Electric charge

1 (a) A plastic rod and a piece of cloth are both uncharged.

A student rubs the plastic rod with the cloth.

The plastic rod becomes negatively charged.

(i) Compared with the plastic rod, which row of the table is correct for the charge on the cloth?

Put a cross (☒) in the box next to your answer.

(1)

	sign of charge	size of charge
☐ **A**	positive	equal
☐ **B**	negative	equal
☐ **C**	positive	bigger
☐ **D**	negative	bigger

(ii) Explain how the plastic rod becomes negatively charged.

(2)

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(iii) The student then holds the plastic rod near to a stream of water coming from a tap.

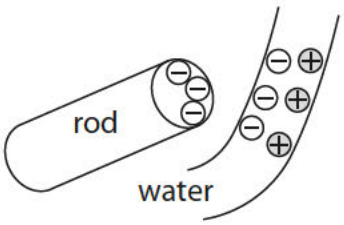
The stream of water bends towards the plastic rod.



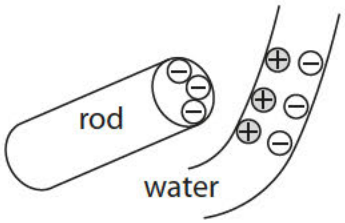
Which picture shows the correct arrangement of charges in the stream of water?

Put a cross (☒) in the box next to your answer.

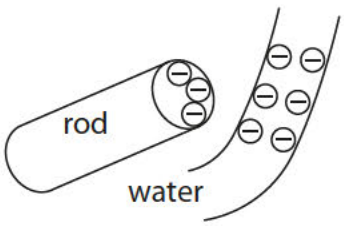
(1)



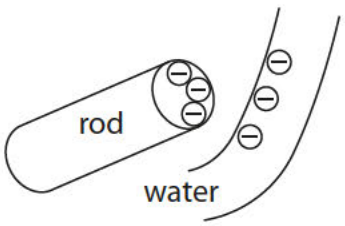
☐ **A**



☒ **B**



☐ **C**



☒ **D**

(iv) The student puts the plastic rod into the stream of water and pulls it out.

Now, when he holds the plastic rod near the stream of water, the stream of water does not bend.

Suggest why the stream of water does not bend.

(1)

(b) 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

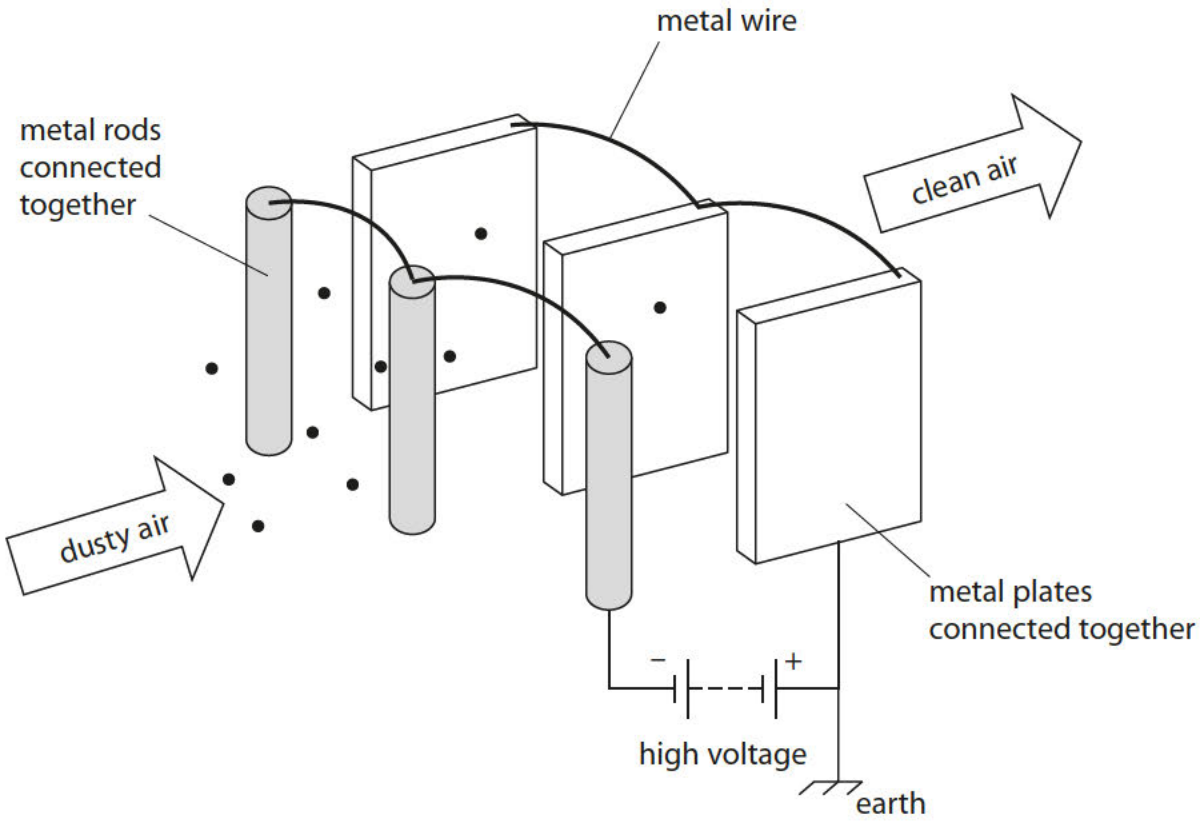
(Total for Question 2 = 8 marks)

