Eduqas Physics GCSE
Topic 7.3: Static electricity - forces and electric fields
Questions by topic

1.

Figure 6 shows a Van de Graaff generator that is used to investigate static electricity.

Before it is switched on, the metal dome has no net charge.

After it is switched on, the metal dome becomes positively charged.

Figure 6

1 Explain how an uncharged object may become positively charged.

[3 marks]

2 **Figure 7** shows a plan view of the positively charged metal dome of a Van de Graaff generator.

Draw the electric field pattern around the metal dome when it is isolated from its surroundings.

Use arrows to show the direction of the electric field.

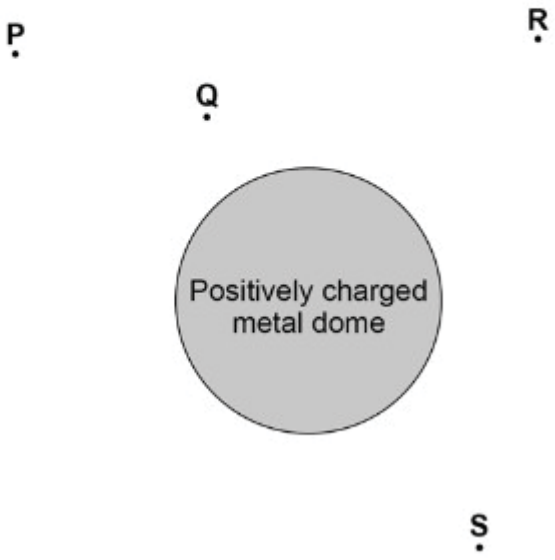
[2 marks]

Figure 7

3 Another positively charged object is placed in the electric field.

Look at **Figure 8**.

Figure 8



In which position would the object experience the greatest force?

Tick **one** box.

[1 mark]

P ☐

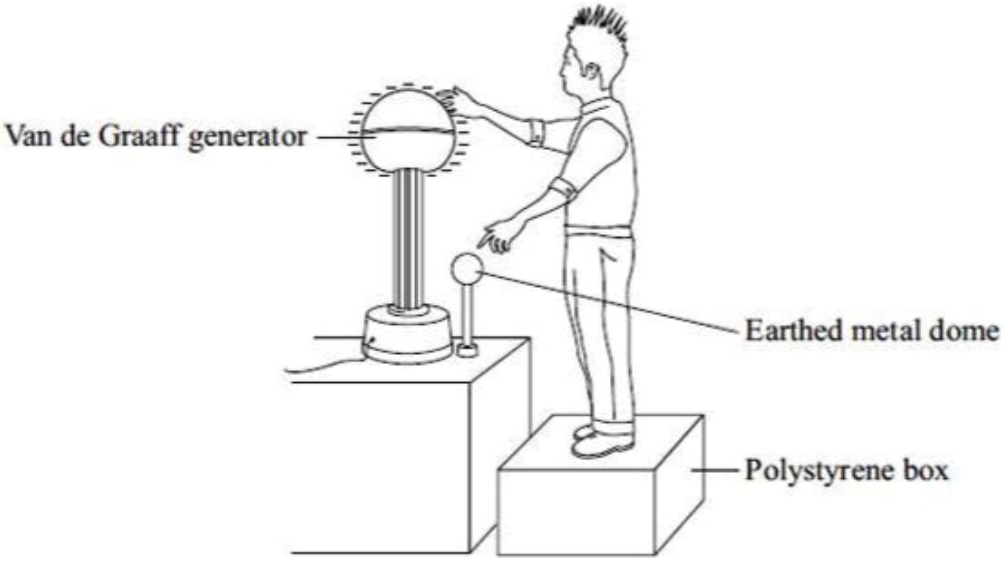
Q ☐

R ☐

S ☐

2.

(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.

energy transformed = potential difference × charge

.....

.....

Charge transferred =..... coulombs

(2)

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

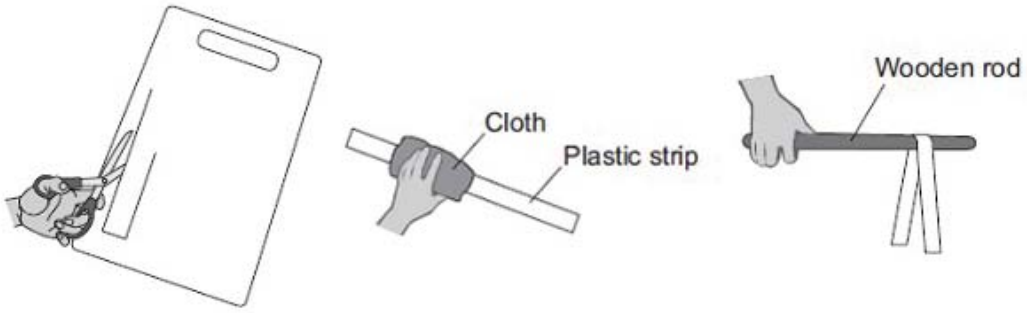
.....

(1)

(Total 5 marks)

3.

.(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.

(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 .....

.....

