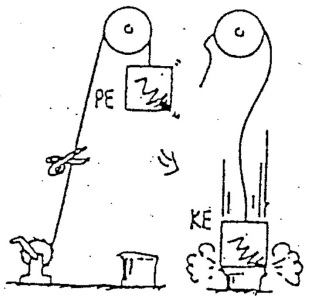
Name _____ Date _____

CONCEPTUAL **Physical Science** PRACTICE SHEET

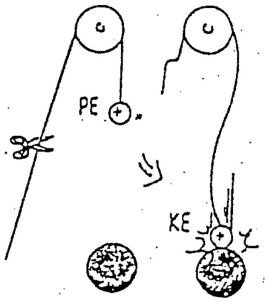
Chapter 9: Static and Current Electricity

Electric Potential

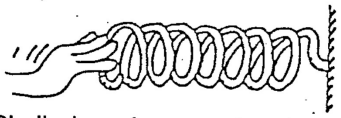


Just as PE transforms to KE for a mass lifted against the gravitation field (left), the electric PE of an electric charge transforms to other forms of energy when it changes location in an electric field (right). In both cases, how does the KE acquired compare to the decrease in PE?

_____



Complete the statements.



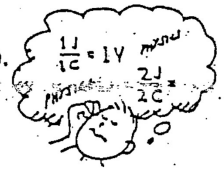
A force compresses the spring. The work done in compression is the product of the average force and the distance moved. W = Fd. This work increases the PE of the spring.

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.

If the test charge is released, it will be repelled and fly past the starting point. Its gain in KE at this point is _____ to its decrease in PE.

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

By definition: Electric Potential = PE/charge. 1 volt = 1 joule/1 coulomb. So 1 C of charge with a PE of 1 J has an electric potential of 1 V. And 2 C of charge with a PE of 2 J has an electric potential of _____V.



If a conductor connected to the terminal of a battery has an electric potential of 12 V, then each coulomb of charge on the conductor has a PE of _____J.

You do very little work in rubbing a balloon on your hair to charge it. The PE of several thousand billion electrons (about one-millionth coulomb [10^{-6}C]) transferred may be a thousandth of a joule [10^{-3}J]. Impressively, however, the electric potential of the balloon is about _____V!

Why is contact with a balloon charged to thousands of volts not as dangerous as contact with household 110 V?

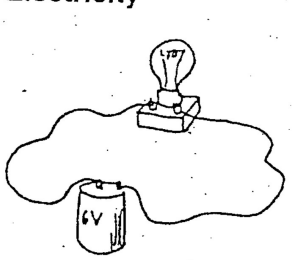
_____

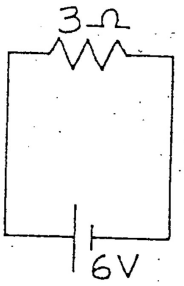
_____

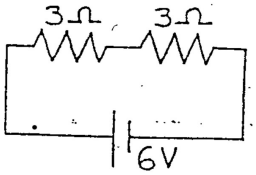
Chapter 9: Static and Current Electricity

Series Circuits

1. The simple circuit is a 6-V battery that pushes charge through a single lamp that has a resistance of 3 Ω. According to Ohm's law, the current in the lamp (and therefore the whole circuit) is _____A.

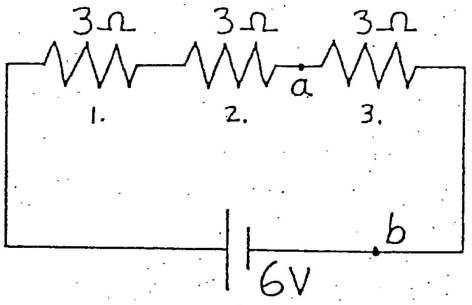






2. If a second identical lamp is added, the 6-V battery must push charge through a total resistance of _____Ω. The current in the circuit is then _____A.

3. If a third identical lamp is added in series, the total resistance of the circuit (neglecting any internal resistance in the battery) is _____Ω.



4. The current through all three lamps in series is _____A. The current through each individual lamp is _____A.

5. Does current in the lamps occur simultaneously, or does charge flow first through one lamp, then the other, and finally the last, in turn? _____

6. Does current flow *through* a resistor, or *across* a resistor?_____ Is voltage established *through* a resistor, or *across* a resistor?_____

7. The voltage across all three lamps in series is 6 V. The voltage (or commonly, *voltage drop*) across each individual lamp is _____V.

8. Suppose a wire connects points *a* and *b* in the circuit. The voltage drop across lamp 1 is now _____V, across lamp 2 is _____V, and across lamp 3 is _____V. So the current through lamp 1 is now _____A, through lamp 2 is _____A, and through lamp 3 is _____A. The current in the battery (neglecting internal battery resistance) is _____A.

9. Which circuit dissipates more power, the 3-lamp circuit or the 2-lamp circuit? (Another way of asking this is which circuit would glow brightest; which would be best seen on a dark night from a great distance?) Defend your answer.

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