

1

An electrician is replacing an old electric shower with a new one.

The inside of the old shower is shown in the figure below.



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- (a) The electrician should **not** change the shower unless he switches off the mains electricity supply.

Explain why.

(2)

- (b) The new shower has a power output of 10 690 W when it is connected to the 230 V mains electricity supply.

The equation which links current, potential difference and power is:

$$\text{current} = \frac{\text{power}}{\text{potential difference}}$$

Calculate the current passing through the new shower.

Give your answer to two significant figures.

Current = _____ A

(4)

- (c) The new shower has a higher power rating than the old shower.

How does the power of the new shower affect the cost of using the shower?

Give a reason for your answer.

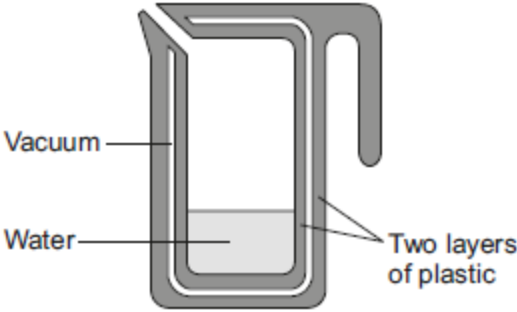
(2)

(Total 8 marks)

2

A new design for a kettle is made from two layers of plastic separated by a vacuum. After the water in the kettle has boiled, the water stays hot for at least 2 hours.

The new kettle is shown below.



- (a) The energy transferred from the water in the kettle to the surroundings in 2 hours is 46 200 J.

The mass of water in the kettle is 0.50 kg.

The specific heat capacity of water is 4200 J/kg °C.

The initial temperature of the water is 100 °C.

Calculate the temperature of the water in the kettle after 2 hours.

Temperature after 2 hours = _____ °C

(3)

- (b) Calculate the average power output from the water in the kettle to the surroundings in 2 hours.

Average power output = _____ W

(2)

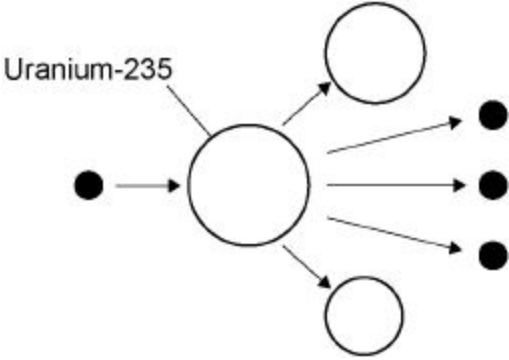
(Total 5 marks)

3

Nuclear power can be used to generate electricity through nuclear fission.

Figure 1 shows the process of nuclear fission.

Figure 1



(a) Complete the sentences.

Choose answers from the box.

gamma rays	light rays	proton	neutron	nucleus	X-rays
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During the process of nuclear fission, a uranium _____

absorbs a _____ .

Electromagnetic radiation is released in the form of _____ .

(3)

(b) The UK needs at least 25 000 000 kW of electrical power at any time.

A nuclear power station has an electrical power output of 2 400 000 kW

Calculate how many nuclear power stations are needed to provide 25 000 000 kW of electrical power.

Number of nuclear power stations = _____

(2)

(c) State **two** environmental issues caused by generating electricity using nuclear power stations.

1. _____

2. _____

(2)

(d) The UK currently generates a lot of electricity by burning natural gas. This process releases carbon dioxide into the atmosphere.

Figure 2 shows how the concentration of carbon dioxide in the atmosphere has changed over the past 115 years.

Figure 2

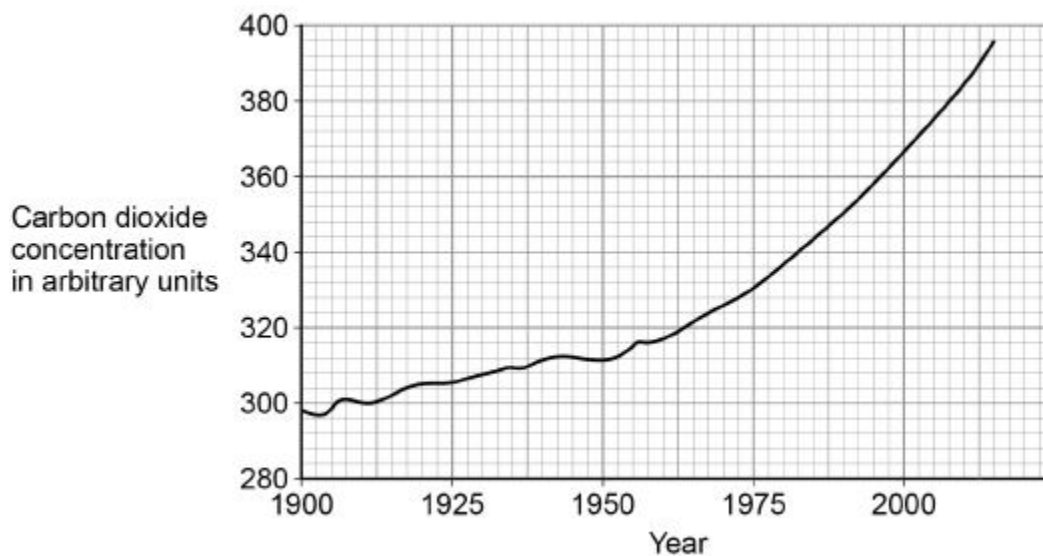
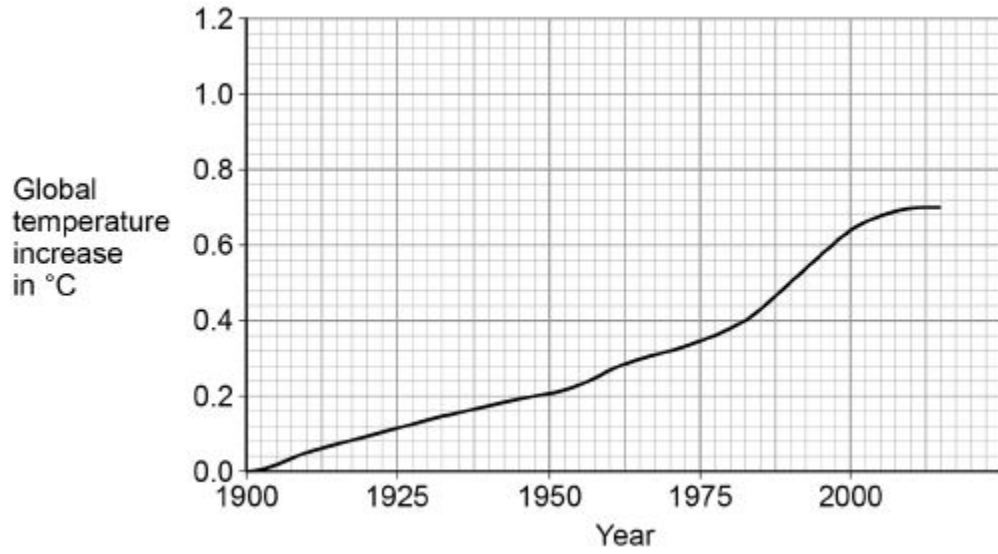


Figure 3 shows how the global temperature has changed over the past 115 years.

Figure 3



Give **one** similarity and **one** difference between the data in **Figure 2** and **Figure 3**.

Similarity _____

Difference _____

(2)
(Total 9 marks)