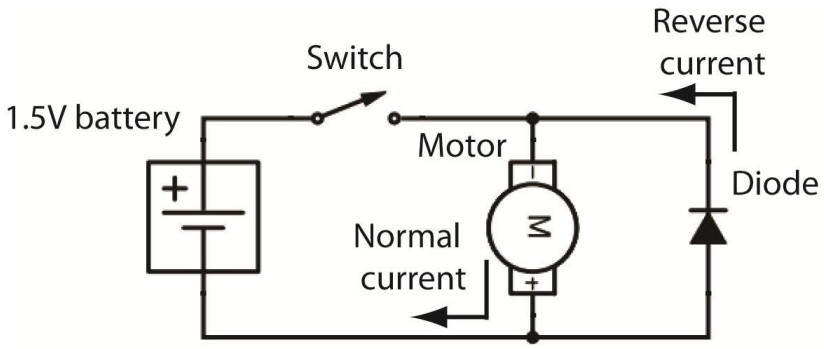
4. Try running the motor without the diode, or with the diode reversed. Is reverse current a big problem with a motor this size?



Forming Conclusions

What can you conclude about motors in circuits? Do you think reverse current only occurs when the motor is shutting off, or would it be an issue when the motor is turned on at first, too? Did you notice how the motor jerks slightly when you start and stop it? Why do you think this is?

Experiment #4: Series Circuits

Observing and Gathering Data

When two components in a circuit are connected one right after the other in a line it is called a **series circuit**. You used a series circuit to connect the resistors to the light bulb earlier. Components in series with each other always share the same current, but the voltage across each component might be different.

When adding resistors in series, the total combined resistance can be found using the equation,

$$R_{total} = R1 + R2$$

where R1 and R2 are the two resistors. If you combine the two 4.7 Ω resistors in series, the total resistance is simply 4.7 Ω + 4.7 Ω = 9.4 Ω. As you can see from the equation, adding more resistors in series increases the resistance, thereby decreasing the current allowed to flow through.

Thinking About It and Predicting

What will happen to the light bulb in your simple circuit if you connect a second D-size battery in series? What will happen if you connect the light bulb and motor in series with only one battery powering them? What will happen if you break the connection at the bulb or motor – will the other one still work? Do you think the bulb or the motor will use more current? Write down your predictions before doing the experiments.