



7.9.4 Static Electricity



71 minutes



79 marks

- Q1.** The diagram shows a student after rubbing a balloon on his hair. The balloon and hair have become charged.



- (a) Draw a ring around the correct answer in the box to complete the sentence.

- (i) After rubbing, the charge on his hair is

positive.
negative.
neutral.

(1)

- (ii) When the balloon is rubbed on his hair the balloon gains

neutrons.
protons.
electrons.

(1)

- (b) After the student rubs the balloon on his hair, his hair stands on end.

Explain why.

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.....

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(2)

(Total 4 marks)

- Q2.** A student did an experiment with two strips of polythene. She held the strips together at one end. She rubbed down one strip with a dry cloth. Then she rubbed down the other strip with the dry cloth. Still holding the top ends together, she held up the strips.



- (a) (i) What movement would you expect to see?

.....

(1)

- (ii) Why do the strips move in this way?

.....

(2)

- (b) Complete the **four** spaces in the passage.

Each strip has a negative charge. The cloth is left with a.....
 charge. This is because particles called have been transferred
 from the to the

(4)

- (c) The student tried the experiment using two strips of aluminium. The strips did not move.

Complete **each** of the sentences.

- (i) Materials, such as aluminium, which electricity will pass through easily, are
 called

(1)

- (ii) Materials, such as polythene which electricity will **not** pass through easily, are
 called

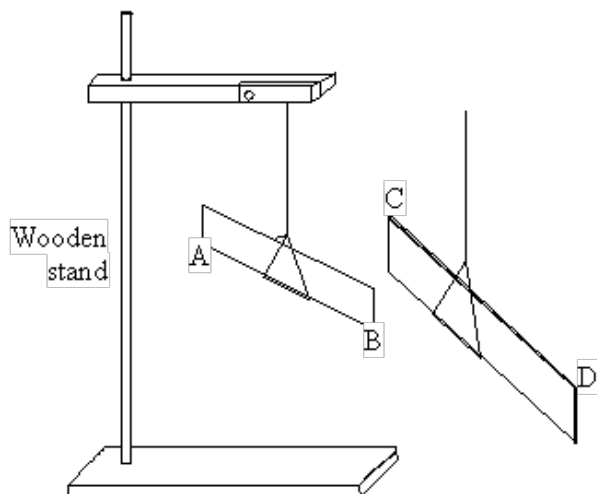
(1)

(Total 9 marks)

Q3. A pupil did an experiment following the instructions below.

1. Take a polythene rod (AB), hold it at its centre and rub both ends with a cloth.
2. Suspend the rod, without touching the ends, from a stand using a stirrup and nylon thread.
3. Take a perspex rod (CD) and rub it with another cloth.
4. Without touching the ends of the perspex rod bring each end of the perspex rod up to, but without touching, each end of the polythene rod.
5. Make notes on what is observed.

The diagram below shows how the apparatus is to be set up.



(a) When end C was brought near to end B they attracted each other.

(i) Explain why they attracted each other.

.....
.....

(ii) What would happen if end C were brought near end A?

.....

(3)

(b) The experiment was repeated with two polythene rods.

(i) Describe what you would expect the pupil to observe as the end of one rod was brought near to the end of the other.

.....
.....

(ii) Explain your answer.

.....
.....

(2)

(c) Explain, in terms of electron movement, what happened as the rods were rubbed with the cloths.

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.....
.....
.....

(3)

(Total 8 marks)

Q4. You wash and dry your hair, then comb it with a plastic comb. As you move the comb away from your head some hairs are attracted to the comb.

(a) What has happened to the comb to make it attract the hairs?

.....
.....

(1)

(b) If the comb is now held above some small pieces of dry tissue paper what is likely to happen?

.....
.....

(1)

(c) If you rub your hands all over the comb it will no longer attract your hair. Explain why.

.....
.....

(2)

(Total 4 marks)

- Q5.** (a) A student rubs a nylon comb on the sleeve of his jumper.



