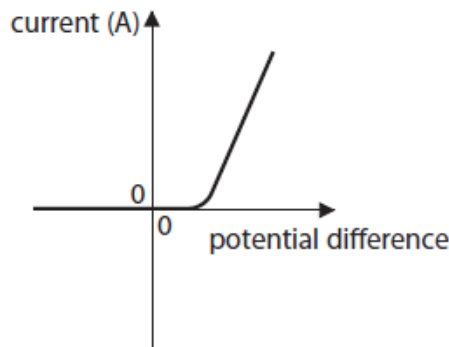


## Questions

Q1.

Figure 12 shows a graph of current against potential difference for an electrical component.



**Figure 12**

Which electrical component will show this variation of current with potential difference?

(1)

- A** thermistor
- B** low value resistor at constant temperature
- C** high value resistor at constant temperature
- D** diode



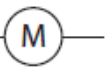
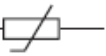
**(Total for question = 1 mark)**

Q2.

**Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box  and then mark your new answer with a cross .**

Which of these symbols is used to represent a thermistor in an electrical circuit?

(1)

- A 
- B 
- C 
- D 

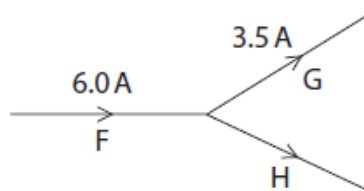
**(Total for question = 1 mark)**

Q3.

Figure 2 shows the junction of three wires, F, G and H, in a circuit.  
 The current in wire F is 6.0 A.  
 The current in wire G is 3.5 A.

Calculate the current in wire H.

**(1)**



**Figure 2**

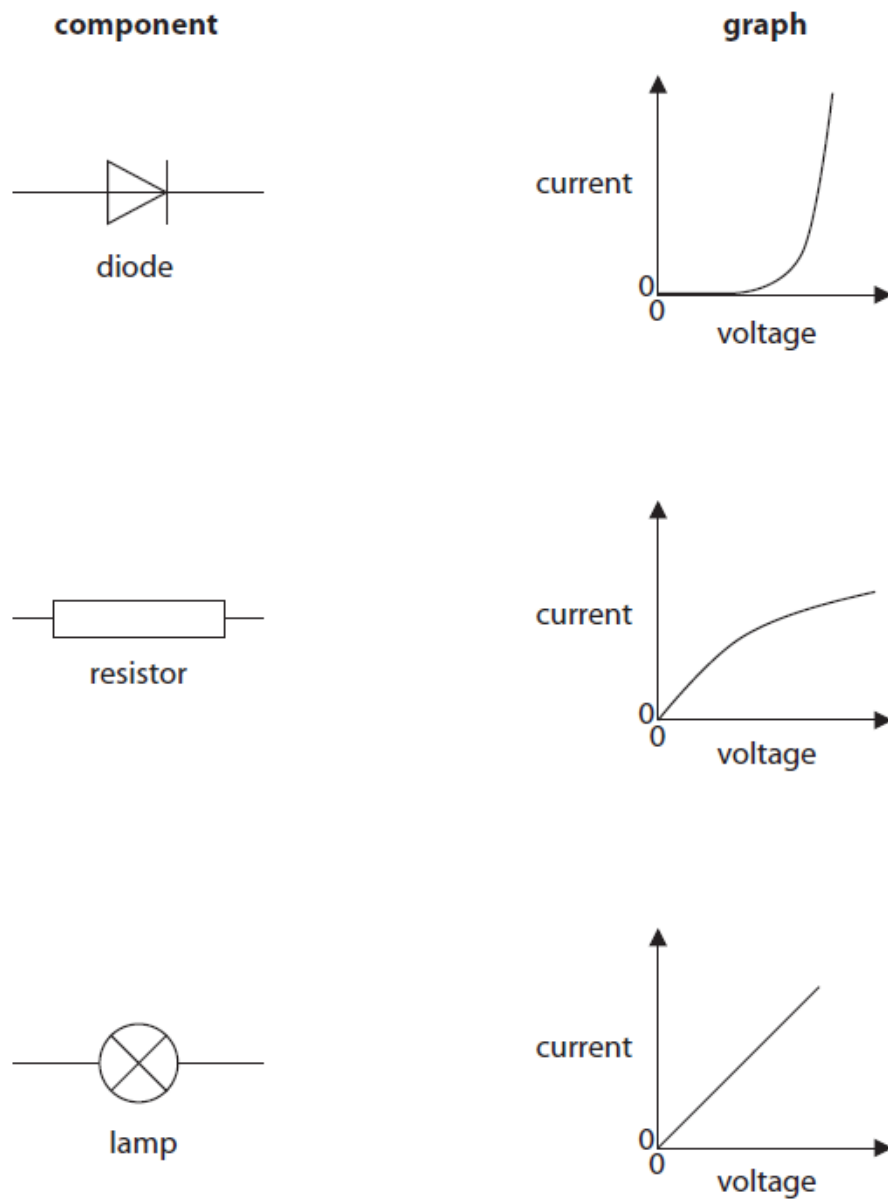
current in wire H = ..... A

**(Total for question = 1 mark)**

Q4.

