Question 619

A point charge Q, at the center of a circle, is surrounded by six charges each of magnitude q at a distance r as shown in figure 4. How much work is done by an external agent to remove the charge Q from the center to infinity? [Consider the electrostatic potential at infinity = 0]
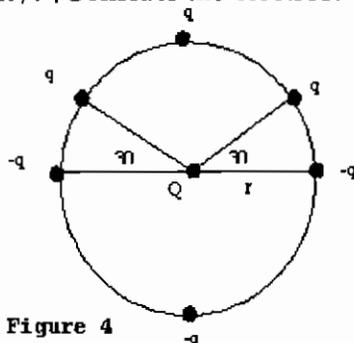

Figure 4

(a)   zero.
(b)   k*6*q/r**2.
(c)   k*3*Q*q/r.
(d)   k*6*Q*q/r**2.
(e)   k*6*q/r.

Question 620

Two protons, P, are fixed 6.0 m apart, as shown in figure 7. An electron, e, is released from point A. Find its speed at point O, midway between the protons.
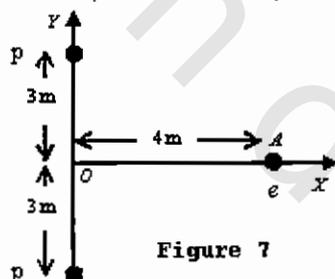

Figure 7

(a)   0.1 m/s.
(b)   24.0 m/s.
(c)   2.4 m/s.
(d)   11.6 m/s.
(e)   121 m/s.

25-11   Potential of a Charged Isolated conductor

Question 621

Two conducting spheres are very far apart. The smaller sphere carries a total charge of 6 micro-C. The larger sphere has a radius twice that of the smaller sphere and is neutral (Q = 0). After the two spheres are connected by a thin conducting wire, the charges on the smaller and the larger spheres, respectively are:

(a)   -4 micro-C and 10 micro-C
(b)   0   and 6 micro-C
(c)   2 micro-C and 4 micro-C
(d)   -6 micro-C and 12 micro-C
(e)   3 micro-C and 3 micro-C

Question 622
Consider two concentric (thin and conducting) spherical shells. The inner has a radius a = 15 cm and a charge of 10 nano-C. The outer shell has a radius b = 30 cm and a charge of -15 nano-C. Find the electric potential on the surface of the inner shell.
(a)   200 V
(b)   110 V
(c)   300 V
(d)   250 V
(e)   150 V

Question 623
A solid conducting sphere of radius R = 5.0 cm has a charge density of 2.0*10**(-6) C/m**2 on its surface. What is the electric potential at the center of the sphere? (Take V = 0 at infinity.)
(a)   2.2*10**4 V
(b)   zero
(c)   7.2*10**4 V
(d)   3.6*10**4 V
(e)   1.1*10**4 V

Question 624
Consider a solid conducting sphere of radius 10 cm and carrying a charge Q= -30 nano-C. Determine the potential difference (Vb-Va) between point "a" at the origin and point "b" 20 cm from the center of the sphere.
(a)   2700 V
(b)   1350 V
(c)   zero
(d)   -2700 V
(e)   -1350 V

Question 625
Which one of the following statements is TRUE for a metallic conductor:
(a)   If it carries a net charge, then the charge must be uniformly distributed throughout its volume.
(b)   If it carries a net charge, then the charge must be distributed on its surface.
(c)   It cannot carry a net charge
(d)   If it carries a net charge, then the charge has to be positive.
(e)   The potential inside the conductor in static equilibrium is smaller than on the surface.

Question 626
Two conducting spheres are very far apart. The smaller sphere carries a total charge of 6 micro-C. The larger sphere has a radius twice that of the smaller sphere and is neutral (Q = 0). After the two spheres are connected by a thin conducting wire, the charges on the smaller and the larger spheres, respectively are:
(a)   -4 micro-C and 10 micro-C.
(b)   3 micro-C and 3 micro-C.
(c)   0   and 6 micro-C.
(d)   2 micro-C and 4 micro-C.
(e)   -6 micro-C and 12 micro-C.