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

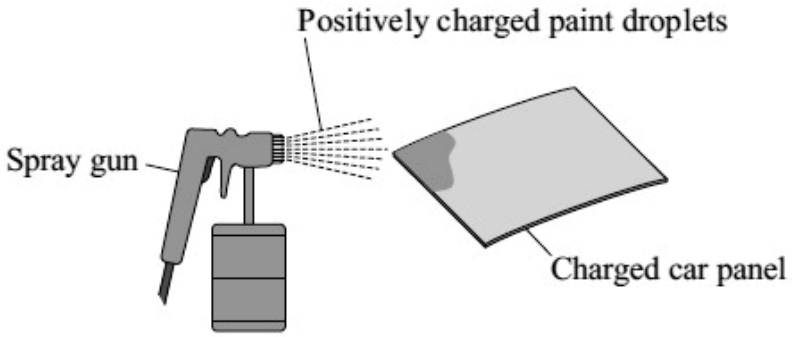
Through which **one** of the following materials would an electrical charge move most easily?

Draw a ring around your answer.

aluminium **glass** **rubber**

(1)
(Total 5 marks)

4. (a) The diagram shows how static electricity is used to paint a metal car panel.



Use words from the box to complete the following sentences.

attract	**opposite**	**repel**	**same**

All the paint droplets have the same type of charge. This makes the paint droplets

..... each other and spread out.

The car panel and the paint droplets have the ..... type of

charge. This causes the car panel to ..... the paint droplets.

The car panel is covered by an even layer of paint.

(3)

(b) In which **one** of the following situations is static electricity dangerous and not useful?

Put a tick (✓) in the box next to your answer.

using a photocopier ☐

refuelling an aircraft ☐

a smoke precipitator ☐

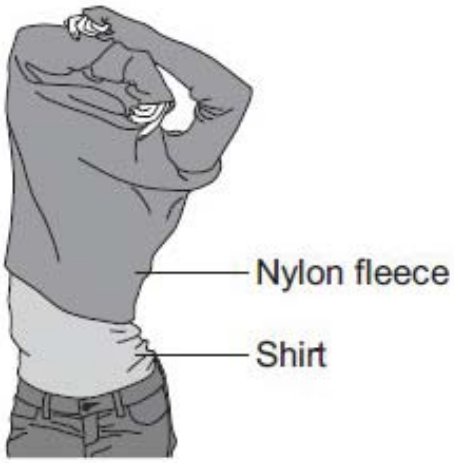
Give a reason for your answer.

.....

.....

(2)
(Total 5 marks)

5. (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. ☐

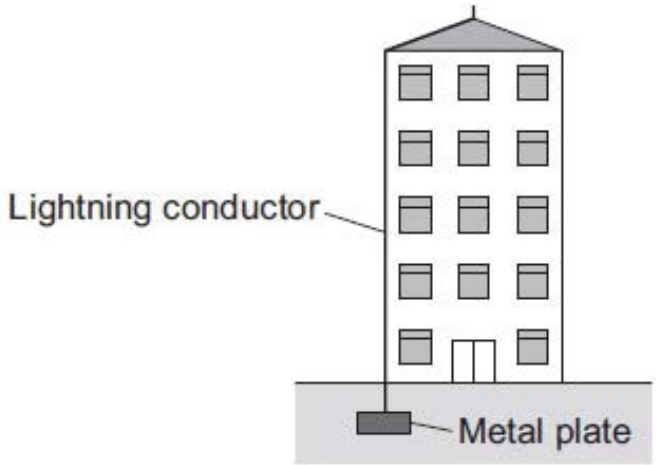
Electrical charges move easily through metals. ☐

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.

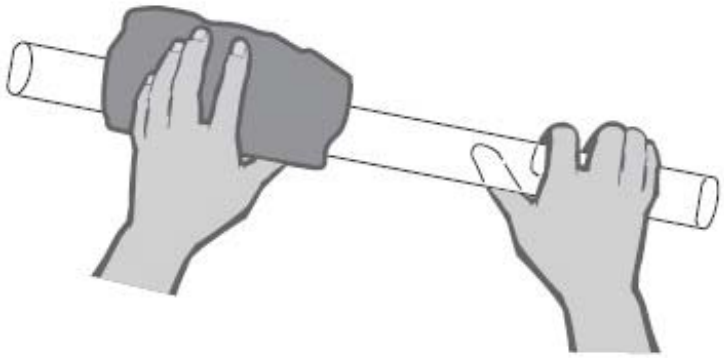
Suggest a reason why.

.....

.....

(1)
(Total 8 marks)

6. (a) The diagram shows a polythene rod being rubbed with a woollen cloth.



The polythene rod becomes negatively charged.

Explain how this happens.

.....

