OCR
Oxford Cambridge and RSA

Accredited

GCSE (9–1) Combined Science A (Physics) (Gateway Science)

F

J250/05 Paper 5 (Foundation Tier)

Sample Question Paper

Date – Morning/Afternoon

Version 2.1

Time allowed: 1 hour 10 minutes

You must have:
- the Data Sheet

You may use:
- a scientific or graphical calculator
- a ruler

First name									
Last name									
Centre number						Candidate number				

INSTRUCTIONS
- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended responses will be assessed in questions marked with an asterisk (*).
- This document consists of **24** pages.

SECTION A

You should spend a maximum of 20 minutes on this section.

Answer **all** the questions.

1 What is the typical diameter of an atom?

A 1×10^{-7} m

B 1×10^{-8} m

C 1×10^{-9} m

D 1×10^{-10} m

Your answer ☐ **[1]**

2 A bus takes 1.8 hours to travel 24 km.

What is the average speed of the bus?

A 13.3 km/hr

B 22.2 km/hr

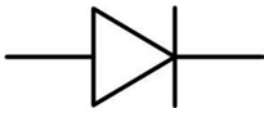
C 25.8 km/hr

D 43.2 km/hr

Your answer ☐ **[1]**

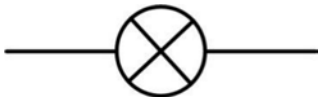
3 Which symbol is used to show an LDR?

A



B

C



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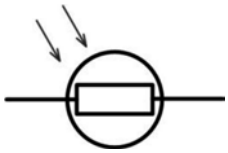


Your answer ☐ **[1]**

4 A student lifts a box with a force of 12 N a distance of 7 m.

How much work does the student do?

A 1.7 J

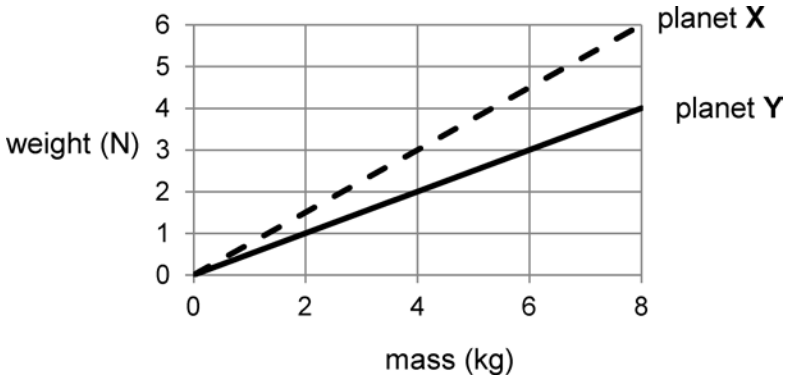
B 5.0 J

C 19 J

D 84 J

Your answer ☐ **[1]**

5 The graph shows the relationship between mass and weight on two different planets.



The weight of an object on planet **X** is 3.0 N.

What is the weight of the same object on planet **Y**?

A 1.5 N

B 2.0 N

C 4.0 N

D 6.0 N

Your answer ☐ **[1]**

6 What is the **minimum** number of forces that are acting on a compressed spring?

A 3

B 2

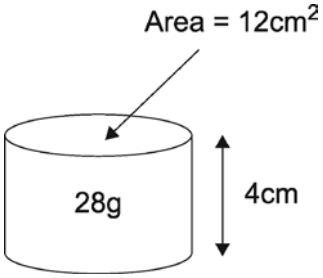
C 1

D 0

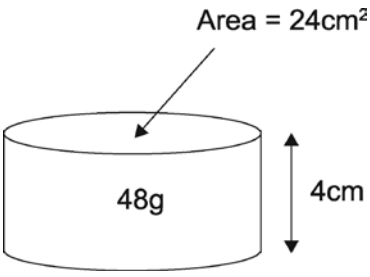
Your answer ☐ **[1]**

7 Which solid block has the **smallest** density?

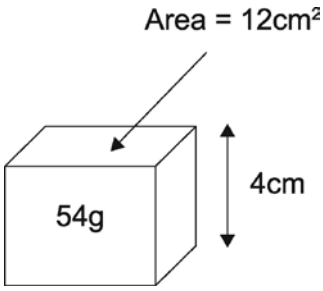
A



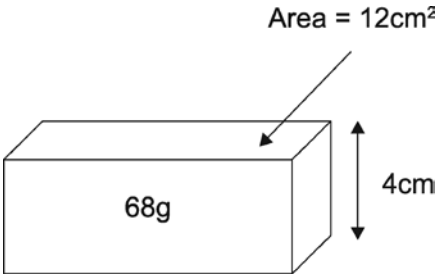
B



C



D



Your answer ☐ **[1]**

8 Which statement about static electricity is **not** correct?

A A charged object exerts a force of attraction or repulsion on another charged object.

