AQA GCSE Physics | 8463

SPECIFICATION POINT 4.2.5.1

Static charge

Past-paper questions

Tier	**Foundation**
Question groups	**19**
Available paper years	**2004–2024**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

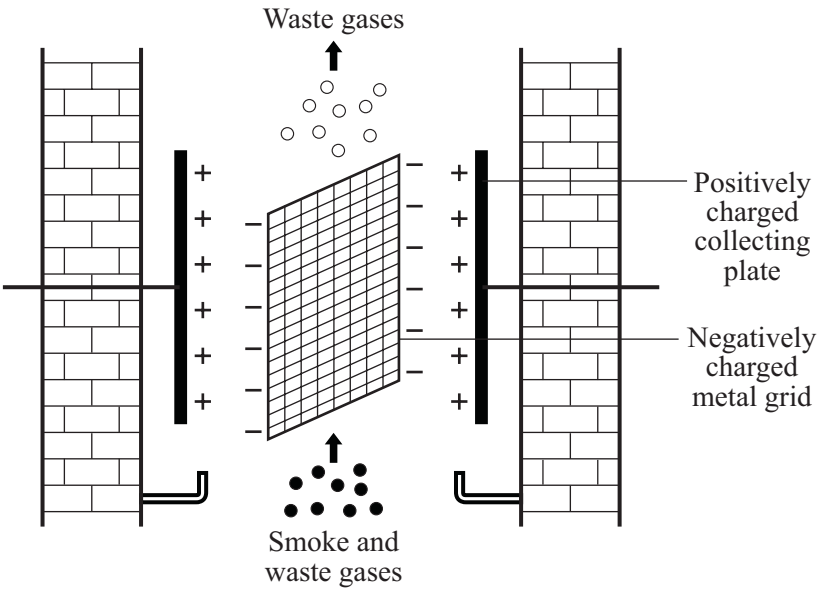
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.2.5.1 Static charge

Question 01

June 2004 | 3451F | Original Q4 | Legacy

4 (a) Burning fuels produce smoke particles and waste gases. An electrostatic smoke precipitator can remove the smoke particles from the waste gases.



The following sentences **A** to **E** describe how an electrostatic smoke precipitator works. The sentences are in the wrong order.

A The smoke particles stick to the positively charged collecting plates.

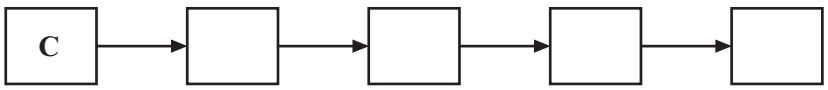
B The smoke particles are given a negative charge.

C The waste gases and smoke pass through a negatively charged metal grid.

D The collecting plates are knocked so the smoke particles fall and can be taken away.

E The smoke particles are repelled from the grid and attracted to the positively charged collecting plates.

Arrange the sentences in the right order. Start with sentence **C**.



(3 marks)

4.2.5.1 Static charge

Question 01 · continued

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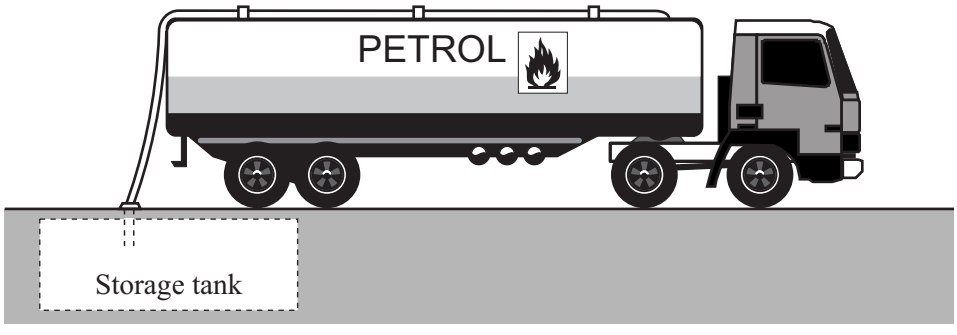
MARGIN BLANK

(b) The underground storage tanks at petrol stations are filled from tankers. A static electric charge can build up on the tanker as the petrol flows through the pipe to the storage tank. This could be dangerous.



Why is the static electric charge dangerous and what should be done to stop the charge building up?

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(2 marks)

(c) A 3-pin plug should always be fitted with the correct value fuse for a particular electrical appliance. The fuse protects the appliance and wires from damage.

Explain how a fuse works.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

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.....

(3 marks)

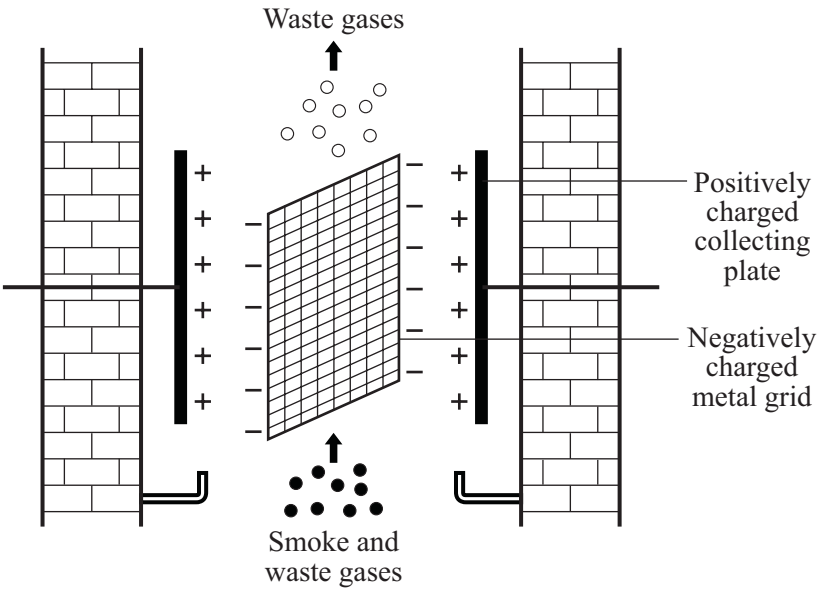
8

4.2.5.1 Static charge

Question 02

June 2004 | 3462F3 | Original Q4 | Legacy

4 (a) Burning fuels produce smoke particles and waste gases. An electrostatic smoke precipitator can remove the smoke particles from the waste gases.



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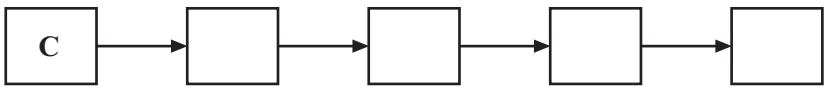
B The smoke particles are given a negative charge.

C The waste gases and smoke pass through a negatively charged metal grid.

D The collecting plates are knocked so the smoke particles fall and can be taken away.

E The smoke particles are repelled from the grid and attracted to the positively charged collecting plates.

Arrange the sentences in the right order. Start with sentence **C**.



(3 marks)

4.2.5.1 Static charge

Question 02 · continued

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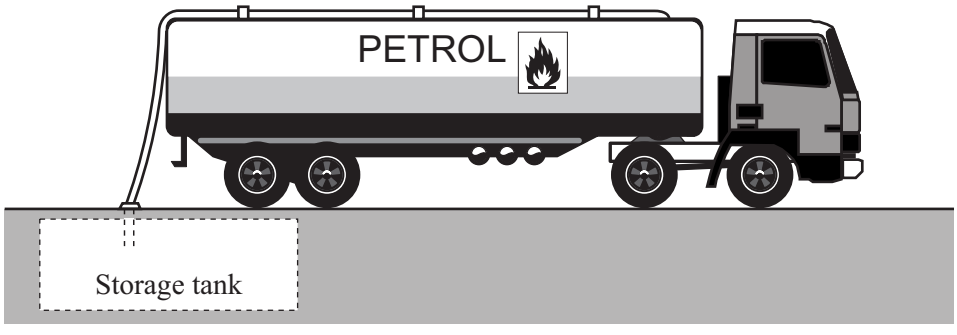
MARGIN BLANK

(b) The underground storage tanks at petrol stations are filled from tankers. A static electric charge can build up on the tanker as the petrol flows through the pipe to the storage tank. This could be dangerous.



