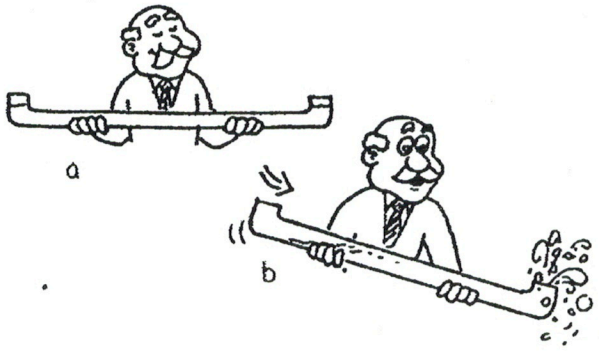
Name _____ Date _____

CONCEPTUAL Physics PRACTICE PAGE

Chapter 23 Electric Current

Flow of Charge



1. Water doesn't flow in the pipe when both ends (*a*) are at the same level. Another way of saying this is that water will not flow in the pipe when both ends have the same potential energy (PE). Similarly, charge will not flow in a conductor if both ends of the conductor are the same electric potential. But tip the water pipe, as in (*b*), and water will flow. Similarly, charge will flow when you increase the electric potential of an electric conductor so there is a potential difference across the ends.

a. The unit of electric potential difference is

[volt] [ampere] [ohm] [watt].

b. It is common to call electric potential difference

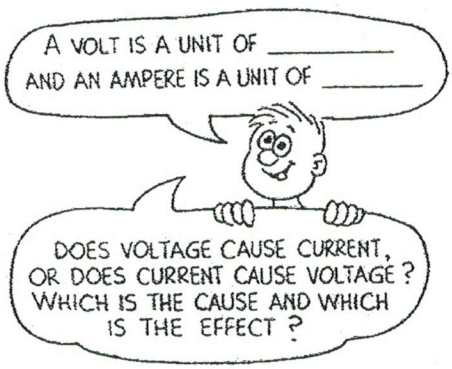
[voltage] [amperage] [wattage].

c. The flow of electric charge is called electric

[voltage] [current] [power]

and is measured in

[volts] [amperes] [ohms] [watts].



Complete the statements:

2. a. A current of 1 ampere is a flow of charge at the rate of _____ coulomb per second.

b. When a charge of 15 C flows through any area in a circuit each second, the current is _____ A.

c. One volt is the potential difference between two points if 1 joule of energy is needed to move

_____ coulomb of charge between the two points.

d. When a lamp is plugged into a 120-V socket, each coulomb of charge that flows in the circuit is raised to a potential energy of _____ joules.

e. Which offers more resistance to water flow, a wide pipe or a narrow pipe? _____

Similarly, which offers more resistance to the flow of charge, a thick wire or a thin wire?

_____

Hewitt Drew It!

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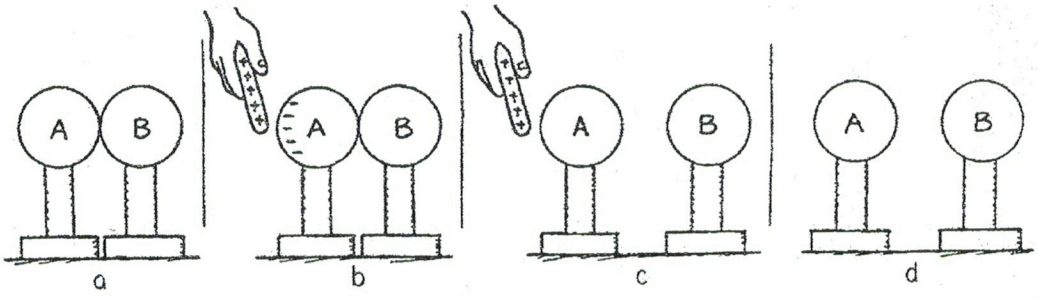
CONCEPTUAL Physics PRACTICE PAGE

