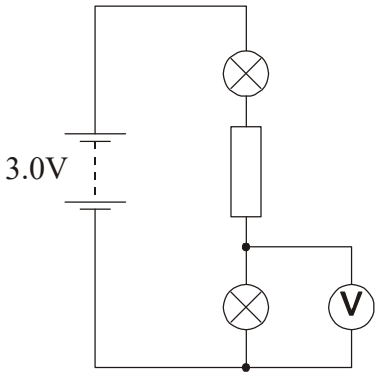
Voltages in circuits

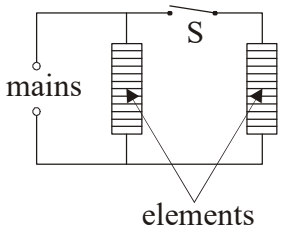
1. The two lamps in the circuit are identical and the voltmeter reads 1.2V. What is the voltage across the resistor?



2. The diagram shows an electric fire with two 1kW elements.

   (a) What is the purpose of switch S?

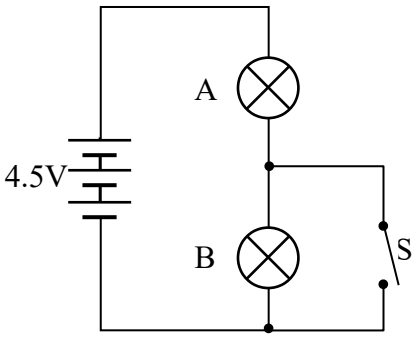
   (b) How would the current from the mains change when you closed S?



3. Two lamps A and B are connected in series to a 4.5V battery. Switch S is in parallel with lamp B.

   (a) With S open (off), what is the voltage across:
   (i) lamp A,
   (ii) lamp B?

   (b) With S closed, what is the voltage across:
   (i) lamp A,
   (ii) lamp B?



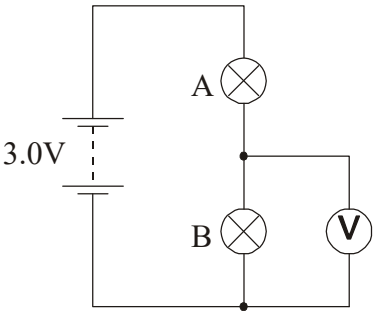
   (c) What effect does closing the switch have on the brightness of lamp A?

4. The two lamps in the circuit are identical.

   (a) What is the reading on the voltmeter?

   (b) What will be the reading on the voltmeter if the filament of lamp A only breaks?

   (c) What will be the reading on the voltmeter if the filament of lamp B only breaks?



(1: 0.6V. 2: switch 2nd element, ×2.
3: 2.25V, 2.25V; 4.5V, 0V; inc.
4: 1.5V, 0V, 3V.)

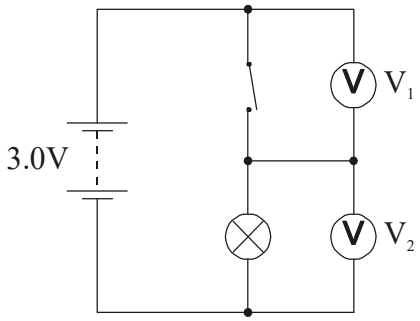
5. A 4.5V battery in a torch supplies a current of 0.12A for 30s.
   (a) How much charge flows? *(3.6C)*
   (b) How much energy is supplied by the battery? *(16J)*

6. You have six 1.5V cells. Draw a circuit diagram of how you would connect them to give:
   (a) the highest output voltage,
   (b) a given current for the longest possible time,
   (c) an output voltage of 4.5V.

7. Draw a diagram to show how you would run:
   (a) four 2.5V lamps from a 10V supply,
   (b) eight 2.5V lamps from a 10V supply

8. 20 identical lamps are connected in series across a 240V supply.
   (a) What is the voltage across each lamp?
   (b) What would a voltmeter read connected between the join of the second and third lamps and the join of the fifth and sixth lamps?

9. What are the readings on voltmeters V1 and V2, with the switch:
   (a) open?
   (b) closed?



(V_1=3V, V_2=0V; V_1=0V, V_2=3V.)

10. A car headlamp connected to a 12V battery takes a current of 5.0A. How much energy does it convert to light and heat every minute? *(3600J)*