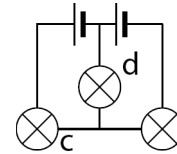
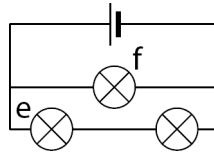
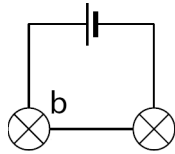
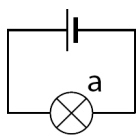


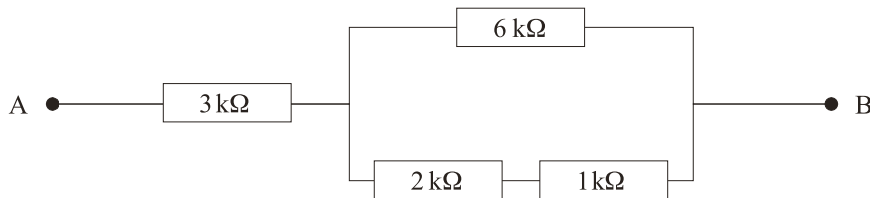
# ELECTRIC CIRCUITS

## BASIC PROBLEMS

- Find some household appliances (e.g. hair-dryer, electric tooth brush, etc.) with a known power and voltage rating. Calculate their resistance and the current flowing through them.
- A circuit connected to a 230 V socket is protected with a 10 A fuse. How many 60 W light bulbs can be connected to this circuit in parallel? Is there a limit to the number of light bulbs in series?
- The equivalent resistance of two resistors in parallel wiring is one third of the first and 60  $\Omega$  smaller than the second resistance. Calculate the resistances.
- The diagram to the very left shows a light bulb (a) which lights up at normal brightness. Decide whether the light bulbs b, c, d, e and f (all identical to a) are brighter than normal, normal, dimmer than normal or off.



- Two resistors in series are connected to 12 V. The voltage across the second resistor is 5 V and the electric current 2 mA. Calculate the resistances.
- Two resistors with resistances 200  $\Omega$  and 300  $\Omega$  are connected in parallel to a voltage supply. The current through the first is 4 mA greater than that through the second one. Calculate the partial currents and the applied voltage.
- Can the formula for series wiring be applied to circuits with light bulbs? What about the formula for parallel wiring? (Hint: Characteristic of a light bulb)
- Find the equivalent resistance between points A and B for the circuit below:



- The resistance of an ammeter is 1 % of the resistance of the consumer load in a simple electric circuit. What is the current measured by the meter when the current through the consumer load alone is 1.00 A?
- A battery has an emf of 4.5 V and an internal resistance of 25  $\Omega$ . It is connected to a 50  $\Omega$  resistor. What is the terminal voltage?

## ADDITIONAL PROBLEMS

- A circuit with three resistors is placed in a closed box with three connectors (A, B and C). The resistance measured between A and B is 5 k $\Omega$ , between A and C it is 7 k $\Omega$  and between B and C 8 k $\Omega$ . Draw the diagram for a possible circuit and calculate the resistance of each resistor.
- Draw all different circuit diagrams for four identical resistors. Arrange them in the order of increasing equivalent resistance.
- An ammeter with resistance 50  $\Omega$  has maximum deflection for 2 mA. How can an additional resistor be connected to allow for the measuring of greater currents? Calculate the additional resistance for a maximum current of 10 A.
- A battery's terminal voltage on a load resistance 10  $\Omega$  is 4.5 V and on 20  $\Omega$  it increases to 5.0 V. Calculate the internal resistance and the emf of the battery.

SOLUTIONS: 2. 38; 3. 180  $\Omega$  / 360  $\Omega$ ; 4. <, =, 0, <, =; 5. 3.5 k $\Omega$  / 2.5 k $\Omega$ ; 6. 12 mA, 8 mA, 2.4 V; 8. 5 k $\Omega$ ; 9. 0.99 A; 10. 3.0 V; 11. 2 k $\Omega$ , 3 k $\Omega$ , 5 k $\Omega$ ; 13. 10 m $\Omega$ ; 14. 2.5  $\Omega$ , 5.6 V