Quiz.

1. A neutral atom contains
   a) an equal number of protons and electrons
   b) more neutrons than electrons
   c) more electrons than protons
   d) more protons than electrons

2. A proton and an electron are placed in an electric field. Which undergoes the greater acceleration?
   a) Neither accelerate.
   b) The proton.
   c) The electron.
   d) Both accelerate equally.

3. Coulomb's law obeys the inverse square law
   a) True
   b) False

4. Charging by friction works because
   a) protons can be easily exchanged between materials
   b) protons can be easily exchanged between materials
   c) different materials have different affinity for electrons
   d) neutrons are transferred between materials
   e) rubbing two materials creates charges

5. When charging by induction
   a) the two objects must touch
   b) the electrons will move, even though the two objects do not touch
   c) the electrons move from one object to another
   d) like charges attract

6. Electric shielding within atoms occurs because
   a) the nucleus repels electrons
   b) outer electrons are attracted to inner electrons
   c) neutrons repel electrons
   d) inner electrons repel outer electrons

7. Electric potential is also called
   a) voltage
   b) electric potential energy
   c) current
   d) electric field

8. The fact that rubbing a balloon on your hair leaves your hair positively charged and the balloon negatively charged arises from
   a) the conservation of charge.
   b) charging by induction.
   c) protrons leaving the balloon.

9. A positive charge and a negative charge are brought near each other and released. Afterwards, as they are moving, the force on each particle
   a) increases.
   b) decreases.
   c) stays the same.

Answer Key.
1. a)

In order for an atom to be neutral, it must contain a net charge of zero. This can be accomplished by having an equal number of positive and negative charges.

2. c)

Electrons contain about 2,000 times less mass than protons do, meaning they have much less inertia!

3. a)

Coulomb's law is the electrostatic force law, and in it the force is inversely proportional to the distance between charges squared. F~1/r^2.

4. c)

For example, when a glass rod is rubbed with a silk cloth, electrons are transferred from the rod to the cloth because the silk has a higher affinity for electrons and becomes negatively charged.

5. b)

When charging by induction, the proximity of the charged object is enough to rearrange or even separate electrons within the other object without physical contact. However, electrons are not transferred between objects.

6. d)

Electric shielding is responsible for the Faraday cage effect. On the surface of a conductor, the electrons spread out on the surface and cancel any electric field inside the conductor. In an atom, inner electrons repel outer electrons, making the outer electrons easier to remove than the inner ones.

7. a)

Voltage is the more common term for electric potential, and it is equal to the electric potential energy per unit charge.

8. a)

Conservation of charge tells us that charge cannot be created nor destroyed within a system. Charging a balloon in this manner is due to friction, not induction. Also, electrons are leaving the hair; protons are not leaving the balloon.

9. c)

According to the fundamental rule of electrostatics, opposite charges attract. According to Coulomb's law, the closer two charges are to each other, the stronger the electrostatic force between them.