The graphs show how the current in a component changes with the voltage applied across the component.

Draw a line from each component to its correct graph.



Q5.

Figure 1 gives the names of three atomic particles and some descriptions of the charge on the particles and their position in the atom.

Draw one straight line from each atomic particle to its correct description.

particle	description
	negative charge inside the nucleus
proton	no charge inside the nucleus
electron	positive charge inside the nucleus
	negative charge outside the nucleus
neutron	no charge outside the nucleus

Figure 1

(Total for question = 3 marks)

Q6.

A torch has a battery and a bulb.

The current in its circuit is 0.08 A.

Calculate the amount of charge passing a point in this circuit in 2 minutes.

(3)

charge = ..... coulombs

Q7.

A student measures the current in the lamp for several values of potential difference across the lamp.

Figure 13 shows the student's results.

potential difference across the lamp in volts (V)	current through the lamp in amps (A)
0.06	0.05
0.12	0.08
0.18	0.10
0.24	0.12
0.30	0.13
0.36	0.13

**Figure 13**

The student uses the results in Figure 13 to write this conclusion.

*'As the potential difference across the lamp increases, the current in the lamp increases and the relationship is directly proportional.'*

Comment on the student's conclusion.

(3)

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**(Total for question = 3 marks)**

Q8.

A wire in a circuit carries a current of 0.9 A.

Calculate the quantity of charge that flows through the wire in 50 s.

State the unit of charge with your answer.

Use the equation

$$\text{charge} = \text{current} \times \text{time}$$

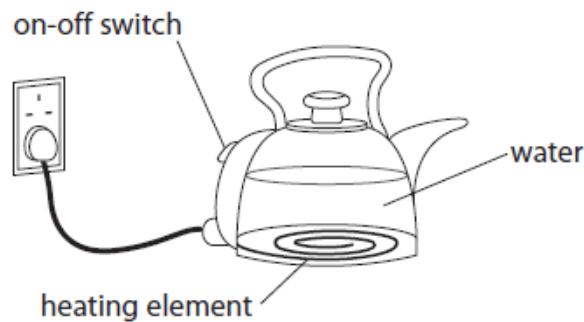
(3)

quantity of charge = ..... unit .....

**(Total for question = 3 marks)**

Q9.

(i) Figure 11 shows an electric kettle.



**Figure 11**

The kettle contains 1.5 kg of water.

The kettle is switched on.

Calculate the energy needed to raise the temperature of the water by 50 °C.

Specific heat capacity of water = 4200 J/kg °C

Use the equation

$$\Delta Q = m \times c \times \Delta\theta$$

(2)

energy needed = ..... J

(ii) The amount of energy,  $E$ , needed to bring the water to boiling point is 670 000 J.

The kettle has a power of 3500 W.

Calculate the time,  $t$ , it takes to bring the water to boiling point.

Use the equation

$$P = \frac{E}{t}$$

(3)

time to bring the water to boiling point = ..... s

**(Total for question = 5 marks)**

Q10.

A student investigates how the current in a lamp changes with the potential difference across the lamp.

The student uses the results to calculate the resistance of the lamp.

The results are shown in the table in Figure 17.

potential difference in V	current in A	resistance in $\Omega$
1.0	0.09	11
2.0	0.14	14
3.0	0.18	17
4.0	0.22	18
5.0	0.26	
6.0	0.30	20

**Figure 17**

(i) One value of resistance is missing from the table in Figure 17.

Calculate the value of resistance that is missing from the table.

(3)

missing resistance = .....  $\Omega$

(ii) The student writes this conclusion:

*'The resistance of the lamp is directly proportional to the potential difference.'*

Comment on the student's conclusion.

Use information from Figure 17 in your answer.

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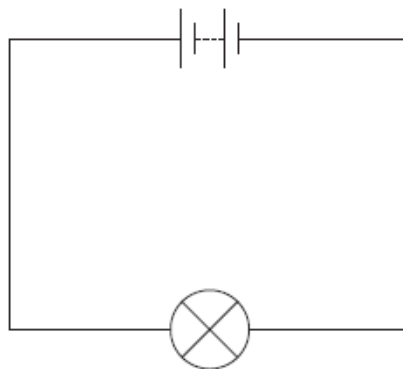
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**(Total for question = 6 marks)**

Q11.