B A neutral object that gains electrons becomes negatively charged.

C Static electricity due to friction involves the movement of electrons.

D Two objects with the same charge attract each other.

Your answer ☐ **[1]**

9 A sealed bottle contains gas.

The bottle is heated and the pressure of the gas increases.

How do the gas particles cause this increase in pressure?

A Their average distance apart increases.

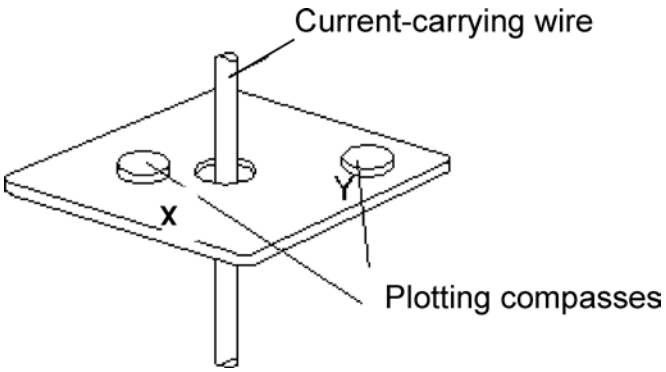
B They expand.

C They hit each other more frequently.

D They hit the can more frequently.

Your answer ☐ **[1]**

10 Plotting compasses are positioned at **X** and **Y** near to a current-carrying wire.



Compared to **Y**, the strength and direction shown on the compass, of the magnetic field at **X** is:

A Stronger and the opposite direction

B Stronger and the same direction

C The same strength and direction

D The same strength and the opposite direction

Your answer ☐ **[1]**

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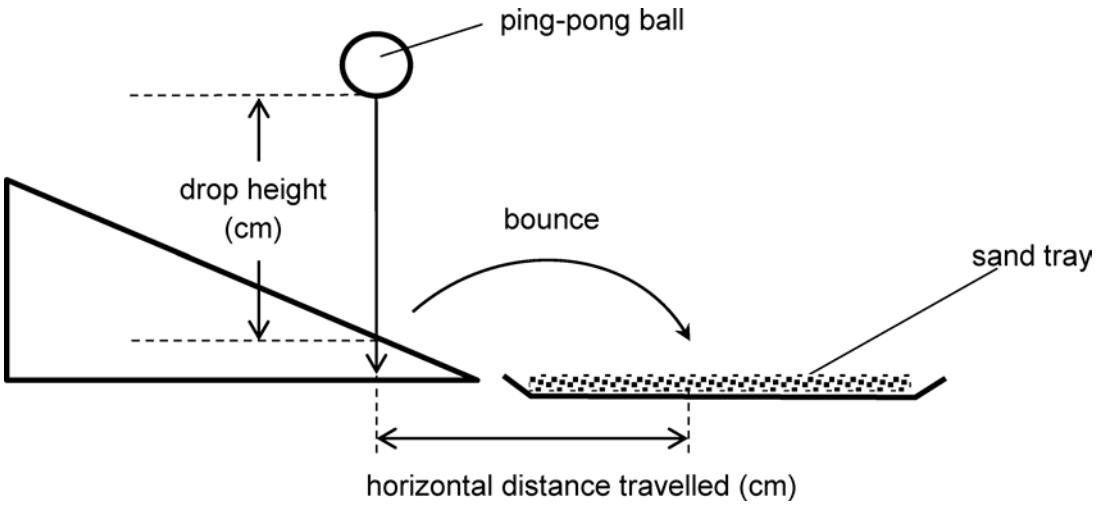
TURN OVER FOR THE NEXT QUESTION

SECTION B

Answer **all** the questions.