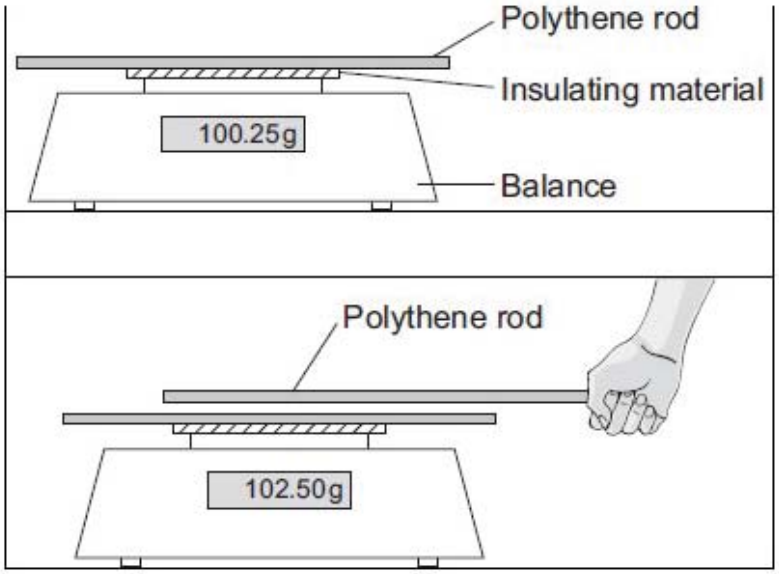
.....

.....

.....

(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)**

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?

.....

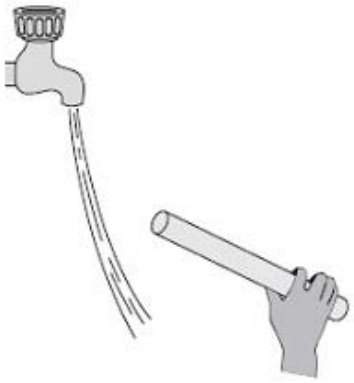
.....

.....

..... **(2)**

(Total 6 marks)

7. (a) The diagram shows a negatively charged plastic rod held near to a thin stream of water. The water is attracted towards the rod.



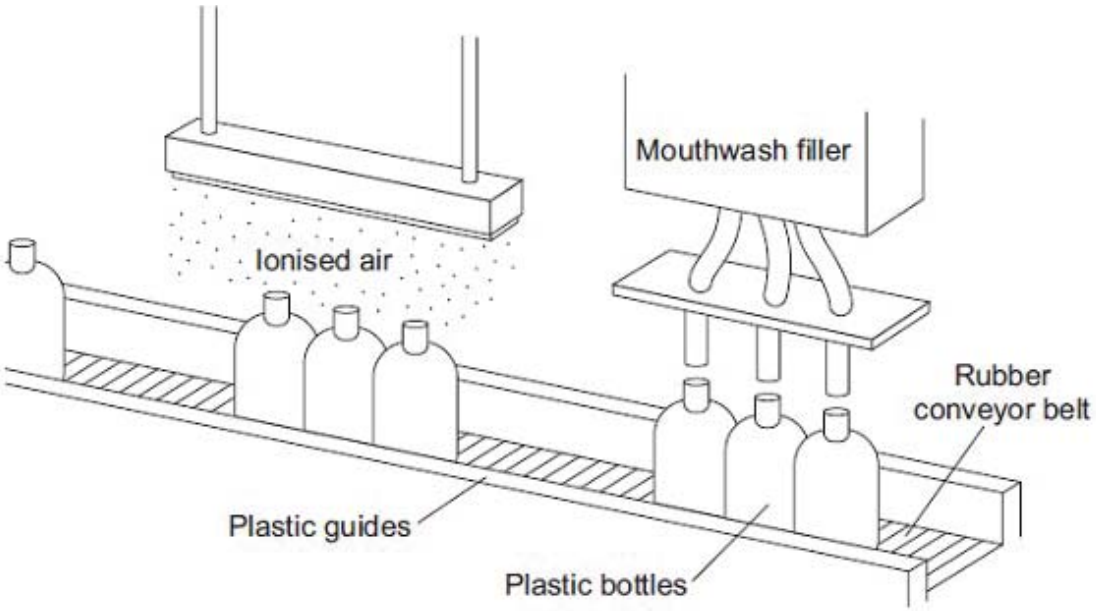
Which **one** of the following statements explains what is happening to the charge in the water?

Tick (✓) **one** box.

The positive and the negative charges in the water are attracted to the rod.	☐
The positive and the negative charges in the water are repelled by the rod.	☐
The negative charge in the water is repelled by the rod and the positive charge is attracted to the rod.	☐
The negative charge in the water is attracted to the rod and the positive charge is repelled by the rod.	☐

(b) A company that produces bottles of mouthwash found a problem with the automatic filling system.

As the bottles go towards the filler, the bottles move around on the conveyor belt and become electrostatically charged. This causes the stream of mouthwash to move sideways, missing the open top of the bottle.



The company came up with an answer to the problem. Before the bottles reach the dfiller, the bottles pass through a stream of ionised air. The ions in the air neutralise the charge on the bottles.

(i) Explain why the plastic bottles became charged.

.....

.....

.....

.....

(2)

(ii) What happens to the structure of an atom to change the atom into an ion?

.....

.....

(1)

(iii) Earthing the conveyor belt with a conducting wire would not have solved this problem.
Give a reason why.

.....

.....

(1)
(Total 5 marks)