Why is the static electric charge dangerous and what should be done to stop the charge building up?

.....

.....

.....

.....

(2 marks)

(c) A 3-pin plug should always be fitted with the correct value fuse for a particular electrical appliance. The fuse protects the appliance and wires from damage.

Explain how a fuse works.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

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.....

.....

(3 marks)

8

4.2.5.1 Static charge

Question 03

June 2005 | 3451 | Original Q6 | Legacy

6 (a) Combing dry hair with a plastic comb makes the comb become positively charged.



Why does the comb become positively charged?

.....

.....

(1 mark)

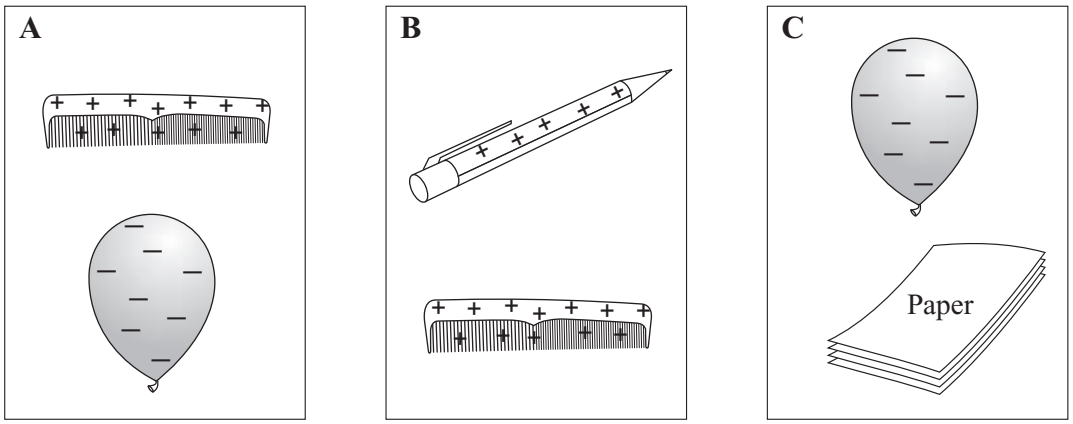
(b) Two objects are drawn in each of the boxes **A**, **B** and **C**. Each object is positively charged, negatively charged or uncharged.

Write under each box whether the two objects will:

repel each other;

attract each other;

do nothing.



....

(3 marks)

4.2.5.1 Static charge

Question 03 · continued

MARGIN
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(c) The following sentences describe how a photocopier uses static electricity to make a photocopy. The sentences are in the wrong order.

A The charge left on the plate has the same pattern as the black parts of the original page.

B The paper is heated to make the powder stick; this is now a photocopy of the original page.

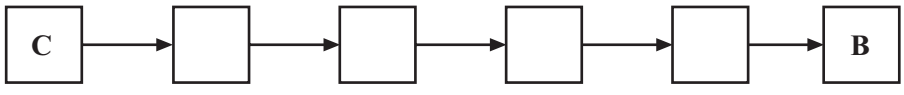
C The copying plate is given a charge. An image of the page to be copied is projected onto the plate.

D The charged parts of the plate attract particles of black powder.

E The black powder is transferred from the plate onto a piece of paper.

F Where light hits the plate, the charge leaks away.

Arrange the sentences in the right order. Start with sentence **C** and end with sentence **B**.



(3 marks)

7

TURN OVER FOR THE NEXT QUESTION

4.2.5.1 Static charge

Question 04

June 2005 | 3462 | Original Q6 | Legacy

6 (a) Combing dry hair with a plastic comb makes the comb become positively charged.



Why does the comb become positively charged?

.....

.....

(1 mark)

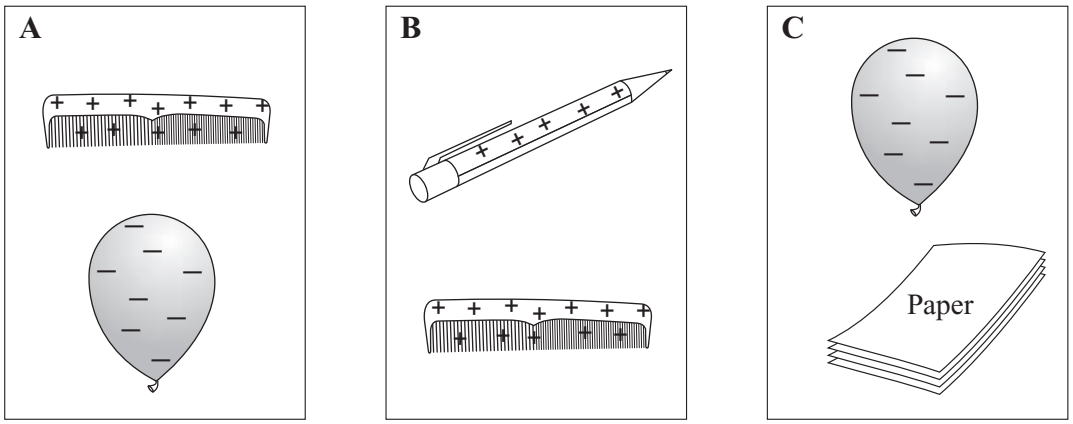
(b) Two objects are drawn in each of the boxes **A**, **B** and **C**. Each object is positively charged, negatively charged or uncharged.

Write under each box whether the two objects will:

repel each other;

attract each other;

do nothing.



....

(3 marks)

4.2.5.1 Static charge

Question 04 · continued

MARGIN
BLANK

(c) The following sentences describe how a photocopier uses static electricity to make a photocopy. The sentences are in the wrong order.

A The charge left on the plate has the same pattern as the black parts of the original page.

B The paper is heated to make the powder stick; this is now a photocopy of the original page.

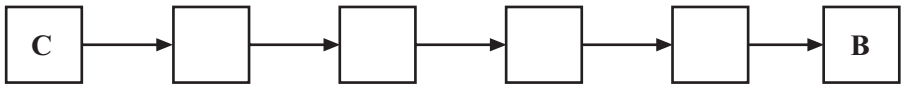
C The copying plate is given a charge. An image of the page to be copied is projected onto the plate.

D The charged parts of the plate attract particles of black powder.

E The black powder is transferred from the plate onto a piece of paper.

F Where light hits the plate, the charge leaks away.

Arrange the sentences in the right order. Start with sentence **C** and end with sentence **B**.



(3 marks)

7

TURN OVER FOR THE NEXT QUESTION

4.2.5.1 Static charge

Question 05

7 During car journeys, the driver will often become electrostatically charged. This is more noticeable on dry days than on damp, humid days.

(a) Explain what happens to cause the driver to become charged.

.....

.....

.....

.....

(2 marks)

(b) Scientists were asked to find out whether the build-up of charge on the driver depends on the type of material used to make the driver's clothes. The results of the investigation are given in the table.

Material	Humidity	Temperature in °C	Charge on the driver in millicoulombs
Nylon	48%	18	3.0 to 3.2
Wool	48%	18	2.4 to 2.5
Cotton	48%	18	1.4 to 1.7

Humidity is a measure of how much water vapour the air can hold.

(i) Why was it important that the scientists controlled the humidity?

.....

.....

(1 mark)

(ii) Does the data in the table show that the charge on the driver would always be less if they were to wear cotton clothing?

Give a reason for your answer.

.....

.....

(1 mark)

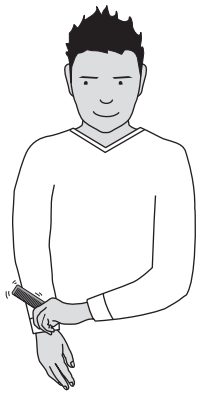
4

4.2.5.1 Static charge

Question 06

June 2008 | PHY2F | Original Q2 | Legacy

2 (a) A student rubs a nylon comb on the sleeve of his jumper.