11 A ping-pong ball is dropped onto a sloping surface.

The ball bounces and the horizontal distance it travels is measured.



The results of the experiment are shown in the table below.

Drop height (cm)	10	20	30	40	50	60	70	80
Horizontal distance travelled (cm)	7	14	20	25	29	32	34	.....

(a) Complete the table above by predicting the horizontal distance travelled by the ping-pong ball when dropped from 80 cm. **[1]**

(b) The ball dropping from 70 cm took 0.6 seconds to travel a horizontal distance of 34cm.

Calculate the horizontal velocity of the ping pong ball.

Use the formula:

distance travelled = speed × time

Show your working and give the unit.

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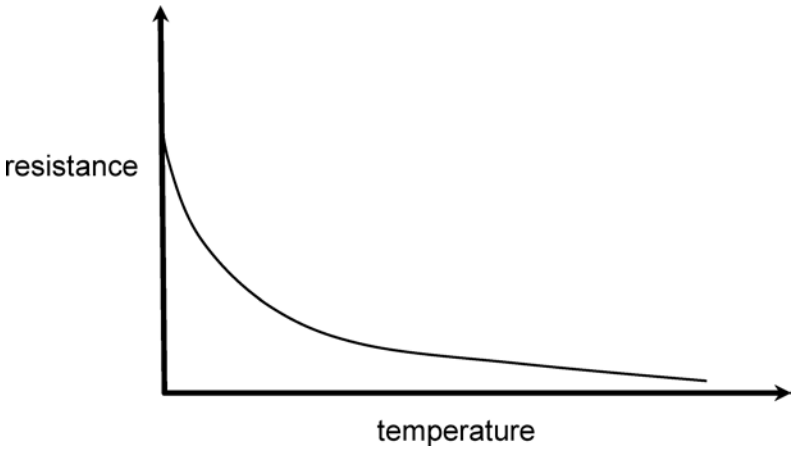
Answer = …… Unit = ... **[4]**

12 A graph of the resistance of a thermistor against temperature is shown below.

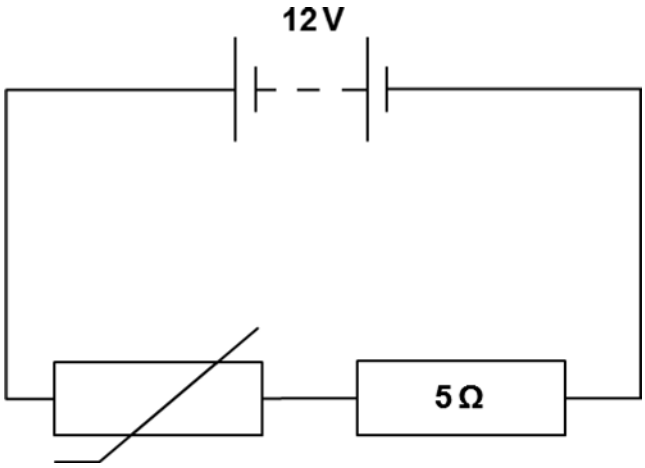


(a) What happens to the resistance of the thermistor as the temperature increases?

.....

..... **[1]**

(b) In the circuit below, the fixed resistor has a resistance of 5 Ω.



A current of 2 A flows through the 5 Ω resistor.

Calculate the power dissipated in the resistor.

Use the equation:

power = (current^2) × resistance

Show your working.

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Answer = ……W **[2]**

13 A spring is stretched using different weights.

An experiment is done to find the extension of the spring using different loads.