- (i) Use words from the box to complete the following sentence.

electrons	hand	jumper	protons
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The comb becomes negatively charged because move
from the student's to the comb.

(2)

- (ii) What type of charge is left on the jumper?

.....

(1)

- (iii) The negatively charged comb is placed close to a charged plastic ruler. The comb and the ruler attract each other.

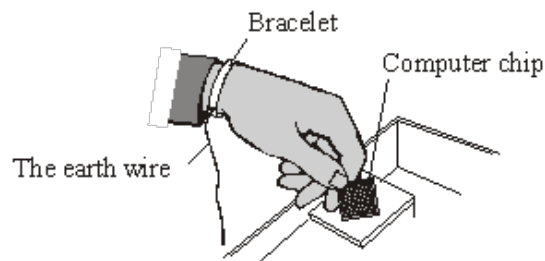
Complete the following sentence by drawing a ring around the correct line in the box.

The ruler is

negatively charged
positively charged
uncharged

(1)

- (b) Electrostatic charge can damage computer chips. People working with computer chips may wear a special bracelet, with a wire joining the bracelet to earth (the earth wire). Any negative charge on the person will flow through the wire to earth.



- (i) Which **one** of the following materials should the bracelet be made from?

Draw a ring around your answer.

copper plastic rubber

Give a reason for your answer.

.....
.....

(2)

- (ii) Which **one** of the following words is used to describe the rate of flow of charge through a wire?

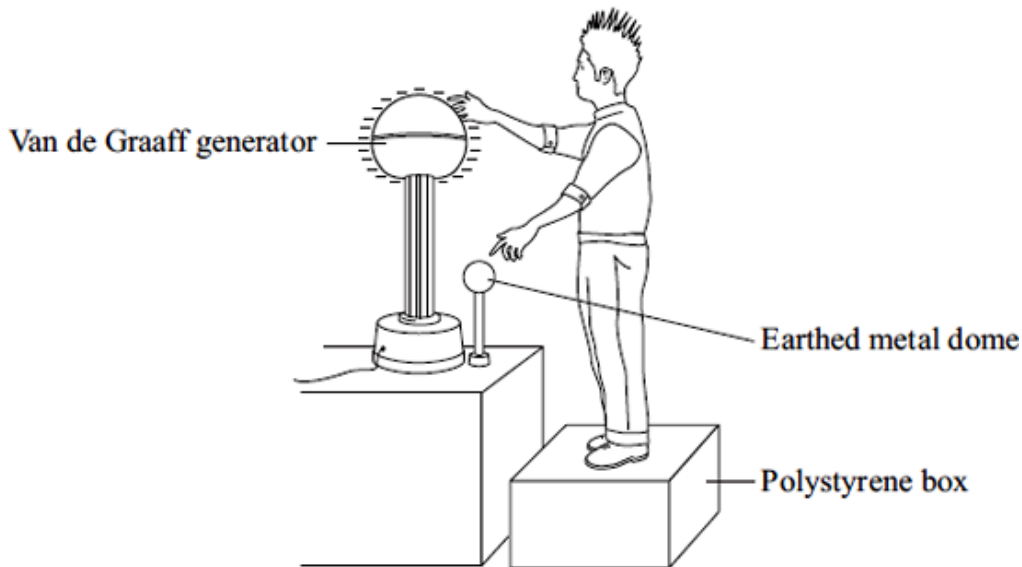
Draw a ring around your answer.

current resistance voltage

(1)

(Total 7 marks)

- Q6.** (a) The diagram shows a student touching the metal dome of a Van de Graaff generator. When the generator is switched on, the metal dome becomes negatively charged.



Explain why the student's hair stands on end when the generator is switched on.

.....

(2)

- (b) When the potential difference between the student and a nearby earthed metal dome reached 15 kV, a spark jumped between the student and the earthed dome. The spark transformed 30 mJ of energy into heat, light and sound. (1 mJ = 0.001 J)

Use the equation in the box to calculate the charge carried by the spark.

