

Electric Charge

Question paper

Level	IGCSE(9-1)
Subject	Physics
Exam Board	Edexcel IGCSE
Module	Single Award (Paper 2P)
Topic	Electricity
Sub-Topic	Electric Charge
Booklet	Question paper

Time Allowed: 62 minutes

Score: /51

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'75%	70%	60%	55%	50%	<50%

1 A man pushes a metal trolley along a corridor towards a lift.

The trolley has nylon wheels and the floor of the corridor is covered with plastic.

The man wears shoes with rubber soles.



As he moves the trolley, the man gains an electric charge.

(a) Explain how the man gains an electric charge.

(2)

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(b) The man presses a metal button to operate the lift.

There is a spark and the man receives an electric shock.

The spark lasts for 75 ms and 0.0017 C of charge passes.

(i) State the equation linking charge, current and time.

(1)

(ii) Calculate the average current in the spark.

Give the unit.

(3)

current = unit

(c) Metal appliances, such as the lift button, are earthed for safety.

Explain why the man receives a shock even though the button is properly earthed.

(3)

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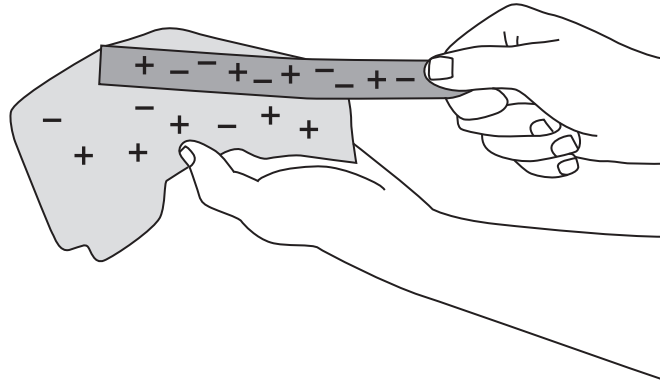
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2 When a plastic rod is rubbed with a cloth, the rod gains charge.



(a) How could you show that the plastic rod gains charge?

(1)

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(b) Explain how the plastic rod gains charge when it is rubbed.

(2)

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(c) There are two types of charge.

Describe how you could demonstrate this using different insulating rods and a cloth.

In your answer, you should name any other equipment you would use.

(3)

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(Total for Question 2 = 6 marks)

3 The photograph shows an investigation of static electricity.

A teacher rubs a balloon with a cloth so that the balloon gains a positive charge.

She then holds the balloon close to her head, and her hair rises.



(a) Explain, in terms of moving charges, how the balloon becomes positively charged.

(2)

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(b) Explain why the teacher's hair rises.

(2)

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(c) Suggest why the charge remains on the balloon even when it is being held.

(1)

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(d) Suggest why the experiment does not work so well when the air is humid (damp).

(1)

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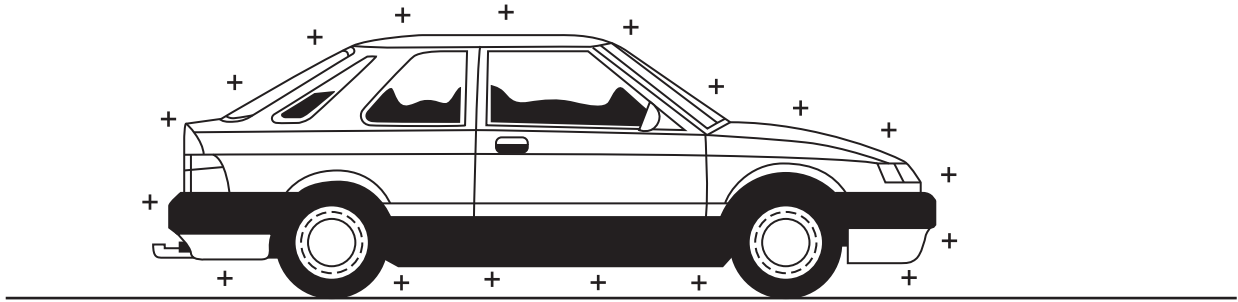
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(Total for Question 3 = 6 marks)

4 A car becomes electrically charged as it travels along a road.



(a) (i) Explain how a moving car becomes electrically charged.

(2)

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(ii) Why does this charge remain on the car after it has stopped moving?