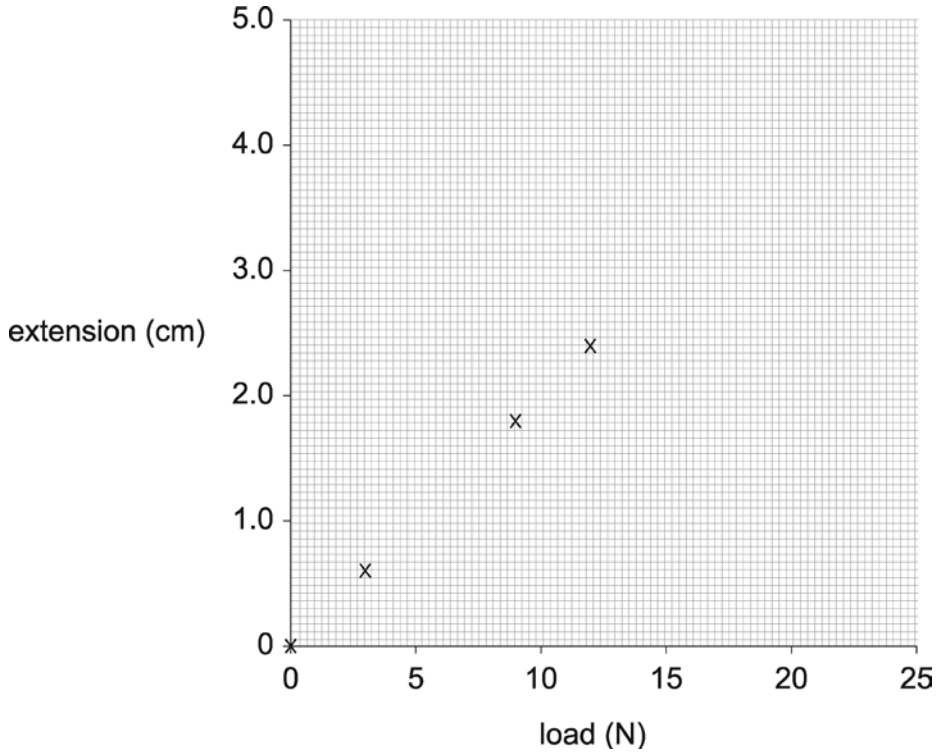
(a) Complete the table of results.

Load (N)	Length (cm)	Extension (cm)
0.0	10.0	0.0
3.0	10.6	0.6
6.0	11.2	.....
9.0	.....	1.8
12.0	12.4	2.4
15.0	13.0	3.0

[2]

(b) Some points from the table have been plotted on the graph below.

Plot the points for loads of 6 N and 15 N against extension and draw a line of best fit.



[2]

(c) What evidence is there that the extension of the spring is **linear**?

..... **[1]**

(d) Calculate the spring constant of the spring.

Use the formula:

force = spring constant × extension

Show your working.

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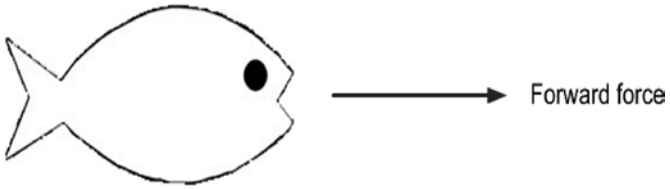
..... **[3]**

Answer = ... N/cm

14 A fish is swimming forwards and the forward force is labelled on the diagram below.



(a) Draw and label the three other forces that are acting on the fish. **[3]**

Ignore any forces from water pressure.

(b) The fish uses 0.18 kJ of energy in 4 seconds,

Calculate the power of the fish.

Use the formula:

work done = power × time

Show your working.