$\text{energy transformed} = \text{potential difference} \times \text{charge}$
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.....

Charge transferred = coulombs

(2)

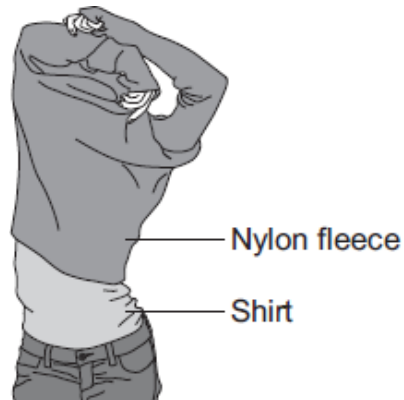
- (c) What name is given to the rate of flow of charge?

.....

(1)

(Total 5 marks)

- Q7.** (a) A student takes off his nylon fleece and feels a small electric shock. He realises that this happens because his fleece becomes charged.



Explain why the fleece becomes charged.

.....

.....

.....

.....

.....

(2)

- (b) Only **two** of the following statements are correct.

Put a tick (✓) in the boxes next to the **two** correct statements.

Positively charged objects repel negatively charged objects.

☐

Electrical charges move easily through metals.

☐

Static electricity is safe; it never causes any danger.

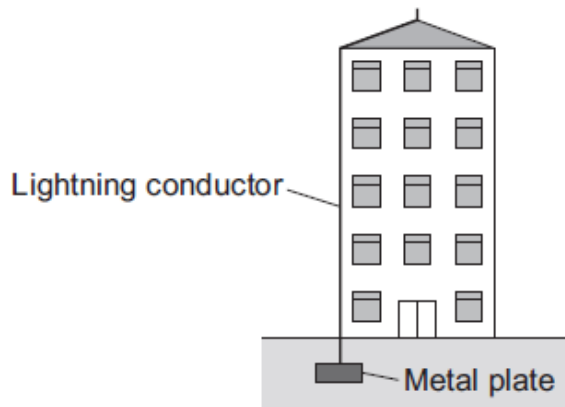
☐

An electric current is a flow of electrical charge.

☐

(2)

- (c) The diagram shows a lightning conductor attached to the side of a tall building.



If the building is struck by lightning, charge flows to earth through the lightning conductor.

- (i) Which of the materials in the list is used to make the lightning conductor?

Draw a ring around your answer.

copper

glass

plastic

Give a reason for your answer.

.....

.....

.....

(2)

- (ii) Complete the sentence by drawing a ring around the correct line in the box.

The resistance of the lightning conductor is

higher than

the same as

lower than

the resistance of the building.

(1)

- (iii) It is almost impossible to test different designs of lightning conductor in controlled experiments during a lightning storm.

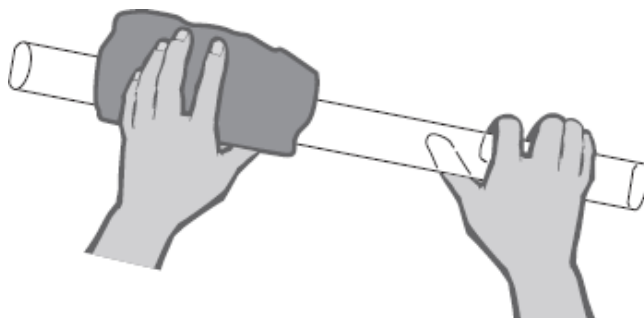
Suggest a reason why.

.....

.....

(1)
(Total 8 marks)

- Q8.** (a) The diagram shows a polythene rod being rubbed with a woollen cloth.



The polythene rod becomes negatively charged.

Explain how this happens.

.....

