14. A point particle with charge q is at the center of a Gaussian surface in the form of a cube. The electric flux through any one face of the cube is:

- ► q/0
- ► q/4π0
- ► q/30
- ► **q/60**

The table below gives the electric flux in N·m2/C through the ends and round surfaces of four Gaussian surfaces in the form of cylinders. Rank the cylinders according to the charge inside, from the most negative to the most positive. Left end right end rounded surface

cylinder 1: +2 × 10−9 +4 × 10−9 −6 × 10−9

cylinder 2: +3 × 10−9 −2 × 10−9 +6 × 10−9

cylinder 3: −2 × 10−9 −5 × 10−9 +3 × 10−9

cylinder 4: +2 × 10−9 −5 × 10−9 −3 × 10−9

- ► 1, 2, 3, 4
- ► 4, 3, 2, 1
- ► 3, 4, 2, 1
- ► **4, 3, 1, 2**

A conducting sphere of radius 0.01m has a charge of 1.0 × 10−9 C deposited on it. The magnitude of the electric field in N/C just outside the surface of the sphere is:

- ► 0

- ▶ 450
- ▶ **900**
- ▶ 4500

A round wastepaper basket with a 0.15-m radius opening is in a uniform electric field of 300N/C, perpendicular to the opening. The total flux through the sides and bottom, in N · m2 C, is:

- ▶ 0
- ▶ 4.2
- ▶ **21**
- ▶ 280

10C of charge are placed on a spherical conducting shell. A particle with a charge of −3C is placed at the center of the cavity. The net charge on the inner surface of the shell is:

- ▶ −7C
- ▶ −3C
- ▶ 0C
- ▶ **+3C**

10C of charge are placed on a spherical conducting shell. A particle with a charge of −3C is placed at the center of the cavity. The net charge on the outer surface of the shell is:

- ▶ −7C
- ▶ −3C

► 0C

► **+7C**

Charge Q is distributed uniformly throughout an insulating sphere of radius R. The magnitude of the electric field at a point R/2 from the center is:

► Q/4π0R2

► Q/π0R2

► 3Q/4π0R2

► **Q/8π0R2**

Positive charge Q is distributed uniformly throughout an insulating sphere of radius R, centered at the origin. A particle with positive charge Q is placed at x = 2R on the x axis. The magnitude of the electric field at x = R/2 on the x axis is:

► Q/4π0R2

► Q/8π0R2

► **Q/72π0R2**

► 17Q/72π0R2

Charge Q is distributed uniformly throughout a spherical insulating shell. The net electric flux in N · m2 /C through the inner surface of the shell is:

► **0**

► Q/0

► 2Q/0

► Q/4π0

Charge Q is distributed uniformly throughout a spherical insulating shell. The net electric flux in N · m2 /C through the outer surface of the shell is:

- ► 0
- ► **Q/0**
- ► 2Q/0
- ► Q/40

A 3.5-cm radius hemisphere contains a total charge of 6.6 × 10−7 C. The flux through the rounded portion of the surface is 9.8 × 104 N · m2 /C. The flux through the flat base is:

- ► 0
- ► +2.3 × 104 N · m2 /C
- ► **−2.3 × 104 N · m2 /C**
- ► −9.8 × 104 N · m2 /C

Charge is distributed uniformly along a long straight wire. The electric field 2 cm from the wire is 20N/C. The electric field 4 cm from the wire is:

- ► 120N/C
- ► 80N/C
- ► 40N/C
- ► **10N/C**

Positive charge Q is placed on a conducting spherical shell with inner radius R1 and outer radius R2. A point charge q is placed at the center of the cavity. The

magnitude of the electric field at a point outside the shell, a distance r from the center, is:

- ► zero
- ► Q/4π0r2
- ► q/4π0r2
- ► **(q + Q)/4π0r2**

Positive charge Q is placed on a conducting spherical shell with inner radius R1 and outer radius R2. A point charge q is placed at the center of the cavity. The magnitude of the electric field produced by the charge on the inner surface at a point in the interior of the conductor, a distance r from the center, is:

- ► 0
- ► Q/4vπ0R2 1
- ► Q/4π0R2 2
- ► **q/4π0r2**
- ► Q/4π0r2

A long line of charge with λ charge per unit length runs along the cylindrical axis of a cylindrical shell which carries a charge per unit length of λc. The charge per unit length on the inner and outer surfaces of the shell, respectively are:

- ► λ and λc
- ► **−λ and λc + λ**
- ► −λ and λc − λc
- ► λ + λc and λc − λ

Charge is distributed uniformly on the surface of a large flat plate. The electric field 2 cm from the plate is 30N/C. The electric field 4 cm from the plate is:

- ► 120N/C
- ► 80N/C
- ► **30N/C**
- ► 15N/C

A particle with charge Q is placed outside a large neutral conducting sheet. At any point in the interior of the sheet the electric field produced by charges on the surface is directed:

- ► toward the surface
- ► away from the surface
- ► **toward Q**
- ► away from Q

A hollow conductor is positively charged. A small uncharged metal ball is lowered by a silk thread through a small opening in the top of the conductor and allowed to touch its inner surface. After the ball is removed, it will have:

- ► a positive charge
- ► a negative charge
- ► **no appreciable charge**
- ► a charge whose sign depends on what part of the inner surface it touched

A spherical conducting shell has charge Q. A particle with charge q is placed at the center of the cavity. The charge on the inner surface of the shell and the charge on the outer surface of the shell, respectively, are:

- ▶ 0, Q
- ▶ q, Q − q
- ▶ **−q, Q + q**
- ▶ −q, 0

A particle with a charge of 5.5×10−8C is 3.5 cm from a particle with a charge of −2.3×10−8 C. The potential energy of this two-particle system, relative to the potential energy at infinite separation, is:

