1. . When a long-haired woman puts her hands on a Van de Graaff generator—a large conducting sphere with charge being delivered to it by a conveyer belt—her hair stands on end. Which of the following explains this phenomenon? (A) Like charges attract (B) Like charges repel (C) Her hair will not stand on end (D) Her body is conducting a current to the ground (E) The Van de Graaf generator makes a magnetic field that draws her hair up on end

2. . Three particles, A, B, and C, are set in a line, with a distance of d between each of them, as shown.  If particle B is attracted to particle A, what can we say about the charge, , of particle A? (A) (B) (C) (D) (E)

3. . A particle of charge +*2q* exerts a force F on a particle of charge –*q*. What is the force exerted by the particle of charge –*q* on the particle of charge +*2q*? (A) ***F*** (B) 0 (C) ***2F*** (D) ***F*** (E) –***F***

4. . Two charged particles exert a force of magnitude ***F*** on one another. If the distance between them is doubled and the charge of one of the particles is doubled, what is the new force acting between them? (A) ***F*** (B) ***F*** (C) ***F*** (D) ***2F*** (E) ***4F***

5. . Four charged particles are arranged in a square, as shown . What is the direction of the force acting on particle A?(A)  (B)  (C)  (D)  (E) 

6. . Two identical positive charges of +Q are 1 m apart. What is the magnitude and direction of the electric field at point A, 0.25 m to the right of the left-hand charge?  (A) 3/4 kQ to the right (B) 128/9 kQ to the left (C) 160/9 kQ to the left (D) 160/9 kQ to the right (E) 128/9 kQ to the right

7. . A particle of charge +q is a distance r away from a charged flat surface and experiences a force of magnitude F pulling it toward the surface. What is the magnitude of the force exerted on a particle of charge +q that is a distance 2r from the surface? (A) 1/8 F (B) 1/4 F (C) 1/2 F (D) F (E) 2F

8. . What is the change in potential energy of a particle of charge +q that is brought from a distance of 3r to a distance of 2r by a particle of charge –q? (A) kq2 /r(B) ( -kq2 )/(6r) (C) kq2 / 4r2 (D) -kq2 / 4r2 (E) kq2 /r2

9. . Two charges are separated by a distance d. If the distance between them is doubled, how does the electric potential between them change? (A) It is doubled (B) It is halved (C) It is quartered (D) It is quadrupled (E) It is unchanged

10. . A solid copper sphere has a charge of +Q on it. Where on the sphere does the charge reside? (A) +Q at the center of the sphere (B) Q/2 at the center of the sphere and Q/2 on the outer surface (C) –Q at the center of the sphere and +2Q on the outer surface (D) +Q on the outer surface (E) The charge is spread evenly throughout the sphere