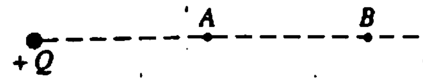
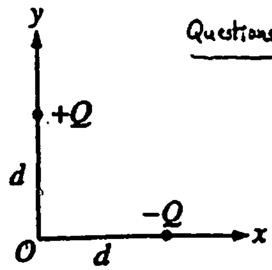
Electricity (2)



7. The diagram above shows an isolated, positive charge Q. Point B is twice as far away from Q as point A. The ratio of the electric field strength at point A to the electric field strength at point B is

(A) 8 to 1
(B) 4 to 1
(C) 2 to 1
(D) 1 to 1
(E) 1 to 2

Questions 8 & 9



Charges $-Q$ and $+Q$ are located on the x- and y-axes, respectively, each at a distance d from the origin O, as shown above.

8. What is the direction of the electric field at the origin O?

(A) →
(B) ←
(C) ↖
(D) ↘
(E) ↙

9. What is the magnitude of the electric field at the origin O?

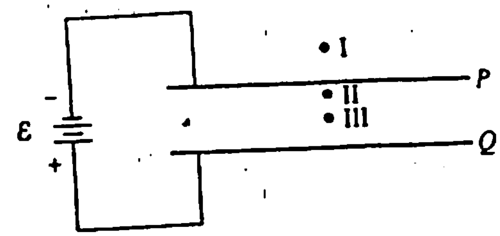
(A) $\frac{kQ}{2d^2}$

(B) $\frac{kQ}{\sqrt{2}d^2}$

(C) $\frac{kQ}{d^2}$

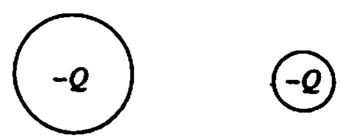
(D) $\frac{\sqrt{2}kQ}{d^2}$

(E) $\frac{2kQ}{d^2}$



10. Two large parallel conducting plates P and Q are connected to a battery of emf $\mathcal{E}$, as shown above. A test charge is placed successively at points I, II, and III. If edge effects are negligible, the force on the charge when it is at point III is

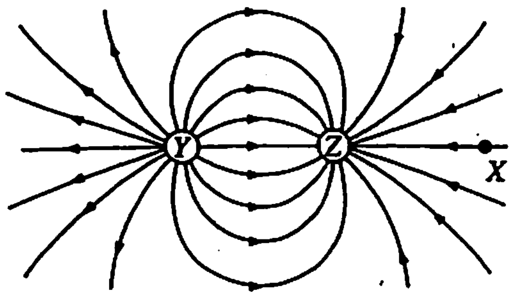
(A) of equal magnitude and in the same direction as the force on the charge when it is at point I
(B) of equal magnitude and in the same direction as the force on the charge when it is at point II
(C) equal in magnitude to the force on the charge when it is at point I, but in the opposite direction
(D) much greater in magnitude than the force on the charge when it is at point II, but in the same direction
(E) much less in magnitude than the force on the charge when it is at point II, but in the same direction



11. Two conducting spheres of different radii, as shown above, each have charge $-Q$. Which of the following occurs when the two spheres are connected with a conducting wire?

(A) No charge flows.
(B) Negative charge flows from the larger sphere to the smaller sphere until the electric field at the surface of each sphere is the same.
(C) Negative charge flows from the larger sphere to the smaller sphere until the electric potential of each sphere is the same.
(D) Negative charge flows from the smaller sphere to the larger sphere until the electric field at the surface of each sphere is the same.
(E) Negative charge flows from the smaller sphere to the larger sphere until the electric potential of each sphere is the same.

Electricity 4/

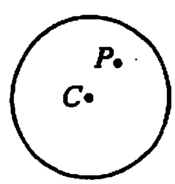


1\. The diagram above shows electric field lines in an isolated region of space containing two small charged spheres, Y and Z. Which of the following statements is true?

(A) The charge on Y is negative and the charge on Z is positive.
(B) The strength of the electric field is the same everywhere.
(C) The electric field is strongest midway between Y and Z.
(D) A small negatively charged object placed at point X would tend to move toward the right.
(E) Both charged spheres Y and Z carry charge of the same sign.

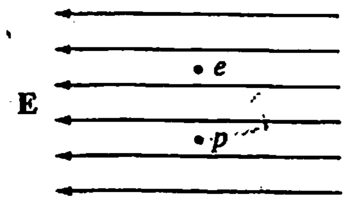
Which of the following is true about the net force on an uncharged conducting sphere in a uniform electric field?

(A) It is zero.
(B) It is in the direction of the field.
(C) It is in the direction opposite to the field.
(D) It produces a torque on the sphere about the direction of the field.
(E) It causes the sphere to oscillate about an equilibrium position.



3\. The hollow metal sphere shown above is positively charged. Point C is the center of the sphere and point P is any other point within the sphere. Which of the following is true of the electric field at these points?

(A) It is zero at both points.
(B) It is zero at C, but at P it is not zero and is directed inward.
(C) It is zero at C, but at P it is not zero and is directed outward.
(D) It is zero at P, but at C it is not zero.
(E) It is not zero at either point.



4\. An electron e and a proton p are simultaneously released from rest in a uniform electric field **E**, as shown above. Assume that the particles are sufficiently far apart so that the only force acting on each particle after it is released is that due to the electric field. At a later time when the particles are still in the field, the electron and the proton will have the same

(A) direction of motion
(B) speed
(C) displacement
(D) magnitude of acceleration
(E) magnitude of force acting on them

5\. A particle of charge Q and mass m is accelerated from rest through a potential difference V, attaining a kinetic energy K. What is the kinetic energy of a particle of charge $2Q$ and mass $m/2$ that is accelerated from rest through the same potential difference?

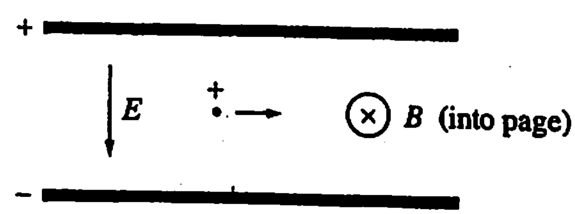
(A) $\frac{K}{4}$

(B) $\frac{K}{2}$

(C) K

(D) $2K$

(E) $4K$



6\. As shown above, a positively charged particle moves to the right without deflection through a pair of charged plates. Between the plates are a uniform electric field E of magnitude 6.0 N/C and a uniform magnetic field B of magnitude 2.0 T, directed as shown in the figure. The speed of the particle is most nearly

(A) 0.33 m/s
(B) 0.66 m/s
(C) 3.0 m/s
(D) 12 m/s
(E) 18 m/s