Quiz 1 Name: _____

ID: _____

1. In a complex circuit, three colored wires (red, green, and blue) are joined together inside a mysterious black box. An ammeter, a device that measures the rate of charge flow (current), shows you that charge enters the box at 3 coulombs per second through the red wire and leaves the box at 2 coulombs per second through the green wire. There is no buildup of charge inside the box. After 10 seconds has elapsed, how much charge has flowed out of the box through the blue wire?

2. A positively charged ant is crawling through a plastic drinking straw with non-zero charges on both ends. One end is located at $x = 0$ and the other is located at $x = 10$ cm. The ant experiences zero net electric force at $x = 3.0$ cm. (a) Can you say whether the ends are positively or negatively charged? (b) Which end has a charge with greater magnitude? (c) Find the ratio of the charge at the 0 cm end to the charge at the 10 cm end. Express your answer as a decimal number.

4. Positive charges with magnitudes 3.50 mC and 6.75 mC are located at the origin and at the point (10.00, 0) meters on the x axis, respectively. What are the strength and direction of the field they generate at the point (0, 10.00) meters on the y axis?

5. A charge of $-3.50\ \mu$C is located on the x axis at $x = -4.00$ m, and a second point charge of $4.00\ \mu$C is located at $x = 6.00$ m. Where should a third point charge of $6.00\ \mu$C be placed to make the electric field zero at the origin?

6. A bicycle wheel with radius 35 cm has 73 charges ($1.0\ \mu$C each) spaced at regular intervals along its edge. A flea with charge $-0.010\ \mu$C lands in the center of the wheel. (a) What is the net electric force on the flea? (b) if the flea now moves 70 cm along a line that goes through the center of the wheel and perpendicular to the plane of the wheel, what is the force the flea experiences at that point? (c) how much work does the flea has to do in order to move there? assuming the flea moves horizontally