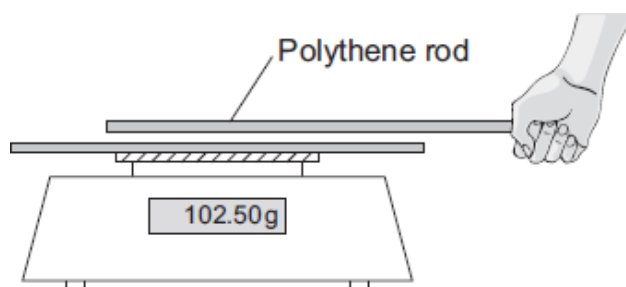
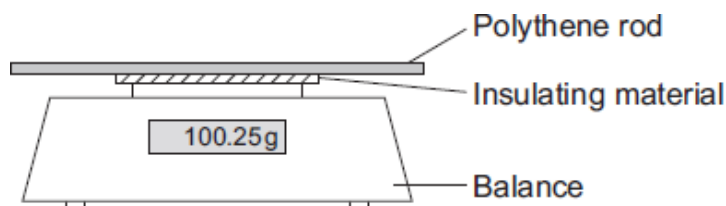
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(2)

- (b) A student put the charged polythene rod on to a balance. The rod was separated from the metal pan of the balance by a thin block of insulating material. The student then held a second charged polythene rod above, but **not** touching, the first rod. The reading on the balance increased.



- (i) Explain why the reading on the balance increases.

.....

.....

.....

.....

(2)

- (ii) The student observed that the nearer the two rods are to each other, the bigger the increase in the balance reading.

What should the student conclude from this observation?

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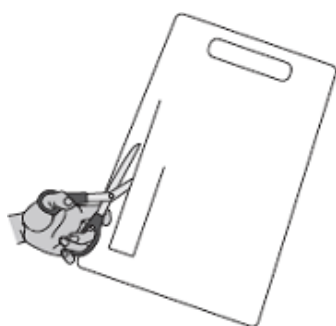
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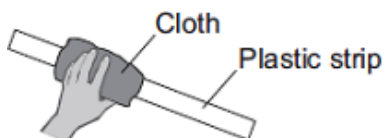
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(2)
(Total 6 marks)

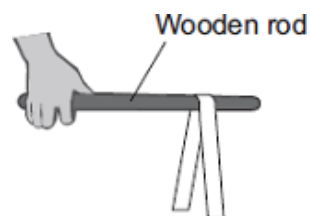
- Q9.** (a) A student uses some everyday items to investigate static electricity.



1 A strip of plastic is cut from a plastic carrier bag



2 The plastic strip is rubbed with a cloth



3 The plastic strip is hung over a wooden rod

- (i) Draw a ring around the correct answer in the box to complete each sentence.

Rubbing the plastic strip with a cloth causes the strip to become negatively charged.

This happens because

electrons
neutrons
protons

move from the cloth onto the plastic strip.

The cloth is left with

a negative
a positive
zero

charge.

(2)

- (ii) When the plastic strip is hung over the wooden rod, the two halves of the strip move equally away from each other.

What **two** conclusions should the student make about the forces acting on the two halves of the plastic strip?

- 1
-
- 2
-

(2)

- (b) Electrical charges move more easily through some materials than through other materials.

Through which **one** of the following materials would an electrical charge move most easily?

Draw a ring around your answer.