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

electrons	**hand**	**jumper**	**protons**

The comb becomes negatively charged because ..... move

from the student's ..... to the comb.

(2 marks)

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

.....

(1 mark)

2 (a) (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

.

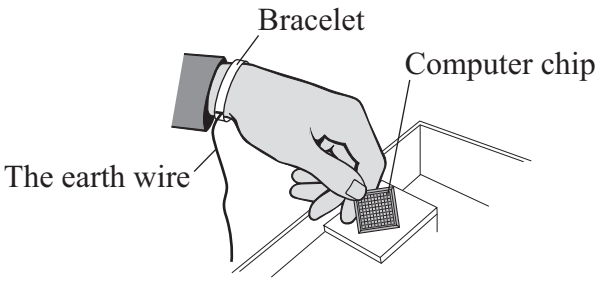
(1 mark)

4.2.5.1 Static charge

Question 06 · continued

for mark

2 (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.



2 (b) (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 marks)

2 (b) (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 mark)

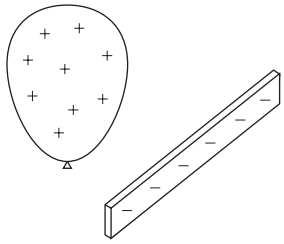
7

4.2.5.1 Static charge

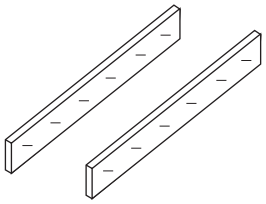
Question 07

January 2009 | PHY2F | Original Q3 | Legacy

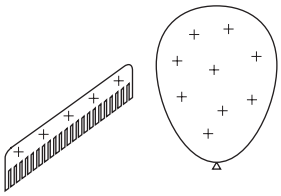
3 (a) The diagrams **X**, **Y** and **Z** show three pairs of charged objects. Each object is either positively charged or negatively charged.



X



Y



Z

3 (a) (i) In which diagram or diagrams do the objects repel each other?

.....

(1 mark)

3 (a) (ii) In which diagram or diagrams do the objects attract each other?

.....

(1 mark)

4.2.5.1 Static charge

Question 07 · continued

for mark

3 (b) The diagram shows a fuel tanker refuelling an aircraft. A static charge can build up as the fuel flows through the pipe to the aircraft. This can be dangerous.



Fuel tanker

3 (b) (i) Static charge could be dangerous in this situation.
Explain why.

.....

.....

.....

.....

(2 marks)

3 (b) (ii) Before refuelling, the aircraft and fuel tanker are joined to earth by a metal wire.

Which **one** of the following statements is the reason why this procedure reduces the danger?

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

The charge will stay in the wire. ☐

The charge will flow to earth. ☐

The charge will move onto the aircraft. ☐

The charge will move onto the fuel tanker. ☐

(1 mark)

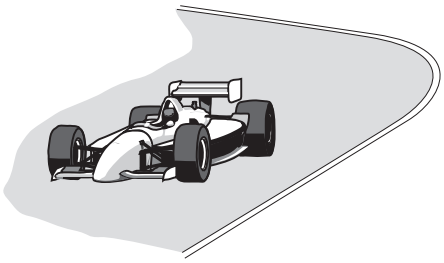
5

4.2.5.1 Static charge

Question 08

January 2009 | PHY3F | Original Q3 | Legacy

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



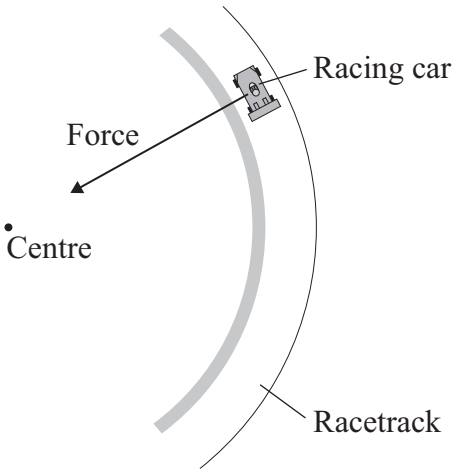
A racing car can accelerate by changing

its direction only
its speed only
either its direction or its speed

.

(1 mark)

3 (b) A racing car moves round a circular part of a racetrack.



A force acts on the racing car. The force is towards the centre of the circular part of the racetrack.

4.2.5.1 Static charge

Question 08 · continued

for mark

Complete the following sentences by drawing a ring around the correct line in each of the boxes.

3 (b) (i) The force is caused by

electrostatics
friction
gravity

.

(1 mark)

3 (b) (ii) The force is a

centripetal force
circular force
perpendicular force

.

(1 mark)

3 (b) (iii) If another racing car has a greater mass and travels at the same speed around the same racetrack, then the force will need to

decrease
stay the same
increase

.

(1 mark)

3 (b) (iv) When the racing car goes faster, the force will need to

decrease
stay the same
increase

.

(1 mark)

Question 3 continues on the next page

4.2.5.1 Static charge

Question 08 · continued

for mark

3 (c) This is an item from a newspaper.

No to racetrack plan

At last night's meeting, one local resident said, "The racetrack will be noisy but motor racing leads to safety improvements in all our cars."

"We'll need better brakes. Motor racing encourages speeding and leads to more accidents", said another.

Most of the residents were against the plan to build a racetrack.

Do you agree with most of the residents?

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

Yes ☐ No ☐ Not sure ☐

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(2 marks)

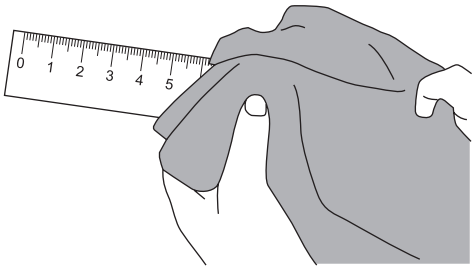
7

4.2.5.1 Static charge

Question 09

June 2009 | PHY2F | Original Q8 | Legacy

8 (a) A plastic ruler is rubbed with a cloth.



The ruler becomes negatively charged.

8 (a) (i) Complete the following sentence by drawing a ring around the correct line in the box.

The ruler becomes negatively charged because it has

gained electrons
lost neutrons
lost protons

.

(1 mark)

8 (a) (ii) How could you show that the ruler is charged?

.....

.....

(1 mark)