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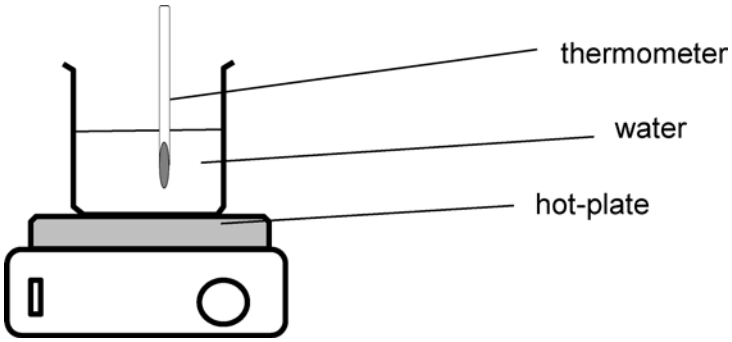
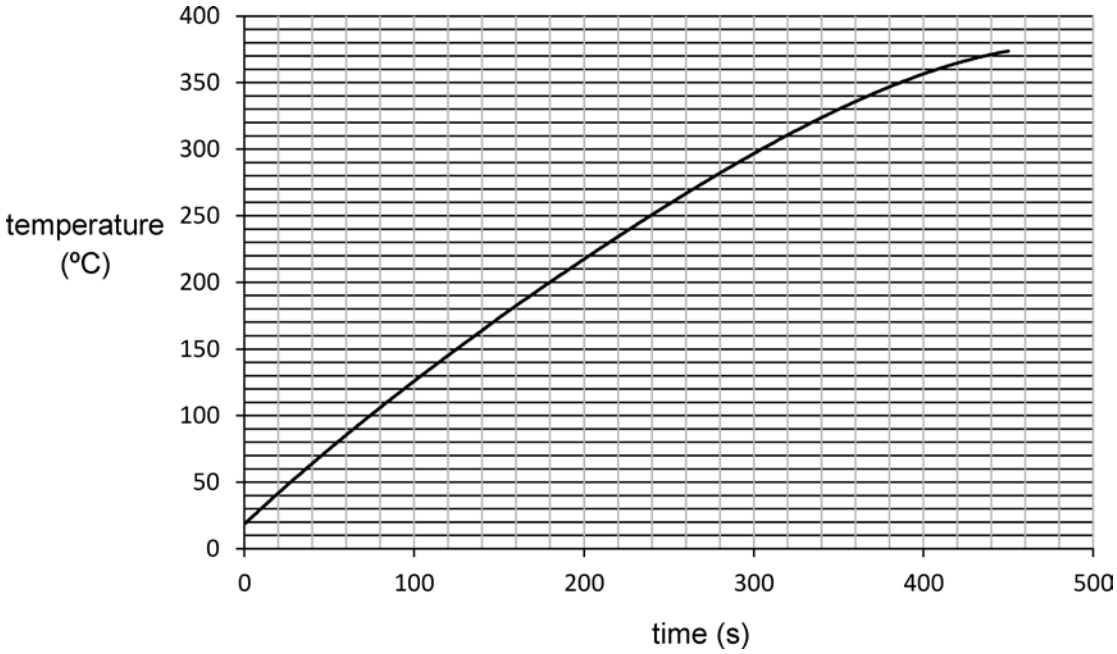
Answer = ... W **[4]**

15 0.4 kg of water is heated on a hot-plate.



The increase in temperature with time of the surface of the hot-plate is shown on the graph below.



(a) (i) Using the temperature–time graph, find the time taken for the hot-plate to reach a temperature of 200°C.

Show clearly on the graph how you measured this time.

Answer = ……s **[2]**

(ii) Predict the temperature of the hot plate at 500 s.

Answer = ……°C **[1]**

(b) The water is heated until it boils to form steam.

The specific latent heat of vapourisation of water is 2 260 000 J/kg.

Calculate how much energy is needed to evaporate 0.4 kg of water.

Use the formula:

energy for a change of state = mass × specific latent heat

Show your working and state the unit.

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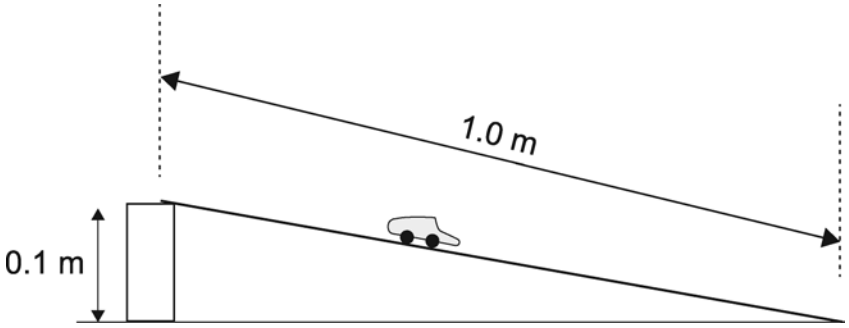
Answer = …… Unit ..... **[3]**

16 A student wants to find out what affects the speed of a toy car.

The diagram shows some of the apparatus she uses.



(a) The student rolls the toy car down the ramp.

She measures the distance from the front of the car to the bottom of the ramp.

- How can the car's average speed on the ramp be measured?
- Predict how changing the distance travelled along the ramp will affect this average speed.

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..... **[3]**

(b) Suggest **two** other factors that could be changed to affect the speed of the car.