Electrostatic air filters

2 An electrostatic air filter is designed to remove dust particles from the air in a room.

A fan blows dusty air past several metal rods and metal plates.

There is a large potential difference (voltage) between the metal rods and the metal plates.



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

When dusty air goes past the metal rods, the dust particles become negatively charged.

This is because the dust particles

(1)

☐ **A** lose electrons

☐ **B** lose protons

☐ **C** gain electrons

☐ **D** gain protons

(b) When the dusty n the metal plates.

Explain why the dust particles settle on the metal plates.

(2)

(c) (i) State what happens to the charge on the dust particles when they settle on the metal plates.

(1)

(ii) Explain why the charge does not build up on the metal plates.

(2)

(d) There is a current of 1.2 mA in the circuit.

Calculate the charge transferred by this current in 40 s.

State the unit.

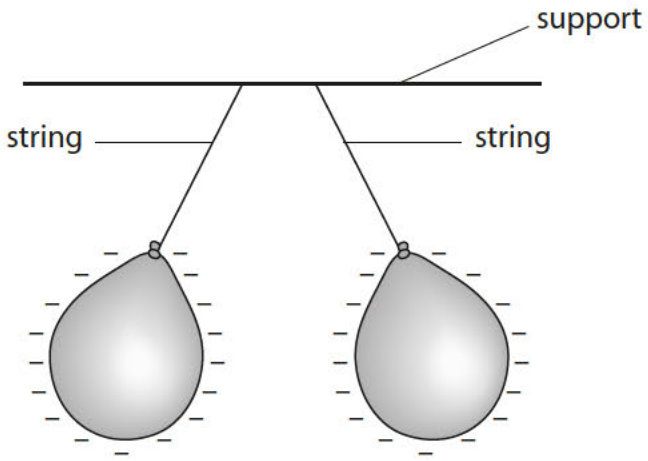
(3)

charge transferred = ... unit: .....

(Total for Question 2 = 9 marks)

Static electricity

3 (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	cha ge	el trons	nega e
neutra	neutrons	posi e	p otons
epel	su t		

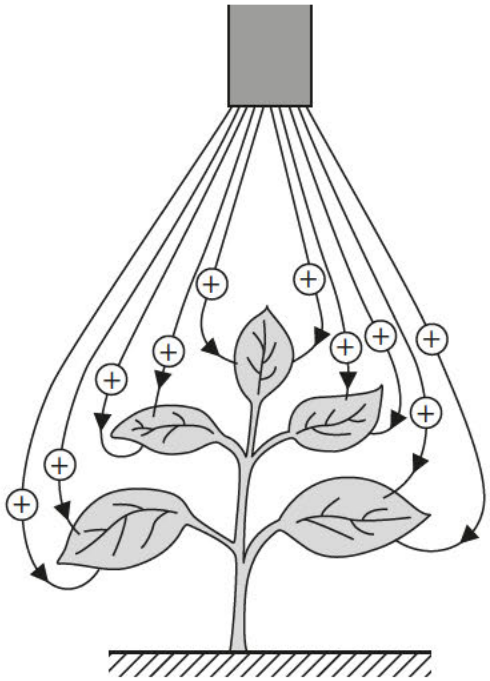
The balloons ..... each other because they have the same .....

