Static electricity

1 (a) A student wins a trophy. It is a metal cup on a black plastic base.



The student cleans the trophy.
She holds one of the metal handles and rubs the rest of the trophy with a dry cloth.

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

The plastic base becomes negatively charged because it gains

(1)

☒ **A** atoms

☒ **B** electrons

☒ **C** neutrons

☒ **D** protons

(ii) Explain why the base gains a negative charge when she rubs the trophy with the cloth.

(2)

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(iii) The metal cup does not become charged when she rubs the trophy.
Suggest why the cup does not become charged.

(2)

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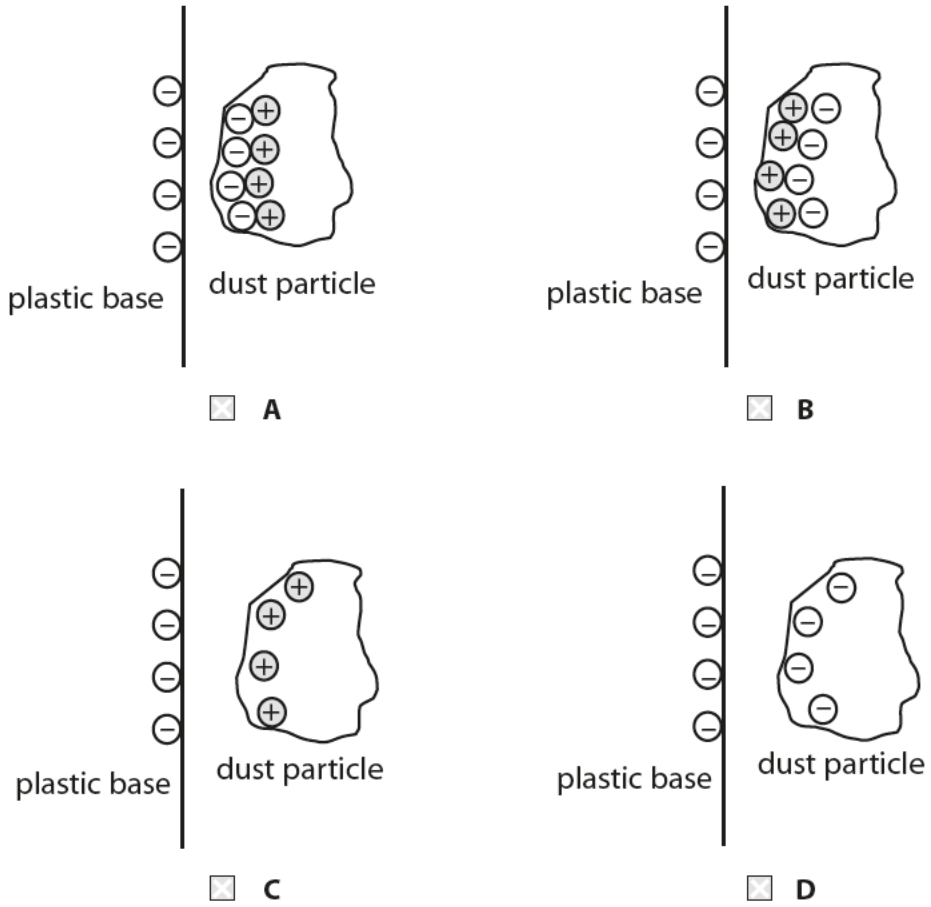
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(iv) Some dust particles in the air drift near to the plastic base just after she cleans the trophy.

Which diagram shows the correct distribution of charges on a dust particle near to the charged plastic base?

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

(1)



☒ **A**

☒ **B**

☒ **C**

☒ **D**

(b) Describe **one** situation where separation of electric charge can create a spark.

(2)

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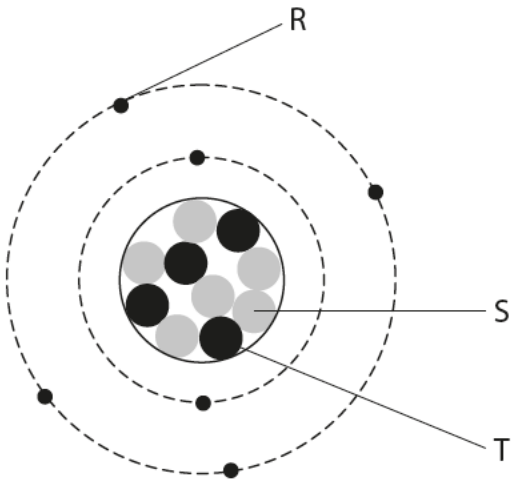
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(Total for Question 1 = 8 marks)

Static electricity

2 (a) The diagram represents an atom.
The atom is neutral.



Draw **one** straight line from each letter in the boxes to the particle.

(2)

letter	particle
R	proton
S	neutron
T	electron

(b) A boy combs his hair using a plastic comb.
His hair becomes positively charged.



(i) Explain what happens to the boy's hair when it becomes positively charged.

(2)

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

His plastic comb also becomes charged.
If a copper comb was used, it would not become charged.

This is because the copper is

(1)

☐ **A** an insulator

☐ **B** a conductor

☐ **C** magnetic

☐ **D** non-magnetic

(iii) The boy puts his charged comb near some small pieces of paper.

Explain what happens.

(3)

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(Total for Question 2 = 8 marks)

3 A light, polystyrene ball is coated with a thin layer of metal.

Diagram 1 shows the ball on a metal plate.
In diagram 2, the plate has been charged and the ball is rising to hit the earthed lid.