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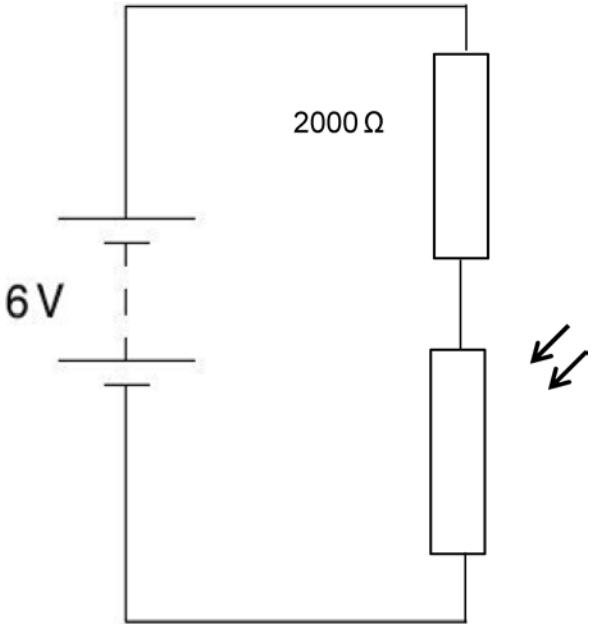
..... **[2]**

17 A security light is designed to switch on automatically when it becomes dark.

The diagram shows part of the circuit for the security light.

The circuit contains a battery, a light dependent resistor (LDR) and a 2000 Ω resistor.



(a) In bright light, there is a potential difference of 4.0 V across the 2000 Ω resistor.

Calculate the potential difference across the LDR.

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Answer = ...V **[1]**

(b) Calculate the current in the 2000 Ω resistor.

Show your working and state the unit.

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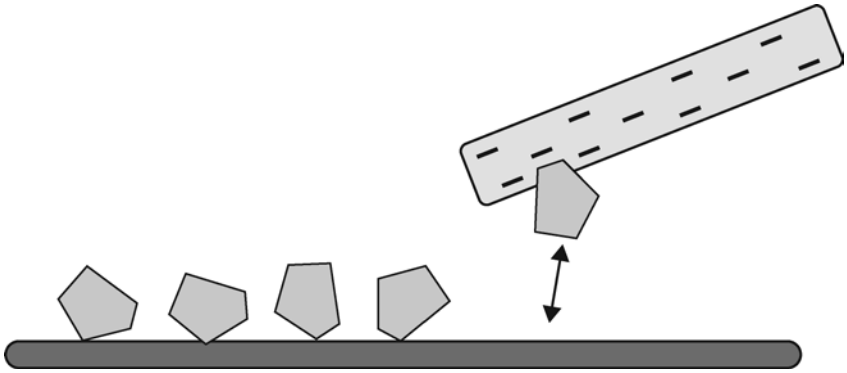
Answer = ... Unit ..... **[4]**

18 Some small pieces of paper are on a surface.

A negatively charged rod is held near to the paper.



(a) (i) State what is meant by the term **negatively charged**?

..... **[1]**

(ii) A negatively charged rod made of another type of plastic is brought near to the pieces of paper.

Why is the plastic rod able to keep the negative charge?

..... **[1]**

(iii) Explain why the pieces of paper move towards the charged rod.

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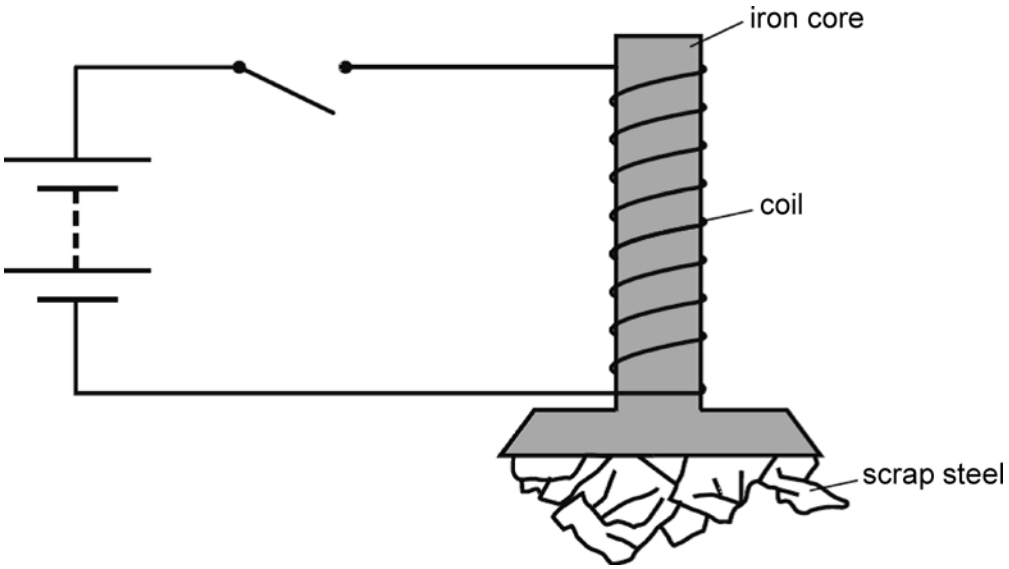
..... **[3]**