25-11

Question 627
In figure (8), a hollow sphere, of radius r that carries a negative charge -q, is put inside another hollow sphere, of radius R that carries a positive charge Q. At a distance x from the common center, such that r < x < R, the potential is:

Figure 8

(a)   k*[(Q/R)-(q/r)].
(b)   k*[(Q/R)-(q/x)].
(c)   k*[(Q/x)-(q/R)].
(d)   k*[(Q/R)+(q/x)].
(e)   k*[(Q/R)+(q/r)].

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Question 628
In figure (5), a hollow sphere, of radius r that carries a negative charge -q, is put inside another hollow sphere, of radius R that carries a positive charge Q. At a distance x from the common center, such that r < x < R, the electric potential is:
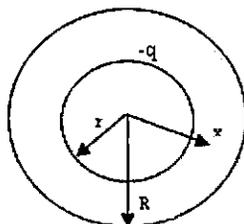(a)   k*[(Q/R)+(q/r)].
(b)   k*[(Q/R)-(q/r)].
(c)   k*[(Q/R)+(q/x)].
(d)   k*[(Q/x)-(q/R)].
(e)   k*[(Q/R)-(q/x)].

25-11
0.55-47%

Question 629
Find the electric potential at the center of a charged metal sphere of radius 15 cm if the electric field at its surface is 1.2*10**4 N/C.
(a)   2.7 kV
(b)   1.8 kV
(c)   1.2 kV
(d)   zero
(e)   Infinity

25-11
0.47-45%

Question 630
Two conducting spheres A and B are electrically isolated. The smaller sphere A has a total charge of 6*10**(-8) C and radius R. Sphere B has a radius (2*R) and is neutral. After connecting the two spheres by a conducting wire, find the charge on sphere B.
(a)   - 6*10**(-8) Coulomb
(b)   + 6*10**(-8) Coulomb
(c)   + 2*10**(-8) Coulomb
(d)   + 4*10**(-8) Coulomb
(e)   + 3*10**(-8) Coulomb

Question 631
Which one of the following statements is CORRECT ?
(a)   All points of a conductor in electrostatic equilibrium are at the same potential.
(b)   If a conducting sphere carries a net charge, the charge will be uniformly distributed over its volume.
(c)   Electric field lines are always in the direction of increasing electric potential.
(d)   Electric field lines are always parallel to equipotential surfaces.
(e)   The electric field at the surface of a conductor in electrostatic equilibrium is parallel to the surface of the conductor.

Question 632
Which of the following statements are CORRECT:
        1. Electric charge is quantized.
        2. The potential at the center of a charged conductor is zero.
        3. If $E = 0$ at a point P then V must be zero at P.
        4. The electric field inside a charged conductor is zero.
        5. If $V = 0$ at a point P then E must be zero at P.
(a)   1, 2, and 5.
(b)   1 and 4.
(c)   2 and 4.
(d)   1, 2 and 3.
(e)   3 and 5.

Question 633
Consider two concentric conducting shells of radii (a) and (b), $b > a$. The smaller (inner) shell has a positive charge (q) and the larger (outer) shell has a charge (Q). If the potential on the inner shell is zero, what is the value of Q?
(a) $Q = b*q/a$.
(b) $Q = -q$.
(c) $Q = -b*q/a$.
(d) $Q = -a*q/b$.
(e) $Q = a*q/b$.

Question 634
A +4.0 pico-Coulomb charge is uniformly distributed over the surface of a solid conducting sphere of radius 8.0 mm. Point A is 4.0 mm from the center of the sphere and point B is 20 mm from the center of the sphere. Determine the electric potential difference $V_A - V_B$.
(a)   +7.2 V
(b)   -2.7 V
(c)   -7.2 V
(d)   +2.7 V
(e)   +4.5 V

Question 635
Which of the following statements are CORRECT:
        (1) The electric flux through a Gaussian surface depends on the shape of the surface.
        (2) The electric flux through a closed surface depends on the net charge enclosed by the surface.
        (3) The electric field inside a uniformly charged solid conducting sphere in electrostatic equilibrium is zero.
        (4) The electric potential inside a uniformly charged solid conducting sphere in electrostatic equilibrium is zero.
(a)   3 and 4 only.
(b)   1, 2, 3, and 4.
(c)   1 and 2 only.
(d)   4 only.
(e)   2 and 3 only.