(1)

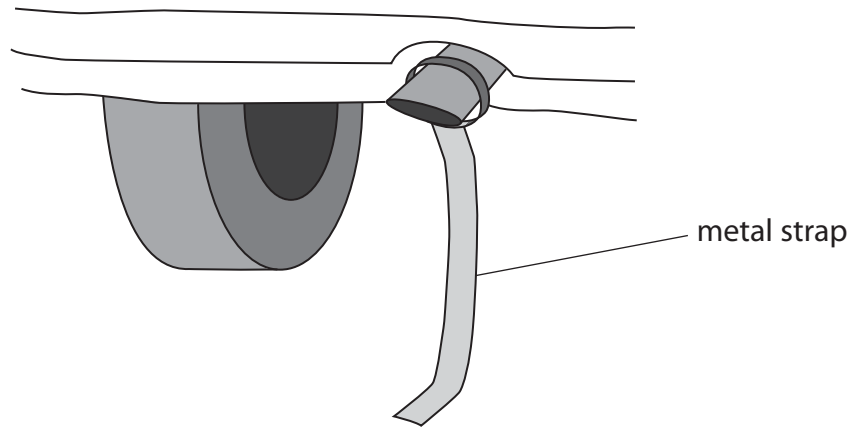
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(b) Some people prefer to prevent their car from becoming charged.

They do this by fixing a metal strap underneath the car.

The metal strap rubs on the ground as the car moves.



(i) Suggest why it is safer to have no electrical charge on a car.

(1)

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(ii) Explain how the metal strap prevents a car from becoming charged.

(2)

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(Total for Question 4 = 6 marks)

5 The photograph shows a fuel delivery at a petrol station.



Source: Jeeferon Siegel, New York Daily News

(a) Explain how a fuel tanker can become electrically charged while it is moving.

(2)

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(b) Pumping fuel from an electrically-charged tanker can be dangerous.

(i) Describe a possible danger of pumping fuel from an electrically-charged tanker.

(1)

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(ii) The driver connects an earth wire to the fuel tanker before pumping fuel.

Explain how connecting the earth wire reduces the possible dangers.

(2)

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(Total for Question 5 = 5 marks)

6 This question is about electrostatic charges.

(a) Complete the sentences using words from the box.

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

(2)

electrons negative neutral neutrons positive protons

When a plastic rod is rubbed with a cloth, the plastic rod gains

After the plastic rod has been rubbed with the cloth, the plastic rod has a
..... charge.

(b) Electrostatic charges can be useful during paint spraying.



(i) The droplets of paint are given the same charge as they leave the sprayer.

Explain why this is an advantage.

(2)

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(ii) The droplets of paint are positively charged.

The object being painted is given a negative charge.

Explain why this is an advantage.

(2)

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(c) Give **one** hazard caused by electrostatic charges and state how the risk from this hazard can be reduced.

(2)

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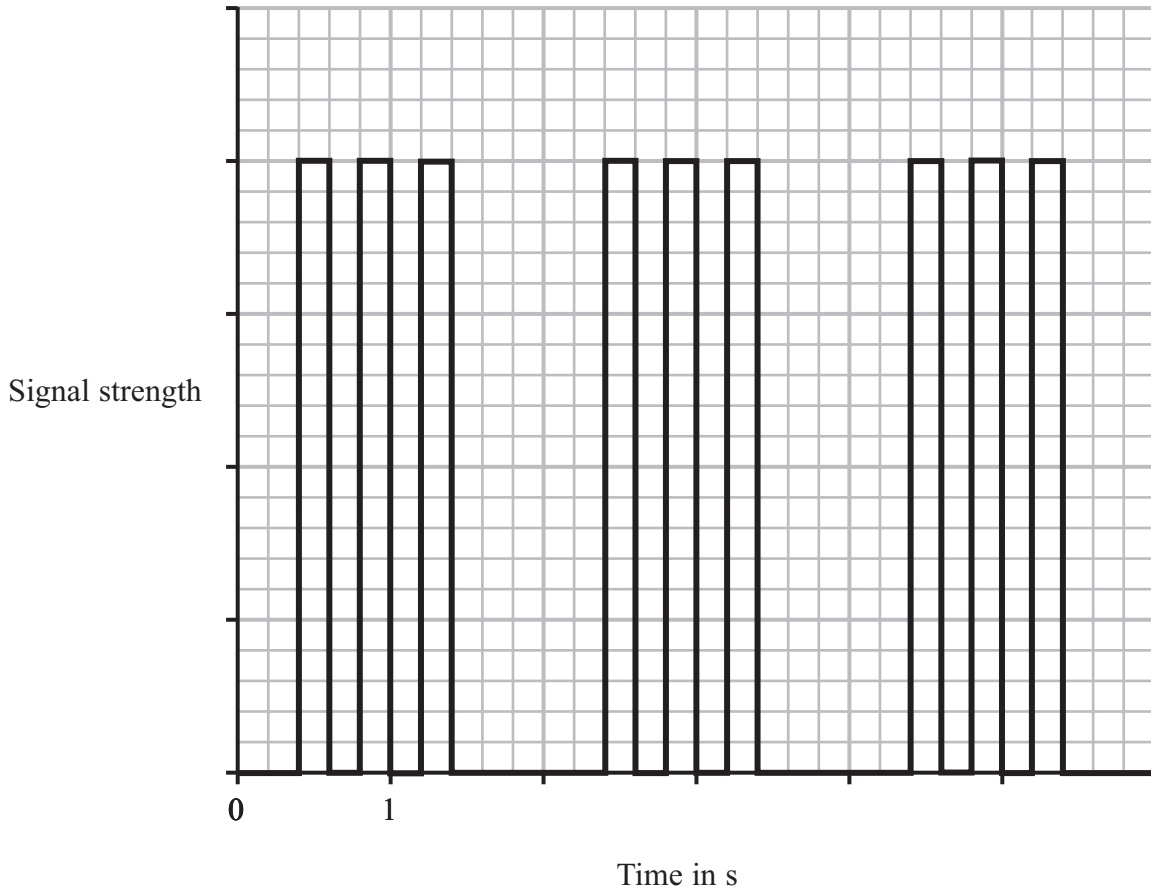
(Total for Question 6 = 8 marks)