\* Figure 18 shows a battery connected to a filament lamp.



**Figure 18**

Explain, in terms of the movement of charged particles, how energy is transferred from the battery, through the lamp, to the surroundings.

**(6)**

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**(Total for question = 6 marks)**

Q12.

A lamp is connected to a potential difference of 0.24 V.

The current in the lamp is 0.12 A.

(i) Calculate the power of the lamp.

Use the equation

$$P = I \times V$$

(2)

power of the lamp = ..... W

(ii) The potential difference is changed to 0.30 V.

The current in the lamp is now 0.13 A.

The lamp is switched on for 35 s.

Calculate the energy that is transferred in this time.

Select an equation from the list of equations at the end of this paper.

(2)

energy transferred = ..... J

(iii) The current in the lamp stays at 0.13 A.

Calculate the charge that flows through the lamp in 35 s.  
Use the equation

$$Q = I \times t$$

(2)

charge = ..... C

**(Total for question = 6 marks)**

Q13.

A student is investigating a filament lamp.

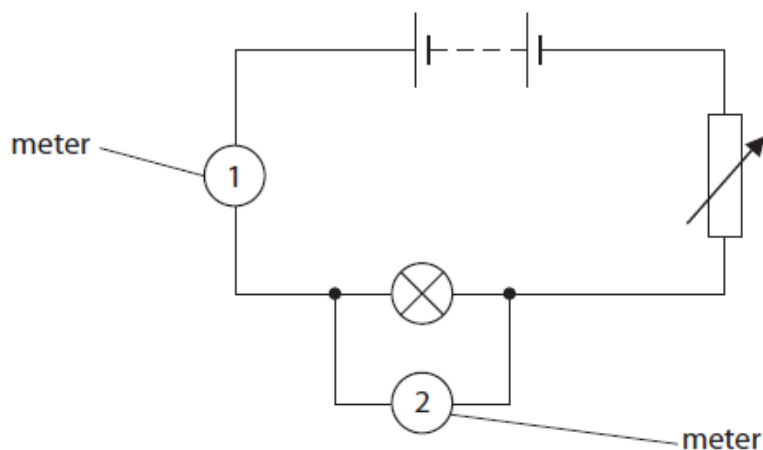
(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The current in the filament lamp is a flow of

(1)

- A** protons
- B** neutrons
- C** electrons
- D** atoms

(ii) The student uses this circuit in his investigation.



State what is measured by the meters.

(2)

Meter 1 measures

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Meter 2 measures

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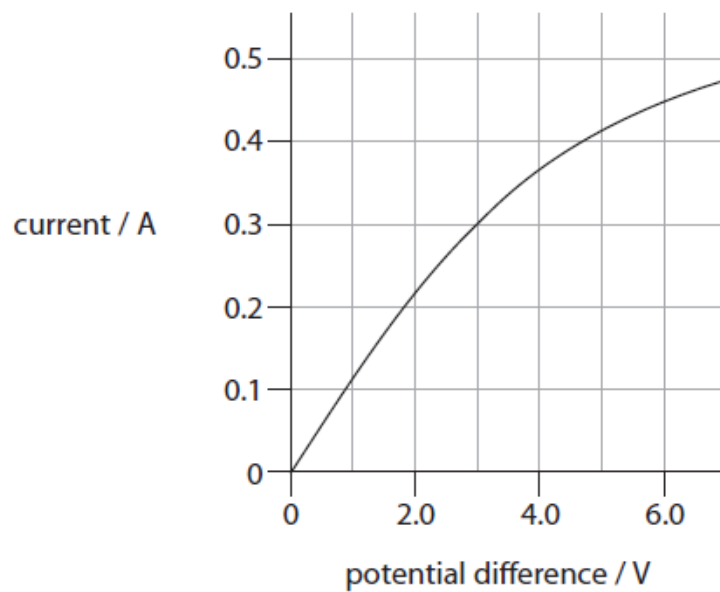
(b) The normal operating potential difference (voltage) and current of the filament lamp is 6 V, 0.4 A.

Calculate the energy supplied to the lamp under these conditions in 20 s.

(2)

energy = ..... J

(c) The graph shows how current varies with potential difference (voltage) for another filament lamp.



