in the figure and charges -2Q and 4Q are given to them. Edge effects are negligeble . The charges on the surface I and III are respectively 

A. $-2Q,\ +2Q$

B. $-Q,\ +3Q$

C. $+Q, +3Q$

D. $+2Q, -3Q$

Answer: C

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41. A particle of mass m and charge -q circulates around a fixed charge q in a circle radius under electrostatic force. The total energy of the system is (k= $\left(\frac{1}{4}\pi\varepsilon_0\right)$)

A. $-\frac{Kq^2}{2r}$

B. $\frac{Kq^2}{r}$

C. $-\frac{Kq^2}{r}$

D. Zero

Answer: A

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42. The work in rotating electric dipole of dipole moment p in an electric field E through

an angle θ from the direction of electric field, is:

A. $-PE\cos\theta$

B. $PE\cos\theta$

C. $PE(1-\cos\theta)$

D. $-PE(1+\cos\theta)$

Answer: C

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43. A solid conducting sphere of radius 10 cm is enclosed by a thin metallic shell of radius 20 cm. A charge $q = 20\mu C$ is given to the inner sphere. Find the heat generated in the process, the inner sphere is connected to the shell by a conducting wire.

A. 12 J

B. 9 J

C. 24 J

D. Zero

Answer: B

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44. Two particles X and Y, of equal masses and with unequal positive charges, are free to move and are initially far away from each other. With Y at rest, X begins to move towards it with initial velocity u. After a long time, finally:

A. If Y is fixed , bith P and E are conserved

B. If Y is fixed, E is conserved nut p is not conserved

C. If both are free to move , P is conserved but E is not conserved

D. If both are free , E is conserved , but P is not conserved

Answer: B

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45. For the situation in figure mark the correct statement 

A. Potential of the conductor is $\frac{q}{4\pi\varepsilon_0 d}$

B. Potential of the conductor is $\frac{q}{4\pi\varepsilon_0(d+R)}$

C. Potential at point B due to the induced charges is '-qR/(4piepsilon_0 (d+R))'

D. Both (2) and (3)

Answer: D

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46. The capacity of parallel plate capacitor depends on

A. The speration between the plates

B. The potential applied across the plates

C. The amount of charge

D. Both (2) and (3)

Answer: A

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47. A parallel plate capacitor (without dielectric) is charged by a battery and kept connected to the battery. A dielectric salb of dielectric constant $'k'$ is inserted between the plates fully occupying the space between the plates. The energy density of electric field between the plates will:

A. Increase K^2 times

B. Decreases K^2 times

C. Increase K times

D. Decrease K times

Answer: C

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48. A capacitor of capacitance C is charged to a potential V. The flux of the electric field through a closed surface enclosing the capacitor is

A. $C\frac{V}{\varepsilon_0}$

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

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

D. Zero

Answer: D

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49. 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 will be

A. $n:1$

B. $n^{\frac{1}{3}}:1$

C. $n^{\frac{5}{3}}:1$

D. $n^2:1$

Answer: C

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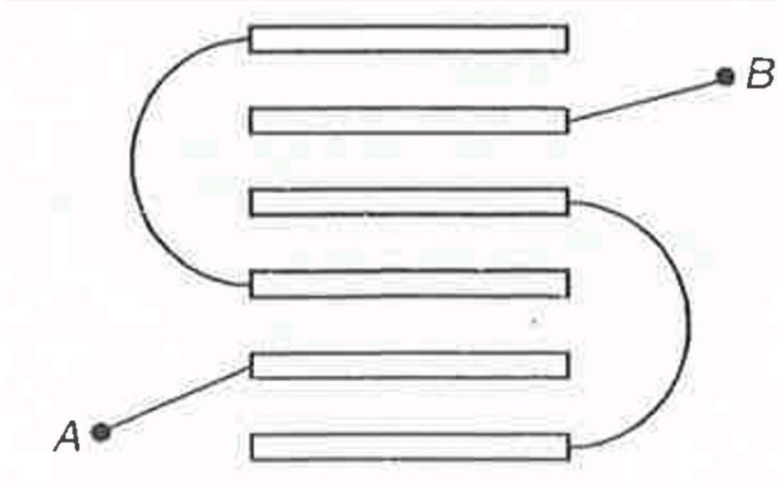
50. Plates of area A are arranged as shown. The distance between each plate is d , the net

capacitance is



A. $\frac{\varepsilon_0 A}{2} d$

B. $\frac{5\varepsilon_0 A}{2} d$

C. $\frac{6\varepsilon_0 A}{2} d$

D. $\frac{\varepsilon_0 A}{d}$

Answer: D

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51. The' distance between the plates of a parallel plate capacitor is d. A metal plate of thickness $d/2$ is placed between the plates. What will e its effect on the capacitance.

A. Remain sme

B. become double

C. become half

D. become one forth

Answer: B

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52. If dielectric constant and dielectric strength be denoted by K and X respectively, then a material suitable for use as a dielectric in a capacitor must have

A. Low K and low k

B. Low K and high k

C. High K and low k

D. High K and High k

Answer: D

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53. Which of the following methods will reduce the capacitance of a parallel plate capacitor ?

A. Converting another capacitor in series with this

B. Reducing the potential difference between the plates

C. Introducing a dielectric slab between the plates

D. Introducing a metal pltes of suitable thickness

Answer: A

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54. A slab of copper of thickness y is inserted between the plates of parallel plate capacitor as shown in figure. The separation between the plates is d. If $y = \frac{d}{4}$, then the ratio of capacitance of the capacitor after nd before inserting the slab is

A. $\sqrt{2}:1$

B. $4:3$

C. $1:1$

D. $4:2$

Answer: B

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55. A parallel plate capacitor is filled with a uniform dielectric , maximum charge that can be given to it does not depends upon

A. Dielectric constant of the dielectric

B. Dielectric strenth of the dielectric

C. Separtion between the plates

D. Area of the plates

Answer: C

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56. Two spherical conductor A and B of radii a and b ($b > a$) are placed concentrically in air. The two are connected by a copper wire as shown in figure. The equivalent capacitance of the system is 

A. $\frac{4\pi\varepsilon_0 ab}{b-a}$

B. $4\pi\varepsilon_0(a+b)$

C. $4\pi\varepsilon_0 b$

D. $4\pi\varepsilon_0 a$

Answer: C

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57. The capacity of an isolated sphere is increased n times when it is enclosed by an earthed concentric sphere. The ratio of their radii is

A. $\frac{n^2}{n-1}$

B. $'\frac{n}{n-1}$

C. $2\frac{n}{n+1}$

D. $\frac{2n+1}{n+1}$

Answer: B

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58. The capacitance of capacitor of plate areas A_1 and A_2 $(A_1 < A_2$ at a distance d is

A. $\frac{\varepsilon_0 A_1}{d}$

B. $\frac{\varepsilon_0 A_2}{d}$

C. $\left(\varepsilon_0 \frac{A_1 + A_2}{d}\right.$

D. $\left(\varepsilon_0 \frac{\sqrt{A_1 A_2}}{d}\right.$

Answer: A

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59. Consider the following four arrangement of spherical shell of radius a and b (a<. Then

which of the following holds good for the value of their capacitances?

A. $C_3 > C_2 > C_1 = C_4$

B. $C_3 > C_1 = C_4 > C_2$

C. $C_2 > C_3 > C_1 > C_4$

D. $C_2 > C_1 = C_4 > C_3$

Answer: B

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