7 In 1901, Marconi received the first radio signal across the Atlantic Ocean.

The signal was the letter S in Morse code (three 'dots') sent over and over again.

Each letter S was produced by quickly turning an electric spark on and off three times.

The graph shows how the strength of the signal changed with time.



(a) (i) The graph shows a digital signal.

Explain what is meant by a digital signal.

(2)

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(ii) Suggest **two** ways that this signal could be made to carry more information.

(2)

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2

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(b) The frequency of Marconi's radio wave was 820 kHz and the wavelength was 366 m.

(i) State the equation linking wave speed, frequency and wavelength for radio waves.

(1)

(ii) Calculate the speed of the radio waves Marconi received.

(2)

Speed of radio waves = m/s

(c) Some people do not believe that Marconi received 820 kHz radio waves.

They think that the frequency was really twice as much: 1640 kHz.

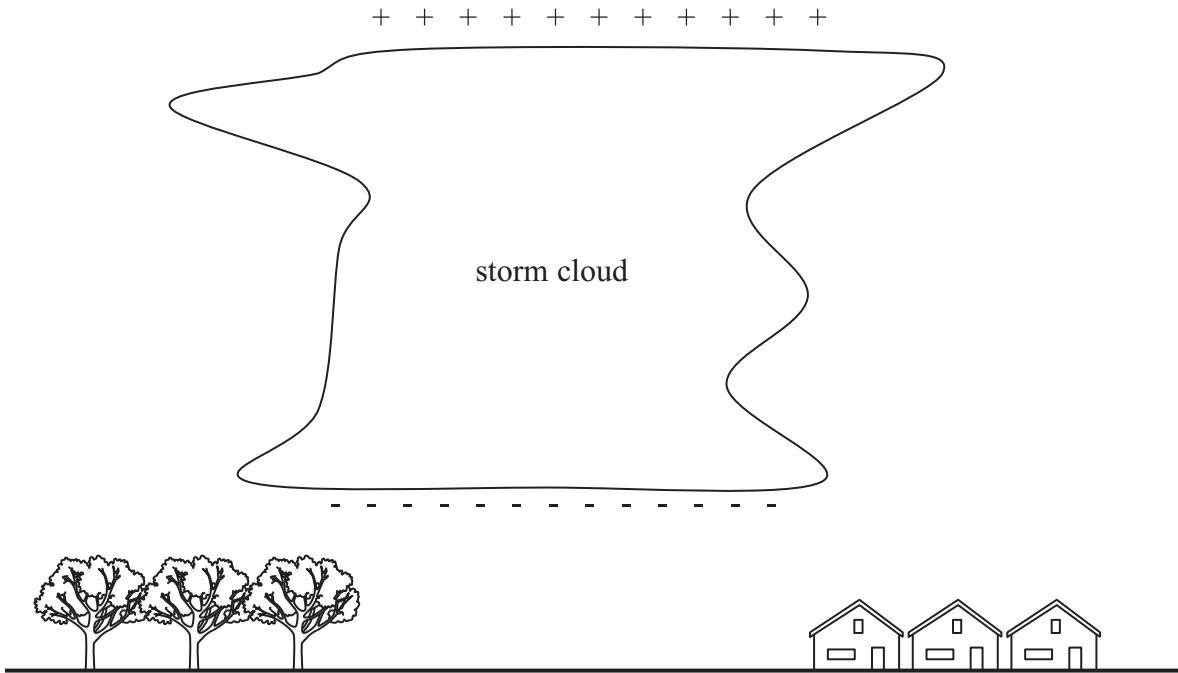
If these people are correct, what wavelength radio waves did Marconi receive?

(1)

Wavelength = m

(d) Other people do not think Marconi received a radio signal across the Atlantic Ocean at all.

They think the radio waves he received were really caused by electrostatic discharges from storm clouds.



Explain what happens when a storm cloud discharges.

(3)

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(Total for Question 7 = 11 marks)