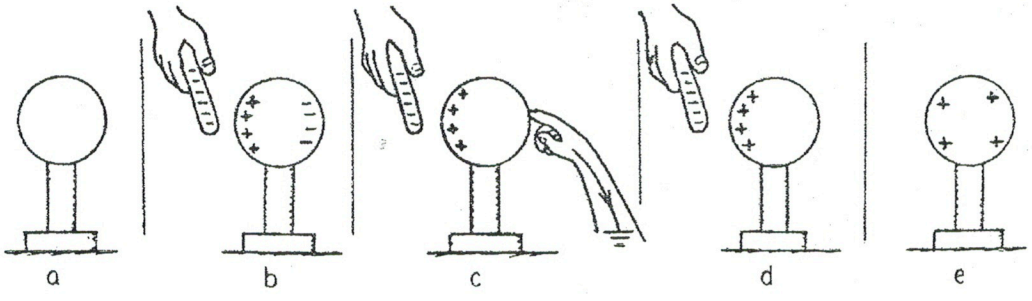
Chapter 22 Electrostatics

Static Charge

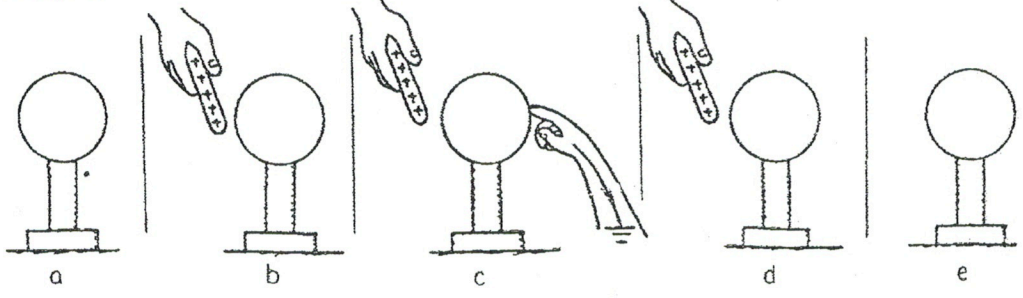
1. Consider the diagram below.
   a. A pair of insulated metal spheres, A and B, touch each other, so in effect they form a single uncharged conductor.
   b. A positively charged rod is brought near A, but not touching, and electrons in the metal sphere are attracted toward the rod. Charges in the spheres have redistributed, and the negative charge is labeled. Draw the appropriate + signs that are repelled to the far side of B.
   c. Draw the signs of charge when the spheres are separated while the rod is still present, and
   d. after the rod has been removed. Your completed work should be similar to Figure 22.7 in the textbook. The spheres have been charged by *induction*.



2. Consider below a single metal insulated sphere, (*a*) initially uncharged. When a negatively charged rod is nearby, (*b*), charges in the metal are separated. Electrons are repelled to the far side. When the sphere is touched with your finger, (*c*), electrons flow out of the sphere to Earth through your hand. The sphere is "grounded." Note the positive charge remaining (*d*) while the rod is still present and your finger removed, and (*e*) when the rod is removed. This is an example of *charge induction by grounding*. In this procedure the negative rod "gives" a positive charge to the sphere.

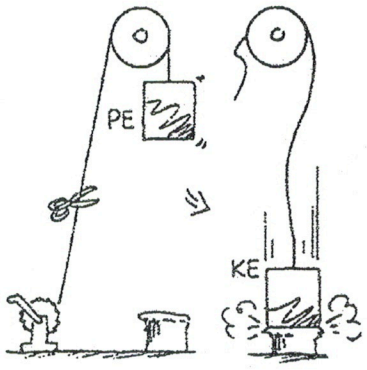


The diagrams below show a similar procedure with a positive rod. Draw the correct charges for *a* through *e*.

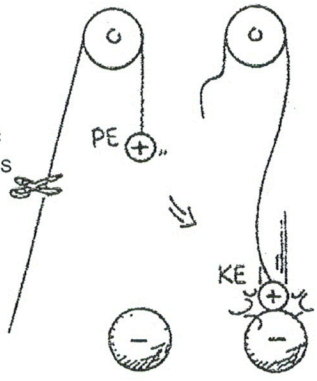


Chapter 22 Electrostatics

Electric Potential



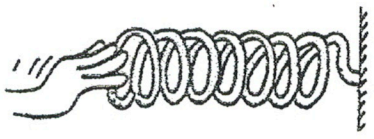
1. Just as PE (potential energy) transforms to KE (kinetic energy) for a mass lifted against the gravitational field (left), the electric PE of an electric charge transforms to other forms of energy when it changes location in an electric field (right). When released, how does the KE acquired by each compare to the decrease in PE?



_____

Complete the statements:

2. A force compresses the spring. The work done in compression is the product of the average force and the distance moved. $W = Fd$. This work increases the PE of the spring.

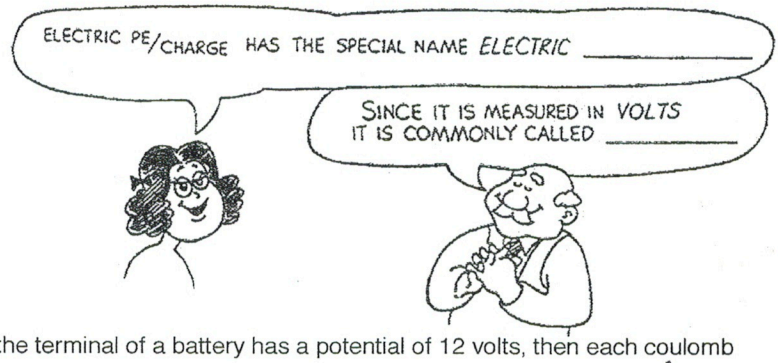


Similarly, a force pushes the charge (call it a test charge) closer to the charged sphere. The work done in moving the test charge is the product of the average _____ and the _____ moved. W = _____ . This work _____ the PE of the test charge.

At any point, a greater quantity of test charge means a greater amount of PE, but not a greater amount of PE *per quantity* of charge. The quantities PE (measured in joules) and PE/charge (measured in volts) are different concepts.

By definition: **Electric Potential** = $\frac{\textbf{PE}}{\textbf{charge}}$. 1 volt = 1 joule/coulomb.

3. Complete the statements:



4. If a conductor connected to the terminal of a battery has a potential of 12 volts, then each coulomb of charge on the conductor has a PE of _____ J.

5. Some people are confused between force and pressure. Recall that pressure is force *per area*. Similarly, some people get mixed up between electric PE and voltage. According to this chapter, voltage is electric PE per _____ .