Heating a greenhouse

1 A greenhouse contains an electric heater.

(a) The heater makes good use of the heating effect of an electric current.

Give an example of a device where the heating effect of an electric current is a **disadvantage**.

(1)

.....

.....

(b) This label is attached to the heater.

230 V 500 W
50 Hz

Use this information to calculate the expected current in the heater.

(3)

current = ... A

(c) Complete the sentence by putting a cross (☒) in the box next to your answer.

The potential difference across the heater can be measured either in volts or in

(1)

☒ **A** amps per ohm

☒ **B** amps per joule

☒ **C** coulombs per ohm

☒ **D** joules per coulomb

(d) When a charge flows in a resistor, the resistor becomes hot.

Explain why the resistor becomes hot.

(2)

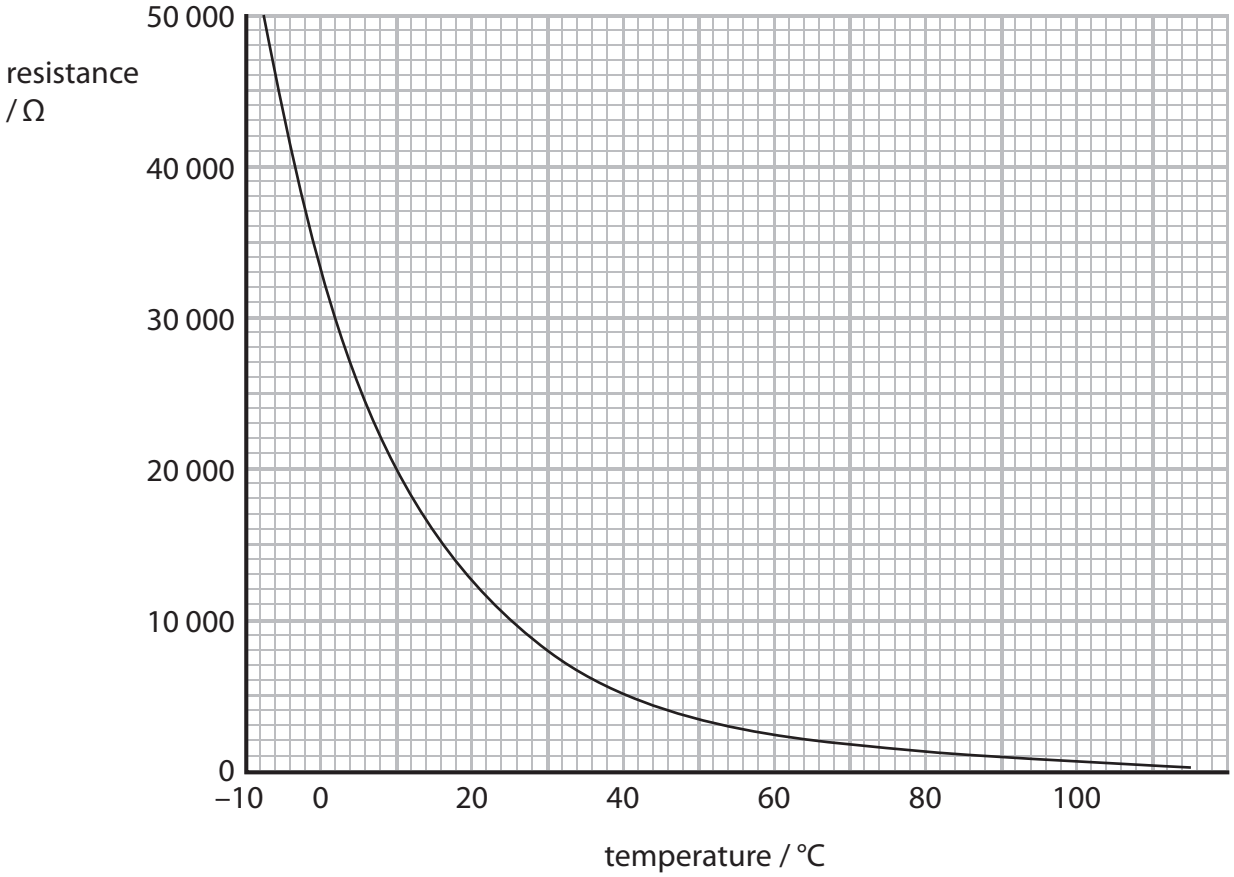
.....