Question 8 continues on the next page

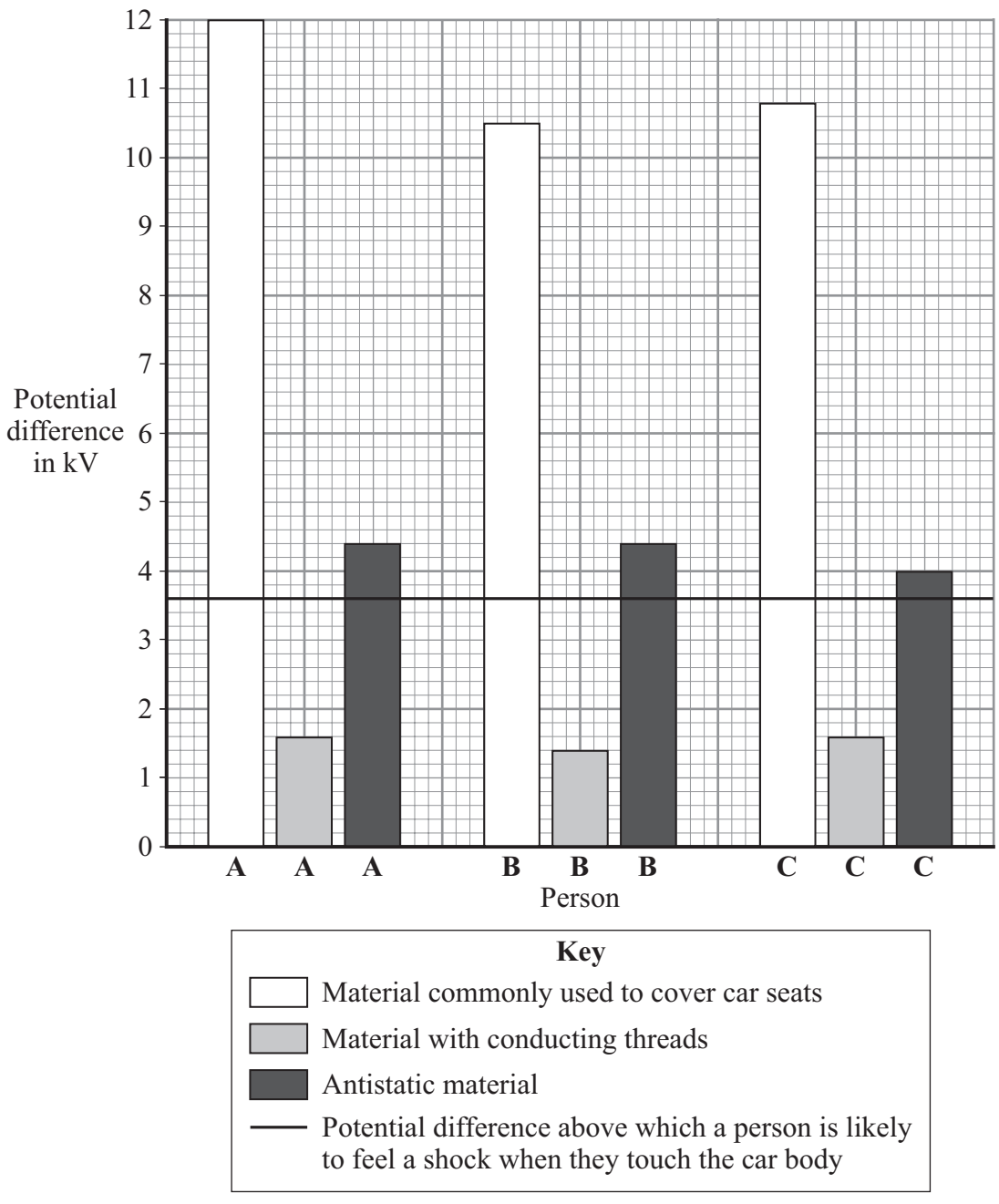
Question 09 · continued

for mark

8 (b) People often become electrostatically charged as they get out of a car.
This happens because their clothing rubs against the car seat.

A scientist was asked to find out whether the amount of charge on a person depended on the type of material which covered the car seat.
Three people, **A**, **B** and **C**, were used to test three different types of seat covering.

In each test, the person got out of the car and stood on a thick sheet of plastic.
The scientist then measured the potential difference between the person and the car body.
The results of the investigation are displayed in the bar chart.



4.2.5.1 Static charge

Question 09 · continued

for mark

8 (b) (i) Explain why the measurement was made with the person standing on a thick sheet of plastic.

.....

.....

.....

.....

(2 marks)

8 (b) (ii) To make this a fair test, the three people, **A**, **B** and **C**, each wore the same type of clothing.

Suggest a reason why this was important.

.....

.....

(1 mark)

8 (b) (iii) The smallest scale division on the voltmeter was 0.1 kV.

Suggest why, from the data, it was **not** necessary to increase the precision of the potential difference measurements.

.....

.....

(1 mark)

8 (b) (iv) Explain why this investigation may cause a manufacturer to change the material used to cover car seats.

.....

.....

.....

.....

(2 marks)

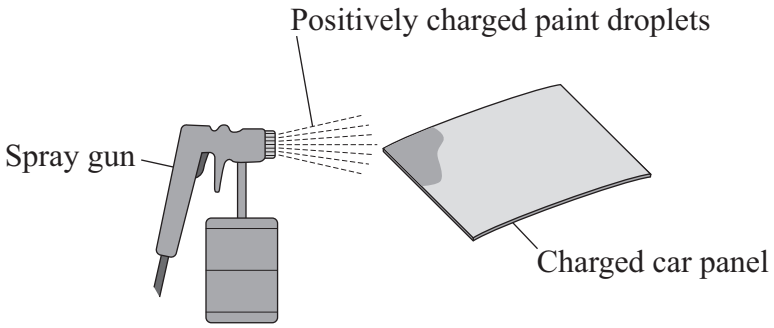
8

4.2.5.1 Static charge

Question 10

January 2010 | PHY2F | Original Q2 | Legacy

2 (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 marks)

2 (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.

.....

.....

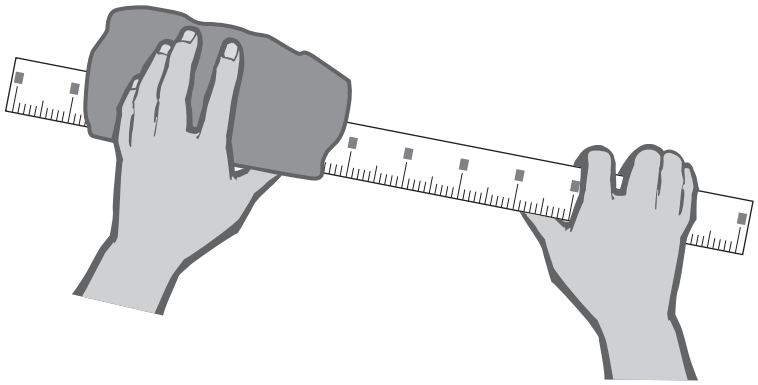
(2 marks)

5

4.2.5.1 Static charge

Question 11

4 (a) A plastic ruler is rubbed with a cloth.



Some electrons move from the cloth onto the ruler.

4 (a) (i) What type of charge does the ruler gain?

.....

(1 mark)

4 (a) (ii) What type of charge is left on the cloth?

.....

(1 mark)

4 (b) The following statement is **false**.

Objects carrying the same type of charge attract each other.

Change **one** word in this statement to make it **true**.

Write down your new statement.

.....

.....

(1 mark)

4.2.5.1 Static charge

Question 11 · continued

4 (c) Many devices use electrostatic charge to work.
The following sentences describe how a photocopier uses electrostatic charge to produce a photocopy.

Use words from the box to complete the sentences.

attracts	charge	insulating	light	photoconducting	repels

1 A roller coated with ..... material is given a charge.

2 A strong light is used to form an image of the page to be copied onto the roller.

3 Where light hits the roller, the ..... flows to earth.

4 The charge left on the roller ..... particles of black toner powder.

5 The toner powder sticks to a sheet of paper, producing the photocopy.

(3 marks)

4 (d) Give **one** other use for electrostatic charge.

.....

.....

(1 mark)

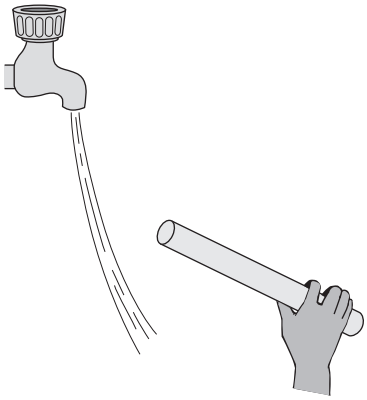
7

4.2.5.1 Static charge

Question 12

January 2011 | PHY2F | Original Q8 | Legacy

8 (a) The diagram shows a negatively charged plastic rod held close 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. ☐

