1. B Charge (either positive or negative) is brought to the woman by the Van de Graaf generator. This charge then migrates to the ends of her hair. The repulsive force between like charges makes the hair separate and stand on end. A violates Columbs Law. D and E do not explain the phenomenon.

2. E Particle C exerts an attractive force on the negatively charged particle B. If B is to be pulled in the direction of A, A must exert an even stronger attractive force than particle C. That means that particle A must have a stronger positive charge than particle C, which is +q.

3. E The electric force exerted by one charged particle on another is proportional to the charge on both particles. That is, the force exerted by the +2q particle on the –q particle is of the same magnitude as the force exerted by the –q particle on the +2q particle, because, according to Coulomb’s Law, both forces have a magnitude of:Since one particle is positive and the other is negative, this force is attractive: each particle is pulled toward the other. Since the two particles are pulled toward each other, the forces must be acting in opposite directions. If one particle experiences a force of F, then the other particle must experience a force of –F.

4. B Coulomb’s Law tells us that : the force between two particles is directly proportional to their charges and inversely proportional to the square of the distance between them. If the charge of one of the particles is doubled, then the force is doubled. If the distance between them is doubled, then the force is divided by four. Since the force is multiplied by two and divided by four, the net effect is that the force is halved.

5. C Particles C and D exert a repulsive force on A, while B exerts an attractive force. The force exerted by D is somewhat less than the other two, because it is farther away. The resulting forces are diagrammed below: The vector sum of the three vectors will point diagonally up and to the right, as does the vector in C.

6. E The vector for electric field strength at any point has a magnitude of and points in the direction that a positive point charge would move if it were at that location. Because there are two different point charges, and , there are two different electric fields acting at point A. The net electric field at A will be the vector sum of those two fields. We can calculate the magnitude of the electric field of each charge respectively:Since both and would exert a repulsive force on a positive point charge, points to the right and points to the left. The net electric field is:Because is closer to A than , the electric field from will be stronger than the electric field from , and so the net electric field will point to the right.

7. D The charged surface is a plane charge, and the electric field exerted by a plane charge is E = kq. That is, the magnitude of the electric field strength does not vary with distance, so a particle of charge +q will experience the same attractive force toward the charged surface no matter how far away it is.

8. B The change in potential energy of a point particle, with reference to infinity is given by:The difference in potential energy between two points is given by:

9. B The electric potential of a charge is given by the equation V = kq/r. In other words, distance is inversely proportional to electric potential. If the distance is doubled, then the electric potential must be halved.

10. D Excess charges always reside on the surface of a conductor because they are free to move, and feel a repulsive force from each other.