.....

.....

.....

(e) A thermistor is used to control the heater.
The graph shows how the resistance of the thermistor changes with temperature.



When the temperature is 10 °C, the current in the thermistor is 0.60 mA.

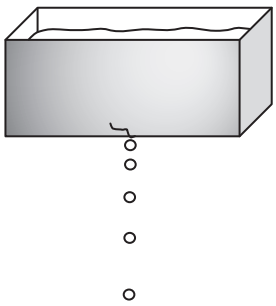
Calculate the potential difference across the thermistor at 10 °C.

(3)

potential difference = ... V

(Total for Question 3 = 10 marks)

2 A water tank drips water.



(a) Scientists could use four quantities to describe the movement of the water drops.
Three of these quantities are vectors.
The other quantity is a scalar.

acceleration	orce	mas	elocity

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The scalar quantity is

(1)

☒ **A** acceleration

☒ **B** force

☒ **C** mass

☒ **D** velocity

(ii) Complete the following sentence using one of the quantities from the word box above.

(1)

In a vacuum, all bodies falling towards the Earth's surface

have the same ..... .

(b) The mass of one water drop is 0.000 08 kg.

Calculate its weight.

(gravitational field strength is 10 N/kg)

(2)

weight = ... N

(c) The water drop falls to the ground, 13 m below, in 1.7 s.

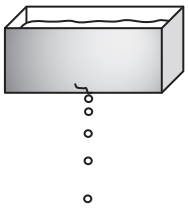
Calculate the average speed of the drop while it is falling.

(2)

average speed = ... m/s

*(d) The tank is a long
It drips at a steady rate.

The first drawing shows water drops which have just left the tank.
The second drawing shows water drops which are near to the ground.



drops leaving the tank

drops near to the ground

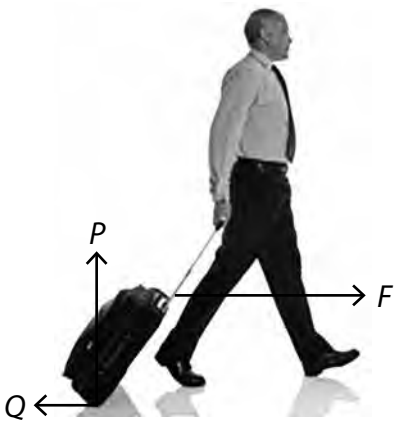
Explain why the drops which are near to the ground are an equal distance apart but the drops which have just started to fall are not.

(6)

(Total for Question 6 = 12 marks)

3 A man pulls a suitcase with a horizontal force, *F*, as shown in Figure 10.

Two other forces acting on the suitcase are labelled *P* and *Q*.



Not to scale

Figure 10

(a) (i) Which of these gives the correct names for the forces *P* and *Q*?

(1)

		name of	
		force *P*	**force *Q***
☒	**A**	upthrust	reaction
☒	**B**	reaction	friction
☒	**C**	reaction	reaction
☒	**D**	friction	upthrust

(ii) Draw an arrow on the diagram to represent the weight of the suitcase.

(1)

(b) The man pulls the suitcase for 80 m along a horizontal path.

The mass of the man and the suitcase is 85 kg.

The man does 1200 J of work on the suitcase as he pulls the suitcase along.

He walks with an average velocity of 1.5 m / s.

(i) Calculate the kinetic energy of the man and the suitcase.

(2)

kinetic energy = ... J

(ii) Calculate the horizontal force, *F*, that the man exerts on the suitcase.

Use the equation:

work done = force × distance moved in the direction of the force

(2)

force = ... N

(c) The man runs up a set of stairs carrying his suitcase.

Explain whether he does more total work if he walks up the same stairs instead of running.

(2)

.....

.....

.....

.....

(d) The man lifts his suitcase.

The increase in gravitational potential energy of the suitcase is 264 J.

The mass of the suitcase is 12 kg.

Calculate the vertical height the suitcase is raised.

(gravitational field strength, g = 10 N/kg)

Use the equation:

change in gravitational potential energy = mass $\times$ g $\times$ change in vertical height

(2)

height raised = ... m

(Total for Question 4 = 10 marks)