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

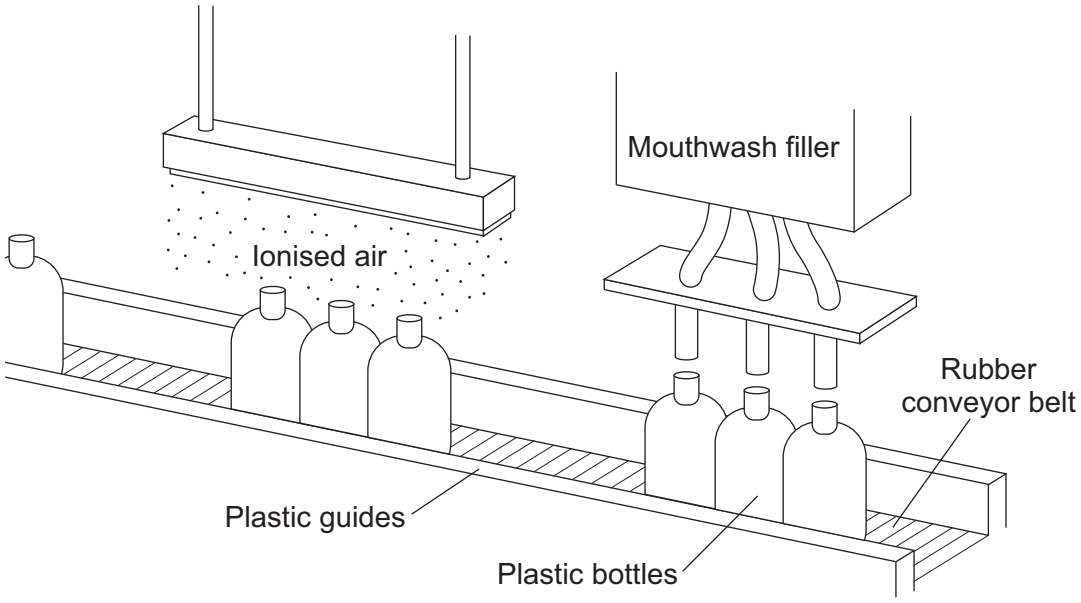
(1 mark)

4.2.5.1 Static charge

Question 12 · continued

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

As the bottles go towards the filler, they move around on the conveyer 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 a solution to the problem. Before the bottles reach the filler, they pass through a stream of ionised air. The ions in the air neutralise the charge on the bottles.

8 (b) (i) Explain why the plastic bottles become charged.

.....

.....

.....

.....

(2 marks)

Question 8 continues on the next page

4.2.5.1 Static charge

Question 12 · continued

8 (b) (ii) What is an ion?

.....

.....

(1 mark)

8 (b) (iii) Earthing the conveyor belt with a conducting wire would not have solved this problem.

Give a reason why.

.....

.....

(1 mark)

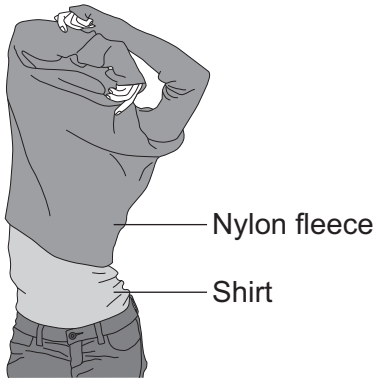
5

4.2.5.1 Static charge

Question 13

June 2011 | PHY2F | Original Q4 | Legacy

4 (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 marks)

4 (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. ☐

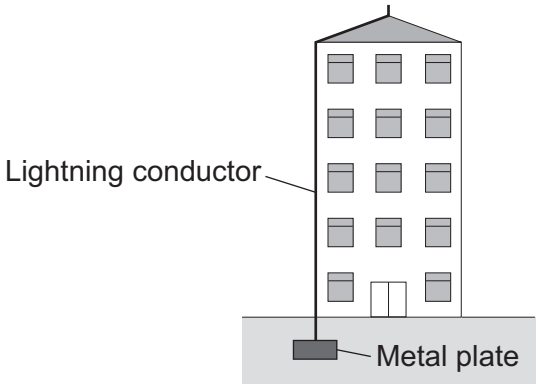
An electric current is a flow of electrical charge. ☐

(2 marks)

4.2.5.1 Static charge

Question 13 · continued

4 (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.

4 (c) (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 marks)

4 (c) (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 mark)

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

Suggest a reason why.

.....

.....

(1 mark)

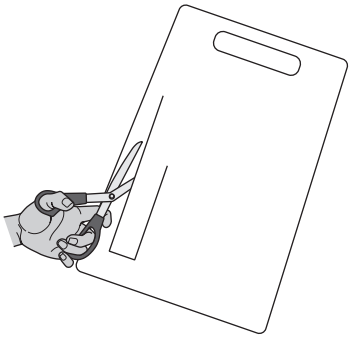
8

4.2.5.1 Static charge

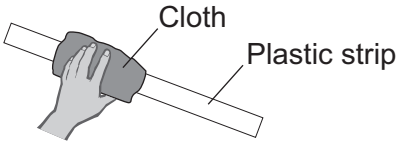
Question 14

January 2013 | PH2FP | Original Q5 | Legacy

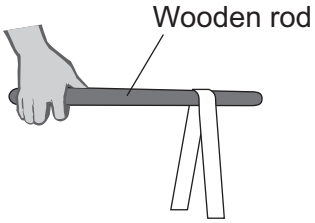
5 (a) A student uses some everyday items to investigate static electricity.



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

5 (a) (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 marks)

5 (a) (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 marks)

4.2.5.1 Static charge

Question 14 · continued

5 (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 mark)

5

Turn over for the next question

4.2.5.1 Static charge

Question 15

June 2017 | PH2FP | Original Q1 | Legacy

1 (a) A student rubs a rubber balloon against the sleeve of her woollen jumper. The balloon becomes negatively charged.

1 (a) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

electrons	neutrons	protons

The balloon becomes negatively charged because it gains _____ from the jumper.

1 (a) (ii) After charging the balloon, what is the overall charge left on the jumper?

[1 mark]

Tick (✓) **one** box.

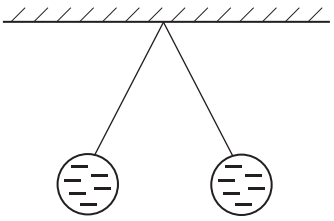
negative ☐

neutral ☐

positive ☐

1 (b) **Figure 1** shows two identically charged balloons hanging close together.

Figure 1



1 (b) (i) Complete the following sentence.

[1 mark]

The balloons carry the same type of charge and so _____ each other.

1 (b) (ii) From **Figure 1**, what can you conclude about the sizes of the **forces** acting on the balloons?

[1 mark]

_____

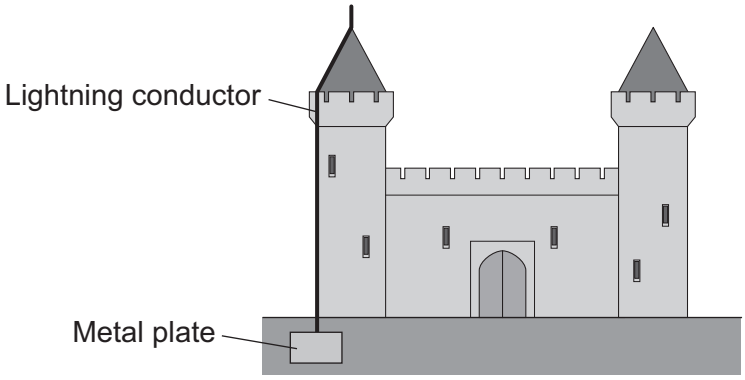
_____

4.2.5.1 Static charge

Question 15 · continued

1 (c) A lightning conductor attached to the outside of a building reduces the risk of damage being caused to the building by a lightning strike.

Figure 2



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

1 (c) (i) Through which one of the following materials can electrical charge flow easily?

Draw a ring around the correct answer.

[1 mark]

copper **plastic** **rubber**

1 (c) (ii) What happens to the temperature of a lightning conductor when electrical charge flows through it?

[1 mark]

Tick (✓) **one** box.

the temperature decreases ☐

the temperature does not change ☐

the temperature increases ☐

1 (c) (iii) During a lightning strike, 4 coulombs of charge flow through a lightning conductor in 0.002 seconds.

