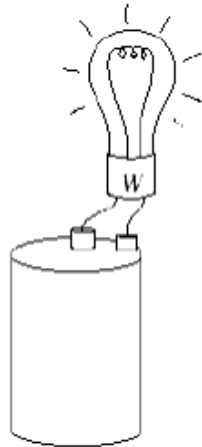


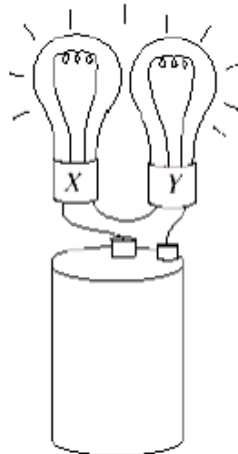
SOME MORE ELECTRICITY REVISION

1. In each circuit below, the batteries are identical and the resistances of the bulbs W, X, Y and Z, are as shown. All the batteries have an EMF of 6.0 V. (2 marks)

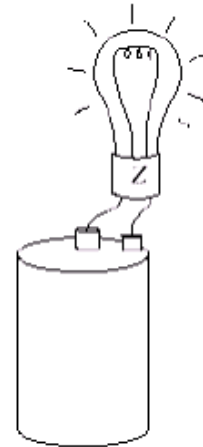
$$R_w = 2 \Omega$$



$$R_x = 2 \Omega \quad R_y = 2 \Omega$$



$$R_z = 4 \Omega$$



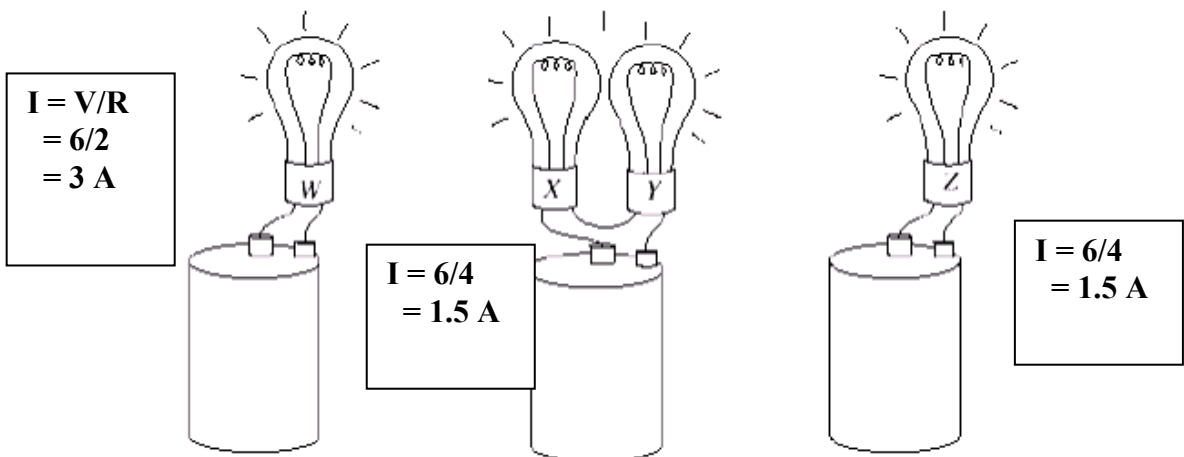
Write a statement that describes the relationship between the brightness of globes W, X, Y and Z.

$$R_w = 2 \Omega$$

$$R_T = 2 + 2 = 4 \Omega$$

$$R_x = 2 \Omega \quad R_y = 2 \Omega$$

$$R_z = 4 \Omega$$



Write a statement that describes the relationship between the brightness of globes W, X Y and Z.

From the calculation of the current, you can see that globes X, Y and Z will have exactly the same brightness. Globe W will be twice as bright as the other three

2. You watch Mum clean the screen on the TV set. The next day you notice that the screen is just as dusty again. Using electrostatics, can you explain why. (3 marks).

- **The friction of cleaning transfers electrons between the screen and the cloth.**
- **This means the screen has an overall charge.**
- **This charge attracts the dust particles in the air and they settle on the screen making it dusty again.**

3. Cheap appliances such as hair dryers often have only two pins instead of three. The missing pin is the Earth wire.

a. What is the purpose of the Earth wire? (2 marks)

The Earth wire is connected to the metallic case of an appliance so that should the appliance become live (have a short circuit to the case or an excess current), the current will flow harmlessly to earth.

b. How are these appliances made safe without the Earth wire? (2 marks)

The appliances are double insulated. The first layer of insulation is around the live components and wires while the second is a robust plastic outer case. There is no earth wire needed.

4. Sandy is studying in the lounge of her old house, which she very recently moved into. On the same circuit, which can carry a maximum of 10 A before the fuse breaks, she has a fridge (rated at 600 W), a microwave (rated at 900 W) and a kettle (rated at 1500 W) all connected in parallel to each other but in series with the fuse. Having a break from her studies, she turns the kettle on. While waiting for the kettle to boil, she decides to defrost the chicken for tonight's dinner (she has never used all three appliances together before). When she turns the microwave on, the 240 V electrical supply goes off.

a. Explain to Sandy why the electricity goes off (calculations required to justify answer). (3 marks)

$$V = 240 \text{ V}$$

$$I = 10 \text{ A}$$

$$P = VI$$

$$= 240 \times 10$$

$$= 2\,400 \text{ W}$$

so maximum power the circuit can carry is 2 400 W

$$\text{Fridge} = 600 \text{ W}$$

$$\text{Microwave} = 900 \text{ W}$$

Fridge will be on constantly

**Kettle = 1500 W
100 W and within the**

**With kettle on (1500 W) the total power is 2
Maximum of 2 400 W**

When she adds the microwave, the total power is 3 000 W so the current is high enough to melt the fuse wire and the fuse blows.

b. Give a safe way that Sandy could prevent this from happening in the future?
(1 mark)

- **Use another circuit for the kettle**
- **Upgrade the wiring in the house! circuit breakers take 15A**
- **Don't use the kettle and the microwave at the same time.**

Don't accept 'Use a larger rated fuse wire' as this is not a safe way

5. A way to 'zap' your friends is to rub your feet on a carpet in summer so as to build up a charge, then you touch a friend and they get 'zapped'. Why do you build up a charge when you rub your feet on carpet and what causes the 'zap' when you touch your friend? (3 marks)

- **The friction between your shoes and the carpet causes electrons to transfer from one surface to another.**
- **This creates a static charge on you.**
- **When you touch someone, electrons move between the two of you to neutralise charge and this is the 'zap'.**