aluminium

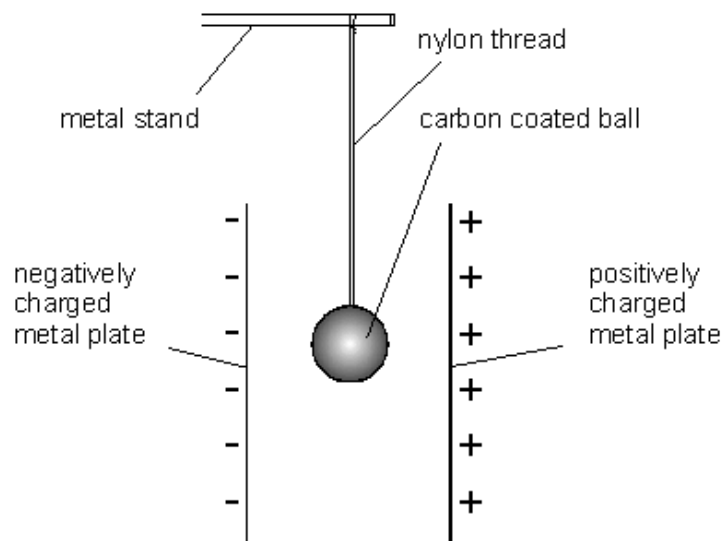
glass

rubber

(1)

(Total 5 marks)

Q10. An experiment is set up as shown.



The plates are charged. The ball is moved across to touch the positive plate, and becomes positively charged. It is repelled from the plate.

- (a) (i) Why is the ball repelled from the positive plate?

-
-

1 mark

(ii) Why is the ball pulled towards the negative plate?

.....

1 mark

(b) The ball reaches the negatively charged plate, touches it, and moves back quickly. Explain why it moves away quickly.

.....

2 marks

(c) Nylon is an insulator. Explain why an insulator is used to hold up the ball rather than a conductor like copper.

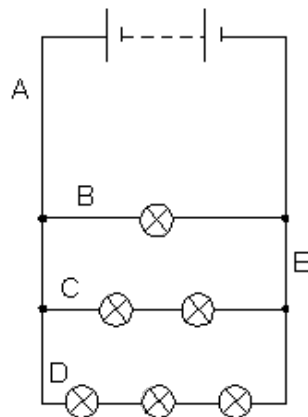
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1 mark

Maximum 5 marks

##

(a) An electrical current is a flow of charge. The diagram shows a circuit containing six identical bulbs.



In which part of the circuit, A, B, C, D or E, is there:

- (i) the greatest flow of charge?
- (ii) the least flow of charge?

2 marks

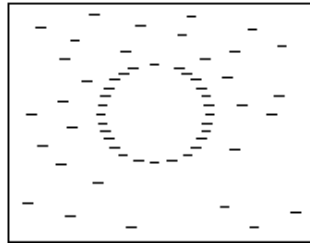
- (b) Sulphur is an electrical insulator, but it can be made to conduct electricity if a very bright light shines on it.

- (i) A slab of sulphur is rubbed with a piece of woollen cloth.
Explain how this gives the sulphur a negative electrical charge.

.....

1 mark

- (ii) A very bright light shines onto a small circular area in the centre of the charged slab of sulphur. The pattern of charge on the sulphur alters. The simplified diagram represents the new pattern of charge.



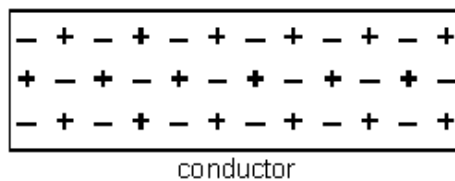
Explain why the pattern alters in this way.

.....

1 mark

Maximum 4 marks

- Q12.** The diagram represents a conductor. It has equal numbers of positive and negative charges.



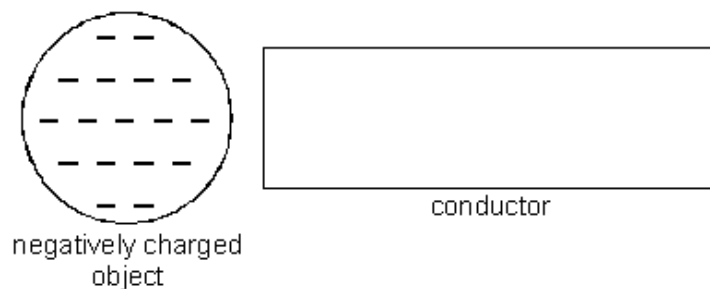
- (a) In the diagram, the + signs and the – signs are shown throughout the conductor. This represents the pattern of positive and negative charges in a real conductor. Why are the charges spread out instead of forming areas of positive charge and areas of negative charge?