Calculate the current in the lightning conductor.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

_____

_____

Current = _____ A

8

4.2.5.1 Static charge

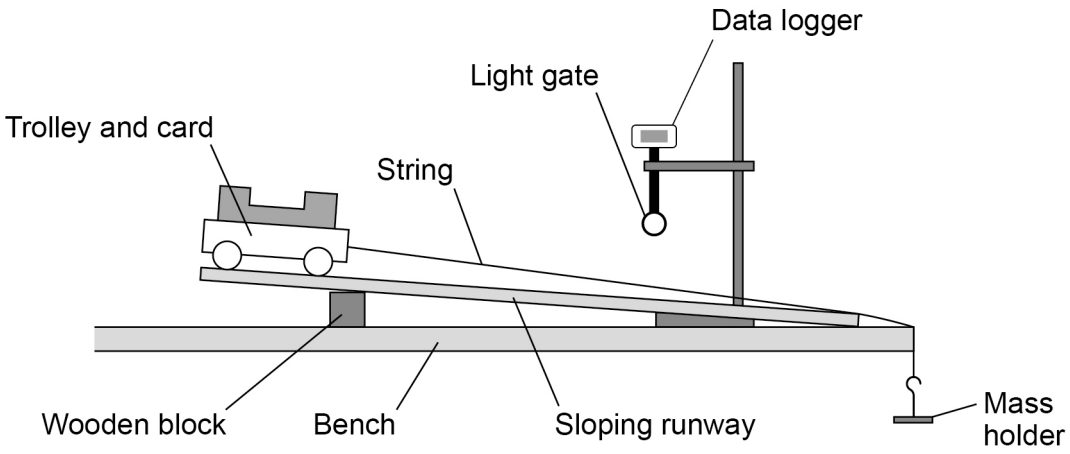
Question 16

November 2020 | 8463/2F | Original Q8

0 8 A student investigated the acceleration of a trolley.

Figure 13 shows how the student set up the apparatus.

Figure 13



0 8 . 1 Before attaching the mass holder the student placed the trolley at the top of the runway. The trolley rolled down the runway without being pushed.

What change to the apparatus in **Figure 13** could be made to prevent the trolley from starting to roll down the runway?

[1 mark]

Tick (✓) **one** box.

Move the wooden block to the left. ☐

Shorten the length of the runway. ☐

Use a taller wooden block. ☐

0 8 . 2 The student attached the mass holder to the string.

The string rubbed along the edge of the bench as the mass holder fell to the floor.

Suggest what the student could do to prevent the string from rubbing.

[1 mark]

Question 16 · continued

The light gate and data logger were used to determine the acceleration of the trolley.

The student increased the resultant force on the trolley and recorded the acceleration of the trolley.

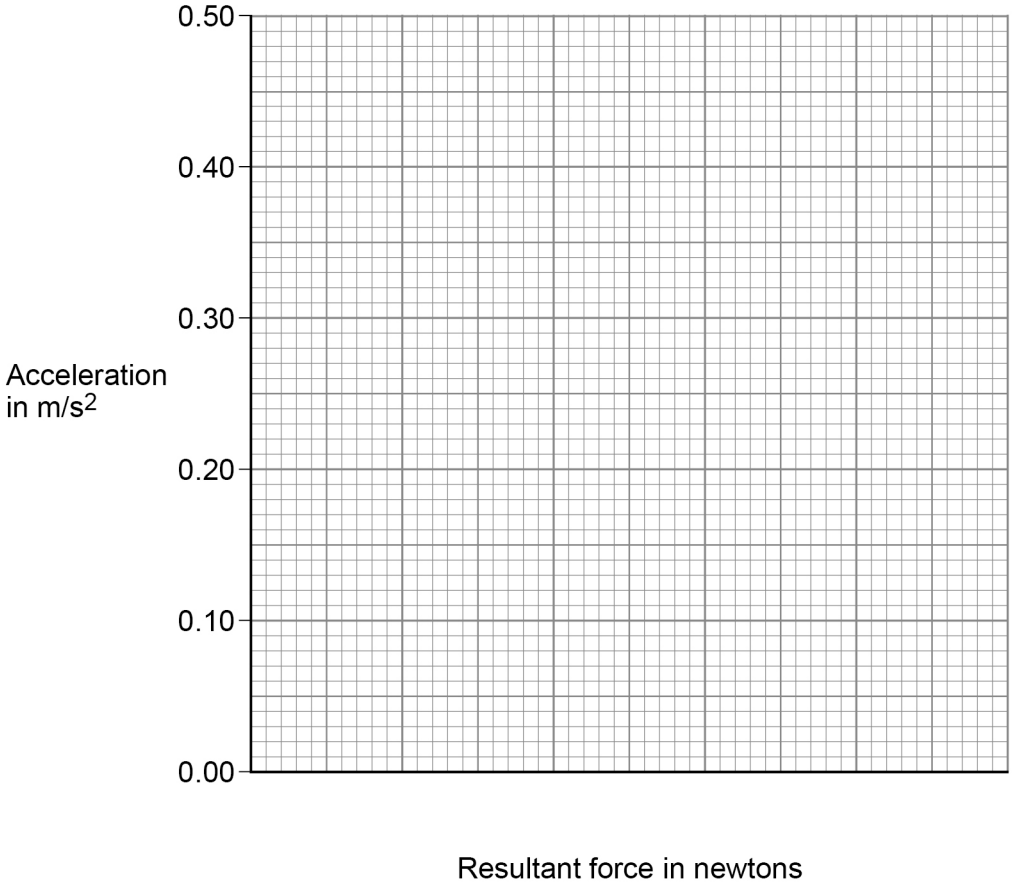
Table 4 shows the results.

Table 4

Resultant force in newtons	Acceleration in m/s²
0.05	0.08
0.10	0.18
0.15	0.25
0.20	0.32
0.25	0.41

Figure 14 is an incomplete graph of the results.

Figure 14



0 8 . 3 Complete **Figure 14**.

- Choose a suitable scale for the x-axis.
- Plot the results.
- Draw a line of best fit.

[4 marks]

4.2.5.1 Static charge

Question 16 · continued

0 8 . 4 Describe the relationship between the resultant force on the trolley and the acceleration of the trolley.

[1 mark]

0 8 . 5 Describe how the investigation could be improved to reduce the effect of random errors.

[2 marks]

0 8 . 6 Write down the equation that links acceleration (*a*), mass (*m*) and resultant force (*F*).

[1 mark]

0 8 . 7 The resultant force on the trolley was 0.375 N.

The mass of the trolley was 0.60 kg.

Calculate the acceleration of the trolley.

Give your answer to 2 significant figures.

[4 marks]

Acceleration (2 significant figures) = _____ m/s^2

14

4.2.5.1 Static charge

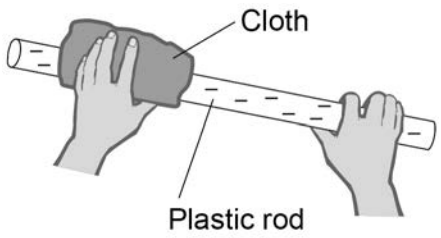
Question 17

June 2022 | 8463/1F | Original Q3

0 3 **Figure 3** shows a plastic rod being rubbed with a cloth.

The plastic rod becomes negatively charged.

Figure 3



0 3 . 1 Complete the sentences.

Choose answers from the box.

Each answer may be used once, more than once or not at all.

[2 marks]

electrons	neutrons	protons

The plastic rod becomes charged because it gains _____ .

The cloth also becomes charged because it loses _____ .

0 3 . 2 What charge is left on the cloth?

[1 mark]

Tick (✓) **one** box.

A negative charge ☐

A neutral charge ☐

A positive charge ☐

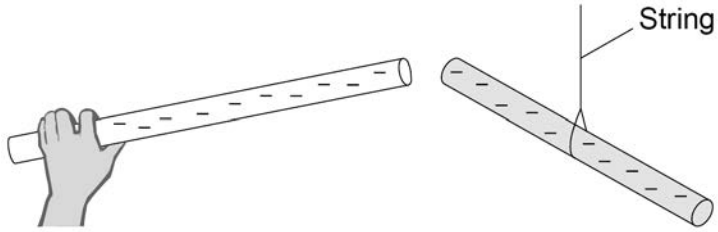
4.2.5.1 Static charge

Question 17 · continued

0 3 . 3 The negatively charged plastic rod is put near another negatively charged plastic rod that is hanging from a string.

