

Section 7

DOES ALL MATTER CONTAIN CHARGE? WHAT ARE ELECTRONS?

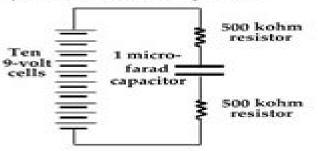
INTRODUCTION

This section uses a new kind of bulb to resolve some basic questions: Do insulators contain charge? If so, is it ever mobile? What carries charge through the connecting wires and the battery? What carries charge through a lit neon bulb?

INVESTIGATION ONE: A NEW BULB AND A NEW CIRCUIT

7.1 Activity: A new kind of bulb

 Consider the following circuit (Figure 7.1a), which your teacher will assemble. This is a very familiar circuit, except that —



- the low voltage battery has been replaced by a high voltage battery (90 volts)
- the two bulbs have been replaced by resistors that will not be burned out
- the resistors have a much higher resistance than the bulbs (about 10,000 times that of a long bulb)
- the 25,000 microfarad capacitor has been replaced by a smaller 1 microfarad capacitor with a higher voltage rating
- What will the value of the final steady voltage across the capacitor after a long time has passed.

Figure 7.1a RESISTOR AND CAPACITOR CIRCUIT

3. Based on the relative values of the resistances and the capacitance, and comparing this circuit with your familiar circuit using two long bulbs and a 25,000 microfarad capacitor, about how long would you estimate it would take to establish this voltage?

 Now we will modify the circuit by adding a new kind of bulb, a neon bulb, in parallel with the capacitor as in Figure 7.1b.

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