.....

1 mark

A negatively charged object is brought near to the conductor. This changes the position of charges in the conductor.

- (b) (i) On the diagram below, draw the new pattern of positive and negative charges in the conductor.



2 marks

- (ii) Why does the pattern of positive and negative charges change in this way?

.....

1 mark

- (c) One end of the conductor is attracted to the negatively charged object and the other end is repelled.

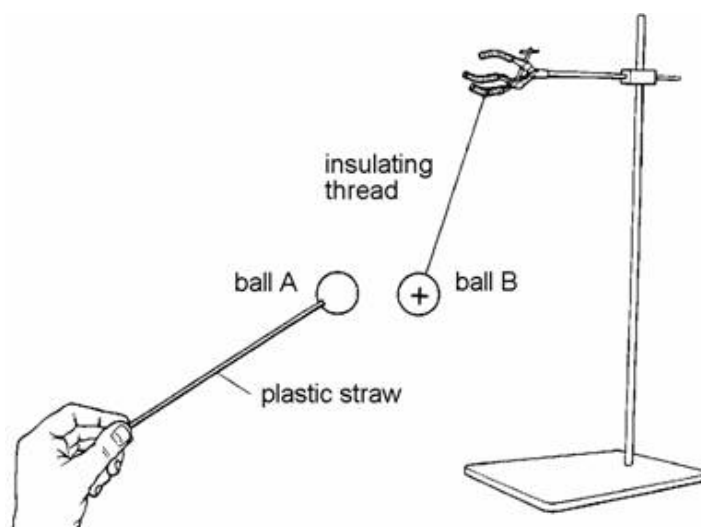
The force of attraction is larger than the force of repulsion. Explain why.

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1 mark
 Maximum 5 marks

##

Two polystyrene balls, A and B, are shown below. Both balls are charged. Ball B is positively charged. The diagram shows what happens when ball A is brought near ball B.



- (a) Ball A is charged. Describe **one** method by which ball A could have been charged.

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1 mark

- (b) Is ball A positively or negatively charged? Explain your answer.

.....
.....

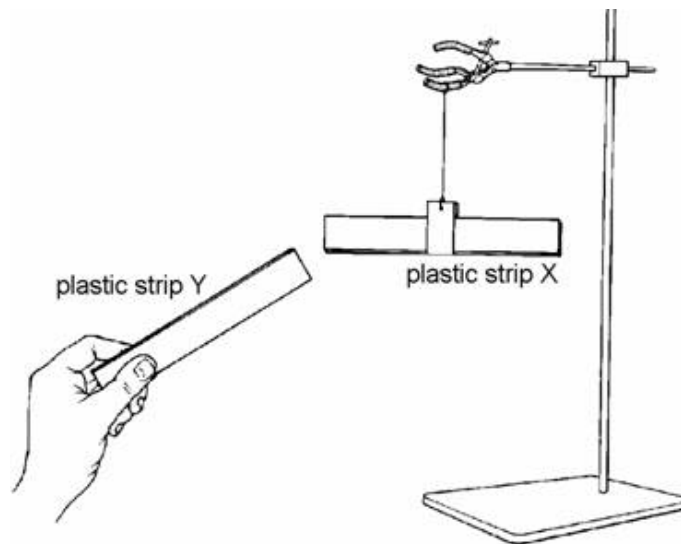
1 mark

- (c) Ball A is moved a little closer to ball B. Which way does ball B move?

.....
.....

1 mark

- (d) Kevin rubs the whole surface of two strips of the same plastic with a cloth. He hangs strip X on a nylon thread. Then he brings strip Y near one end of strip X.



Describe what will happen to strip X and explain your answer.

.....
.....
.....

2 marks

- (e) Describe what will happen if Kevin brings strip Y near the **other** end of strip X and explain your answer.

.....

.....

.....

2 marks
Maximum 7 marks