Figure 4 shows the two rods.

Figure 4



What force is exerted on the two rods?

Tick (✓) **one** box.

Give a reason for your answer.

[2 marks]

A force of attraction ☐

A force of repulsion ☐

There is no force ☐

Reason _____

_____

_____

Question 3 continues on the next page

4.2.5.1 Static charge

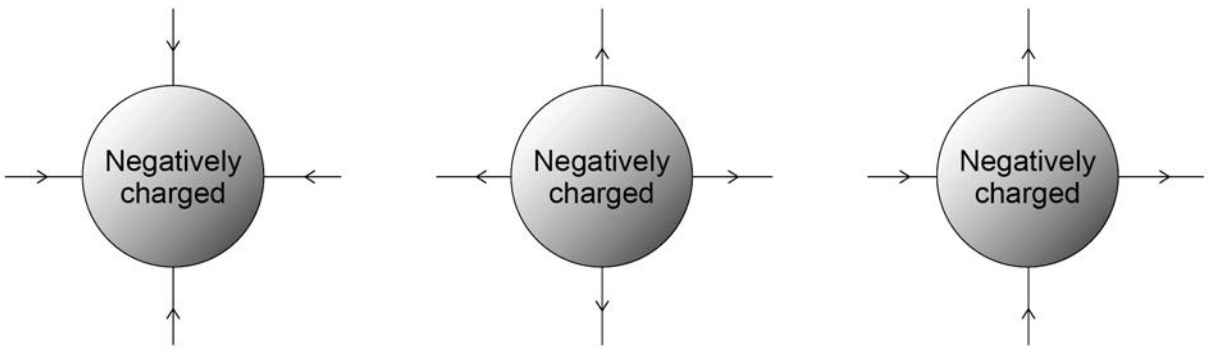
Question 17 · continued

0 3 . 4 There is an electric field around any charged object.

Which diagram shows the electric field pattern around a negatively charged sphere?

[1 mark]

Tick (✓) **one** box.

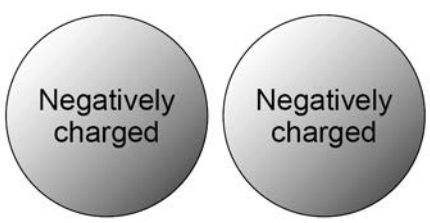


☐ ☐ ☐

0 3 . 5 In which position do two charged spheres experience the greatest electrostatic force?

[1 mark]

Tick (✓) **one** box.

A 

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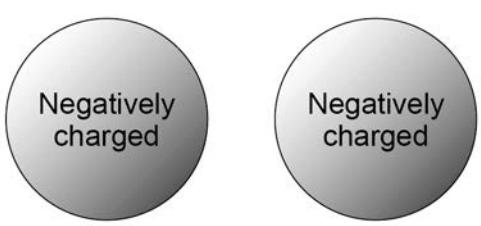
B 

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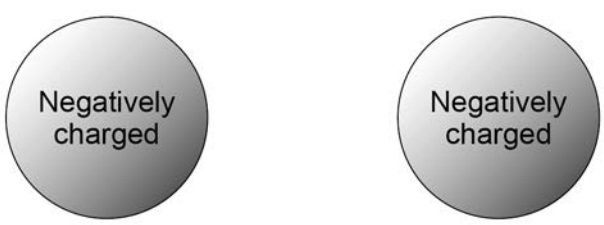
C 

☐

7

4.2.5.1 Static charge

Question 18

June 2023 | 8463/2F | Original Q2

0 2 The stopping distance of a car is the braking distance added to the thinking distance.

0 2 . 1 Complete the sentences.

Choose answers from the box.

[2 marks]

chemical	**electrostatic**	**kinetic**
nuclear		**thermal**

A driver applies the brakes to a moving car.

As the car slows down, there is a decrease in the _____ energy of the car.

The work done by friction causes an increase in the _____ energy store of the brakes.

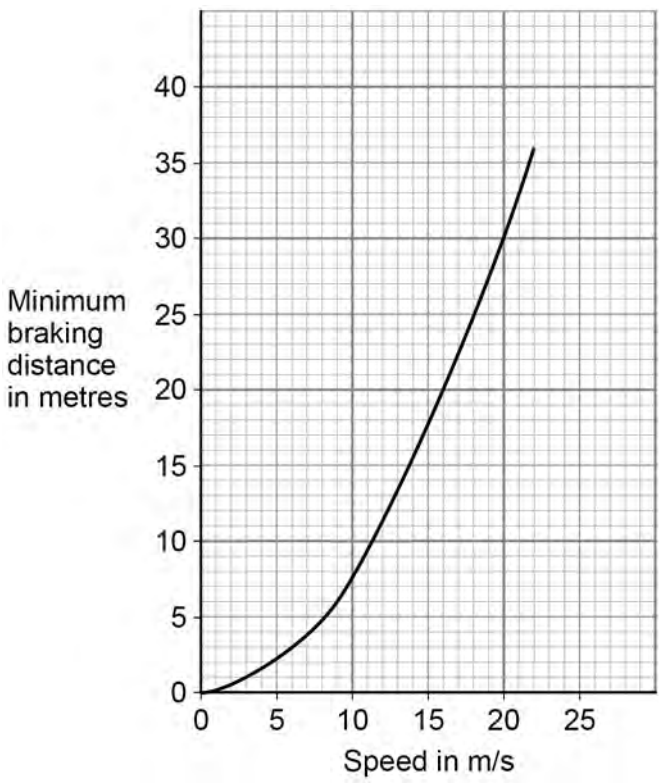
Question 2 continues on the next page

4.2.5.1 Static charge

Question 18 · continued

0 2 . 2 **Figure 3** shows how the speed of the car affects the minimum braking distance of the car.

Figure 3



Describe the relationship between the speed of the car and the minimum braking distance of the car.

[1 mark]

0 2 . 3 Complete the sentence.

Choose the answer from the box.

[1 mark]

decreases	**stays the same**	**increases**

When the road becomes icy, the braking distance _____.

4.2.5.1 Static charge

Question 18 · continued

A car driver applies the brakes to decelerate the car as it approaches a road junction.

The car decelerates at 0.25 m/s^2.

mass of the car = 1600 kg

0 2 . 4 Calculate the time taken for the velocity of the car to decrease from 12.5 m/s to 5.0 m/s.

Use the equation:

$$\text{time taken} = \frac{\text{change in velocity}}{\text{deceleration}}$$

[3 marks]

Time taken = _____ s

0 2 . 5 Calculate the resultant force causing the car to decelerate.

Use the equation:

$$\text{resultant force} = \text{mass} \times \text{deceleration}$$

[2 marks]

Resultant force = _____ N

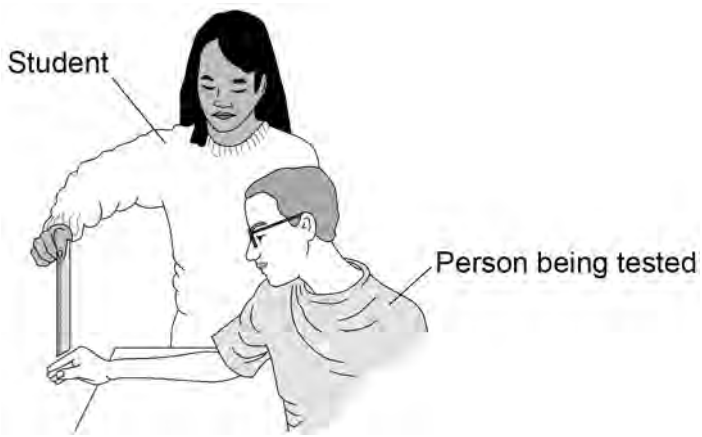
4.2.5.1 Static charge

Question 18 · continued

Thinking distance is affected by the reaction time of the driver.