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

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

called .....

(b) The diagram show .
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 3 = 10 marks)

4 (a) A student rubs a plastic rod with a dry cloth. The cloth becomes positively charged.

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

The cloth becomes positively charged because

(1)

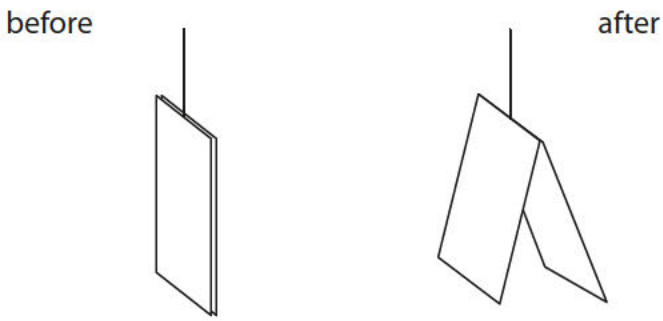
☐ **A** negative charge has moved from the cloth to the rod

☐ **B** negative charge has moved from the rod to the cloth

☐ **C** positive charge has moved from the cloth to the rod

☐ **D** positive charge has moved from the rod to the cloth.

(ii) Two plastic strips are joined at the top and are hanging by a thread.
The student rubs both strips with another dry cloth.
The diagram shows the two plastic strips before and after the student rubs them.



Explain why the strips behave in this way after they are rubbed with the cloth.

(2)

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(b) The student reads an article about the possible build-up of static electricity during the refuelling of an aircraft.

(i) Explain why this build-up could be dangerous.

(2)

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(ii) The article also states that the aircraft is connected by a metal cable to the ground. The aircraft is also connected by a metal cable to the refuelling tanker.

Explain how these cables reduce the dangers when refuelling the aircraft.

(3)

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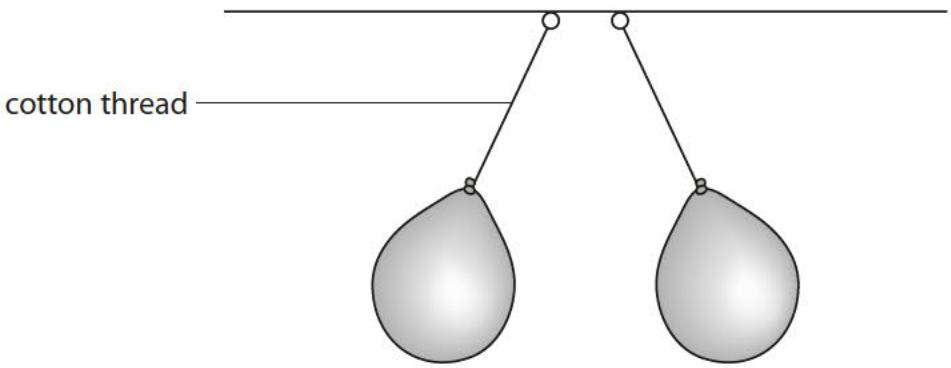
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(Total for Question 1 = 8 marks)

5 (a) A student charges two balloons and hangs them side by side.



Explain why the cotton threads are not vertical.

(2)

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(b) The student rubs another balloon with a cloth.
This balloon becomes negatively charged.

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

Compared to the charge gained by the balloon, the cloth gains

(1)

☐ **A** a larger negative charge

☐ **B** a larger positive charge

☐ **C** an equal negative charge

☐ **D** an equal positive charge

(ii) Explain why the balloon became negatively charged when it was rubbed with the cloth.

(2)

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(iii) The student then puts this charged balloon against a metal cabinet.

Describe what happens to the charge on the balloon where it touches the metal cabinet.

(2)

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(iv) The student charges another balloon and holds it against a wall. The charged balloon sticks to the wall when he lets go.

Suggest why the balloon is attracted to the wall.

(1)

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(Total for Question 2 = 8 marks)