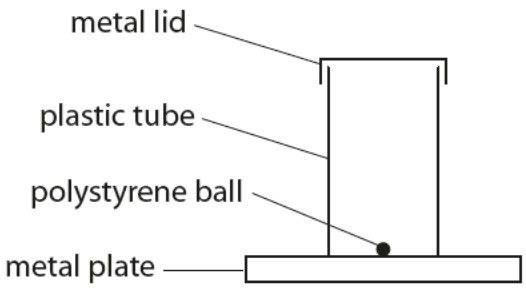


diagram 1

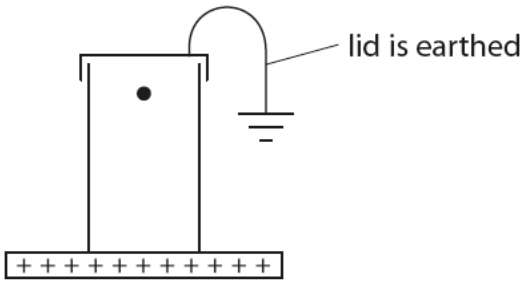


diagram 2

(a) (i) State the sign of the charge on the ball as it moves upwards.

(1)

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(ii) Explain why the ball moves upwards.

(2)

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(b) The ball discharges when it hits the earthed lid.

Explain how the ball loses its charge.

(2)

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(c) The ball continues to move up and down between the charged plate and the earthed lid.

Explain why the ball continues to move up and down.

(2)

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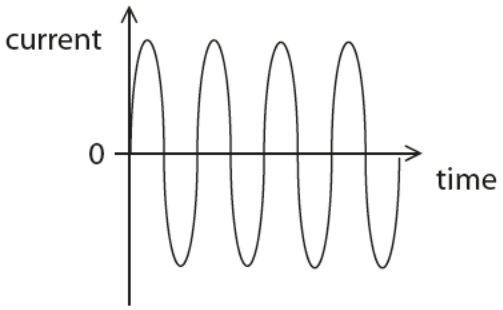
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(d) The current in the wire connected to earth may be described by a graph.

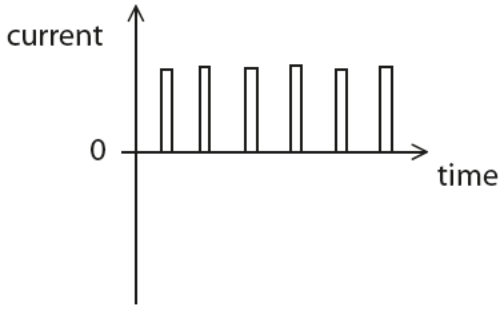
Which of these graphs best shows the current in the earth wire?

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

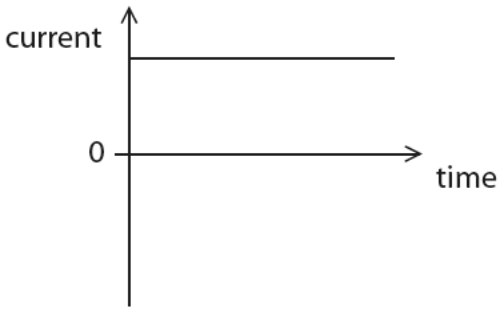
(1)



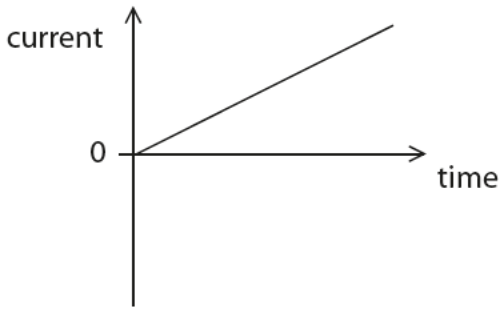
☒ **A**



☒ **B**



☒ **C**



☒ **D**

(Total for Question 2 = 8 marks)

4 An atom contains electrons, neutrons and protons.

(a) Use words from the box to complete the sentences.

neutral	e
much larger than a neutron	much smaller than a neutron
positive	the same size as a neutron

(i) The charge on an electron is .....

(1)

(ii) An electron has a mass that is .....

(1)

(b) At a petrol station, a pipe is used to transfer petrol to the storage tanks.

The pipe is earthed.

There is friction between the petrol and the end of the pipe.

(i) Explain why it is dangerous **not** to earth the pipe.

(2)

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(ii) Explain how earthing the pipe makes this process much safer.

(2)

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*(c) The photographs show some electrostatic effects.



positively charged balloon near hair



positively charged rod near some paper



positively charged balloon near a thin stream of water

Explain in terms of electric charges how **one** of these effects is caused.

You may include diagrams to help with your answers.

(6)

(Total for Question 6 = 12 marks)

Charge and Current

5 A battery sends a current through a metal wire.

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

Direct current is movement of charge

(1)

☒ **A** backwards and forwards

☒ **B** in many directions

☒ **C** in one direction

☒ **D** up and down

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

The particles that flow in the metal wire are

(1)

☒ **A** atoms

☒ **B** electrons

☒ **C** protons

☒ **D** neutrons

(b) The current in a wire is 3.7 A.

Calculate the charge that flows into the wire in 13 s.

(2)

charge = ... C

(c) Plastic is an insulator.

A student rubs a piece of plastic with a cloth.

This gives the plastic a negative charge.

(i) Explain how the plastic is charged by the rubbing.

(2)

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(ii) The cloth is also charged when it rubs against the plastic.

Describe the charge on the cloth.

(2)

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(Total for Question 1 = 8 marks)