- ▶ 3.2 × 10−4 J
- ▶ **−3.2 × 10−4 J**
- ▶ 9.3 × 10−3 J
- ▶ −9.3 × 10−3 J

A particle with a charge of 5.5 × 10−8C is fixed at the origin. A particle with a charge of −2.3×10−8 C is moved from x = 3.5 cm on the x axis to y = 4.3 cm on the y axis. The change in potential energy of the two-particle system is:

- ▶ 3.1 × 10−3 J
- ▶ −3.1 × 10−3 J
- ▶ **6.0 × 10−5 J**
- ▶ −6.0 × 10−5 J

A particle with a charge of 5.5 × 10−8 C charge is fixed at the origin. A particle with a charge of −2.3 × 10−8 C charge is moved from x = 3.5 cm on the x axis to y = 3.5 cm on the y axis. The change in the potential energy of the two-particle system is:

- ► 3.2 × 10−4 J
- ► −3.2 × 10−4 J
- ► 9.3 × 10−3 J
- ► **0**

Three particles lie on the x axis: particle 1, with a charge of 1×10−8 C is at x = 1 cm, particle 2, with a charge of 2 × 10−8 C, is at x = 2 cm, and particle 3, with a charge of −3 × 10−8 C, is at x = 3 cm. The potential energy of this arrangement, relative to the potential energy for infinite separation, is:

- ► +4.9 × 10−4 J
- ► **−4.9 × 10−4 J**
- ► +8.5 × 10−4 J
- ► −8.5 × 10−4 J

Two identical particles, each with charge q, are placed on the x axis, one at the origin and the other at x = 5 cm. A third particle, with charge −q, is placed on the x axis so the potential energy of the three-particle system is the same as the potential energy at infinite separation. Its x coordinate is:

- ► **13 cm**
- ► 2.5 cm

- 7.5 cm
- 10 cm

Choose the correct statement:

- The potential of a negatively charged conductor must be negative
- If E = 0 at a point P then V must be zero at P
- If V = 0 at a point P then E must be zero at P
- **None of the above are correct**

If 500 J of work are required to carry a charged particle between two points with a potential difference of 20V, the magnitude of the charge on the particle is:

- **12.5C**
- 20C
- cannot be computed unless the path is given
- none of these

The potential difference between two points is 100V. If a particle with a charge of 2C is transported from one of these points to the other, the magnitude of the work done is:

- **200 J**
- 100 J
- 50 J
- 100 J

Two large parallel conducting plates are separated by a distance d, placed in a vacuum, and connected to a source of potential difference V . An oxygen ion, with charge 2e, starts from rest on the surface of one plate and accelerates to the other. If e denotes the magnitude of the electron charge, the final kinetic energy of this ion is:

- ► eV/2
- ► eV/d
- ► eV d
- ► **2eV**

An electron volt is :

- ► the force acting on an electron in a field of 1N/C
- ► the force required to move an electron 1 meter
- ► **the energy gained by an electron in moving through a potential difference of 1 volt**
- ► the energy needed to move an electron through 1 meter in any electric field

An electron has charge −e and mass me. A proton has charge e and mass 1840me. A "proton volt" is equal to:

- ► **1 eV**
- ► 1840 eV
- ► (1/1840) eV
- ► √1840 eV

Two conducting spheres are far apart. The smaller sphere carries a total charge Q. The larger sphere has a radius that is twice that of the smaller and is neutral. After the two spheres are connected by a conducting wire, the charges on the smaller and larger spheres, respectively, are:

- ► Q/2 and Q/2
- ► **Q/3 and 2Q/3**
- ► 2Q/3 and Q/3
- ► zero and Q

A conducting sphere with radius R is charged until the magnitude of the electric field just outside its surface is E. The electric potential of the sphere, relative to the potential far away, is:

- ► zero
- ► E/R
- ► E/R2
- ► **ER**

A 5-cm radius conducting sphere has a surface charge density of 2 ×10−6 C/m2 on its surface. Its electric potential, relative to the potential far away, is:

- ► **1.1 × 104 V**
- ► 2.2 × 104 V
- ► 2.3 × 105 V
- ► 3.6 × 105 V

A hollow metal sphere is charged to a potential V . The potential at its center is:

- **V**
- 0
- –V
- 2V

Questions:

1. **Consider a lamp hanging from a chain. What is the tension in the chain?**
2. **Aproton travels with a speed of 3.00 * 106 m/s at an angle of 37.0° with the direction of a magnetic field of 0.300 T in the + y direction. What are (a) the magnitude of the magnetic force on the proton and (b) its acceleration?**
3. **Light from the Sun takes approximately 8.3 min to reach the Earth. During this time interval the Earth has continued to rotate on its axis. How far is the actual direction of the Sun from its image in the sky?**
4. **Do all current-carrying conductors emit electromagnetic waves? Explain**
5. **Explain solar convection zone. What is its other name?**
6. **If a charged particle moves in a straight line through some region of space, can you say that the magnetic field in that region is zero?**
7. **Can all gas molecules in the vessel have the same speed?**
8. **What are the properties of wave function?**
9. **A bike accelerates uniformly from rest to a speed of 7.10 m/s over a distance of 35.4 m. Determine the acceleration of the bike.**

10.A flat loop of wire consisting of a single turn of cross-sectional area 8.00 cm2 is perpendicular to a magnetic field that increases uniformly in magnitude from 0.500 T to 2.50 T in 1.00 s. What is the resulting induced current if the loop has a resistance of 2.00 W?