Figure 4 shows how a student tested a person's reaction time.

Figure 4



The student held a ruler and then released it.

The person being tested closed his hand to catch the ruler as quickly as possible.

The further the ruler fell the greater the person's reaction time.

0 2 . 6 The student wanted to test the reaction time of the people in her class.

Which of the following could have been a control variable in this investigation?

[1 mark]

Tick (✓) **one** box.

Distance fallen by the ruler before being caught ☐

Initial height of the ruler above the person's hand ☐

Reaction time of the person being tested ☐

4.2.5.1 Static charge

Question 18 · continued

0 2 . 7 The student tested three people in her class.

The mean distance that the ruler fell before being caught was 18.2 cm.

If all of the people in her class were tested, the mean distance may not be 18.2 cm.

Suggest why.

[1 mark]

0 2 . 8 Describe how this investigation could be changed to find out how listening to music affects reaction time.

[2 marks]

13

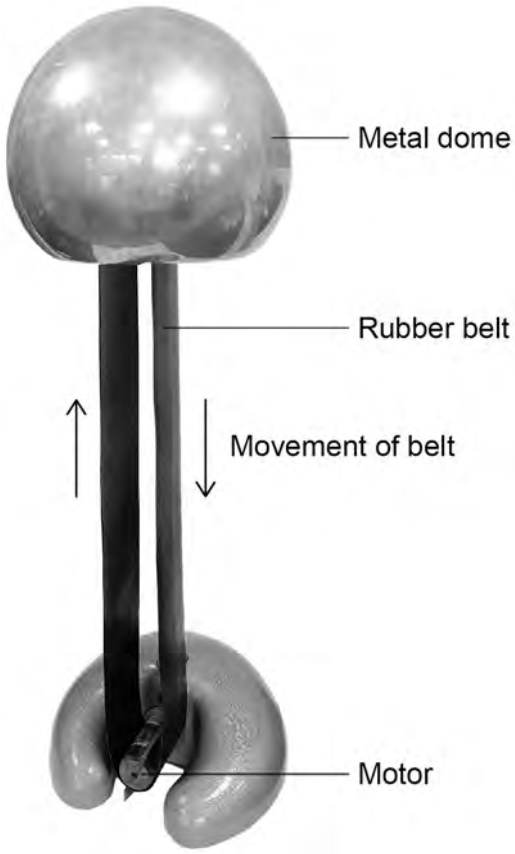
4.2.5.1 Static charge

Question 19

June 2024 | 8463/1F | Original Q1

0 1 **Figure 1** shows a static electricity generator.

Figure 1



The rubber belt is turned by a motor.

As the rubber belt moves, charge is transferred from the rubber belt to the metal dome.

4.2.5.1 Static charge

Question 19 · continued

Figure 2 shows a student touching the metal dome of the static electricity generator.

The dome is negatively charged.

Figure 2



0 1 . 1 Complete the sentence.

Choose the answer from the box.

[1 mark]

negative	**neutral**	**positive**

When the student touches the negatively charged metal dome the student's hair gains a _____ charge.

Question 1 continues on the next page

4.2.5.1 Static charge

Question 19 · continued

0 1 . 2 Complete the sentence.

Choose the answer from the box.

[1 mark]

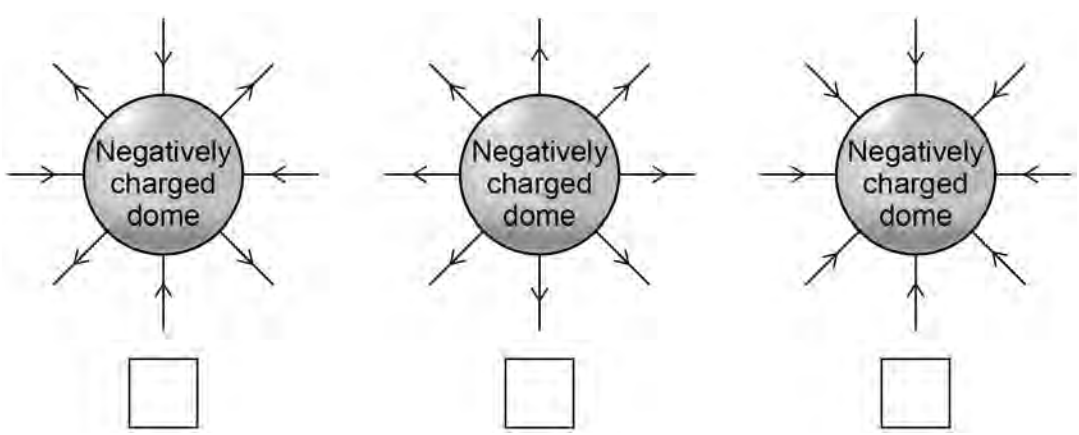
attraction	**gravity**	**repulsion**

The hair on the student's head stands up because the strands of hair experience forces of _____.

0 1 . 3 Which of the following diagrams shows the electric field pattern around the negatively charged metal dome?

[1 mark]

Tick (✓) **one** box.

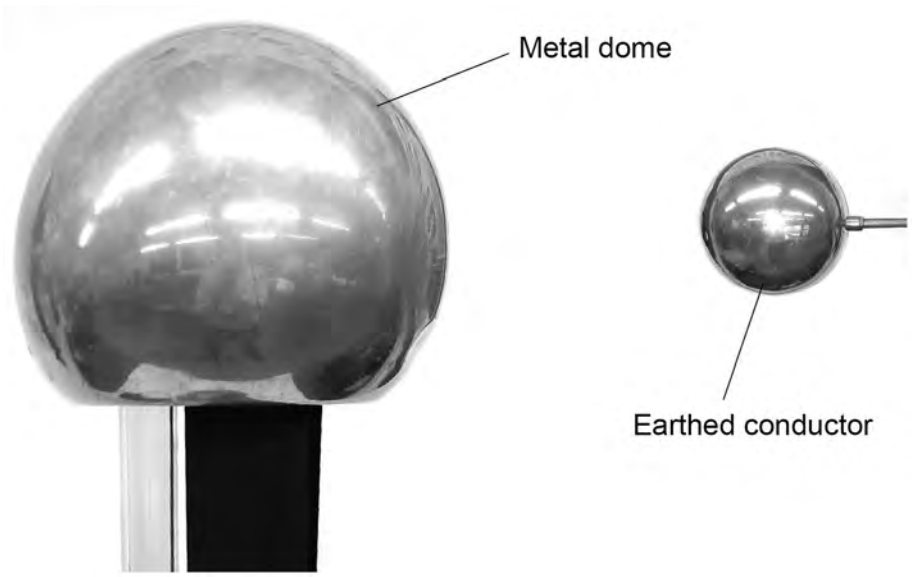


4.2.5.1 Static charge

Question 19 · continued

Figure 3 shows the negatively charged metal dome and an earthed conductor.

Figure 3



0 1 . 4 The air between the dome and the earthed conductor is an insulator.

Complete the sentence.

Choose the answer from the box.

[1 mark]

efficiency	**resistance**	**temperature**

The air between the dome and the earthed conductor has

a high _____.

Question 1 continues on the next page

Question 19 · continued

The earthed conductor is moved closer to the metal dome.

A spark jumps from the dome to the earthed conductor.

0 1 . 5 Complete the sentence.

Choose the answer from the box.

[1 mark]

earthed	**ionised**	**neutral**

The spark jumps because the air around the charged dome has

become _____.

0 1 . 6 Which particles are transferred when the spark jumps from the negatively charged metal dome to the earthed conductor?

[1 mark]

Tick (✓) **one** box.

Electrons ☐

Neutrons ☐

Protons ☐

4.2.5.1 Static charge

Question 19 · continued

0 1 . 7 The potential difference between the metal dome and earth is 300 000 V.

When the spark jumps there is a charge flow of 0.000 002 C.

Calculate the energy transferred by the spark.

Use the equation:

energy transferred = charge flow × potential difference

[2 marks]

Energy transferred = _____ J

8

Turn over for the next question