Calculate the resistance of the lamp when the current in the lamp is 0.3 A.

resistance = potential difference ÷ current ( $R = V / I$ )

(3)

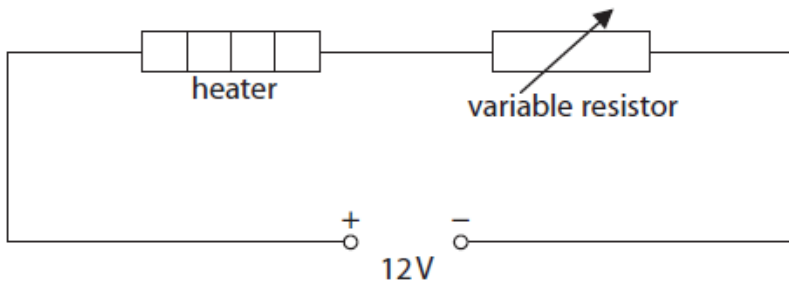
resistance = .....  $\Omega$

**(Total for Question = 8 marks)**

Q14.

A technician investigates the potential difference (voltage) across an electrical heater.

This circuit diagram shows the circuit the technician uses.



(i) Add a voltmeter to the circuit which will measure the potential difference (voltage) across the heater.

(2)

(ii) The resistance of the heater is  $15 \Omega$ .

The current in the heater is  $0.56 \text{ A}$ .

Calculate the potential difference (voltage) across the heater.

(2)

potential difference = ..... V

(iii) The technician changes the value of the variable resistor.

She measures the new voltage across the heater and the new current in it.

Here are her results:

voltage =  $6.0 \text{ V}$

current =  $0.40 \text{ A}$ .

Calculate the amount of electrical energy transferred in  $30 \text{ s}$  by the heater.

(2)

energy transferred = ..... J

(iv) The total energy supplied by the battery in  $30 \text{ s}$  is  $144 \text{ J}$ .

Explain why your answer in (iii) is not the same as the total energy supplied by the battery.

(2)

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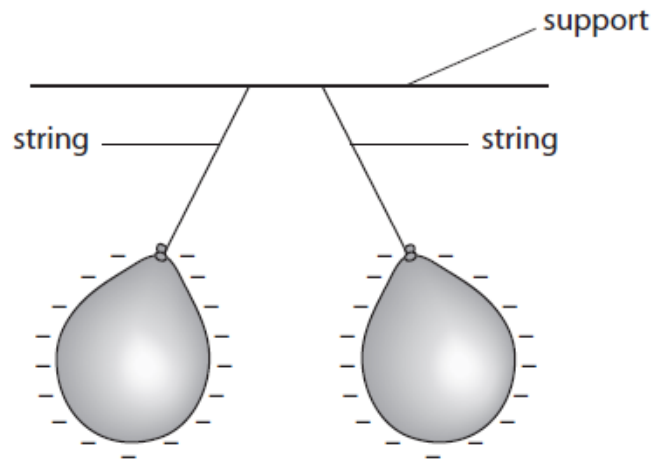
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Q15.

(a) A student ties two balloons to a support with some string. The student rubs both balloons with a dry cloth which gives the balloons a negative charge. The diagram shows the balloons after they were rubbed.



Use words from the box to complete the sentences.

(4)

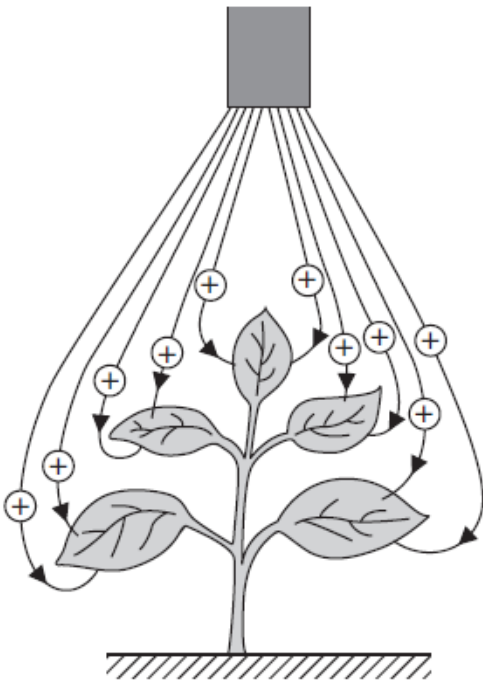
attract	charge	electrons	negative	neutral
neutrons	positive	protons	repel	support

The balloons ..... each other because they have the same .....

The cloth is left with a ..... charge.

The charged particles that are transferred from the cloth to the balloons are called .....

(b) The diagram shows an electrostatic insecticide spray being used on a plant. The plant is initially uncharged. Each droplet of spray is given a positive charge.



(i) Explain the advantages of using an electrostatic insecticide spray compared to an uncharged insecticide spray.

(3)

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(ii) There is a current of 0.008 A in the sprayer for a time of 10 minutes.

Calculate the charge supplied to the sprayer in this time.

(3)

charge = ..... C

**(Total for Question = 10 marks)**