19* The diagram shows a simple circuit diagram for an electromagnet used to pick up scrap steel.



When the switch is closed, the scrap steel is attracted to the electromagnet.

Explain why this happens.

What modifications could be made to the apparatus to pick up even more steel?

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..... **[6]**

END OF QUESTION PAPER

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OCR
Oxford Cambridge and RSA

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…day June 20XX – Morning/Afternoon

GCSE (9–1) Combined Science (Physics) A (Gateway Science)
J250/05 Paper 5 (Foundation Tier)

SAMPLE MARK SCHEME

Duration: 1 hour 10 minutes

MAXIMUM MARK 60

This document consists of 12 pages

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

3. Log-in to scoris and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

   YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the scoris messaging system.

5. Work crossed out:
   a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks
   b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If

the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. There is a NR (No Response) option. Award NR (No Response)
   - if there is nothing written at all in the answer space
   - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
   - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

   Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The scoris **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
If you have any questions or comments for your Team Leader, use the phone, the scoris messaging system, or email.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

    Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer. Once the level is located, award the higher or lower mark:

    The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.
    The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

    In summary:

    The skills and science content determines the level.
    The communication statement determines the mark within a level.

11. Annotations

Annotation	Meaning
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
_	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

12. Subject-specific Marking Instructions

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9–1) in Combined Science A (Gateway Science):

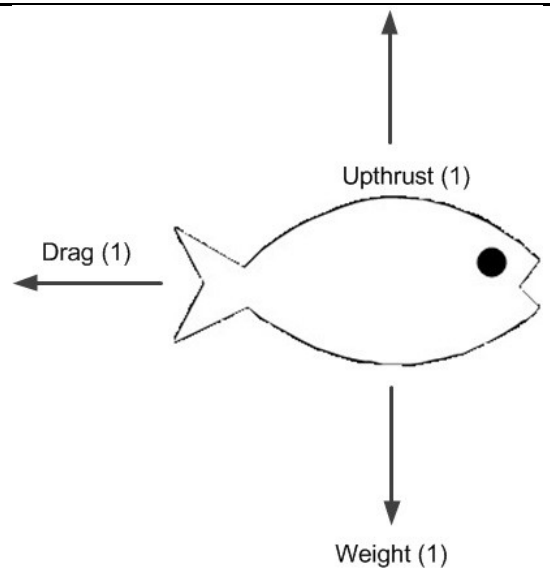
	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.**
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	**Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.**
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

SECTION A

Question	Answer	Marks	AO element	Guidance
1	D	1	1.1	
2	A	1	2.1	
3	D	1	1.2	
4	D	1	2.1	
5	B	1	2.1	
6	B	1	1.2	
7	B	1	2.1	
8	D	1	1.1	
9	D	1	1.1	
10	A	1	2.1	

SECTION B

Question			Answer	Marks	AO element	Guidance
11	(a)		35 (1)	1	3.1b	
	(b)		Rearrange given formula: speed = distance ÷ time (1) Substitute values: 34/0.6 (1) Answer: 56.7 (1) Units: cm/s (1)	4	1.2 2.1 2.1 1.1	**ALLOW** 0.567 m/s or 0.57 m/s with correct units for full marks
12	(a)		Higher temperature means lower resistance / **ORA** (1)	1	3.1a	
	(b)		Correct substitution: $P = (2^2) \times 5$ (1) 20 (W) (1)	2	2 x 2.1	
13	(a)		(length) 11.8 (1) (extension) 1.2 (1)	2	2 x 3.1b	
	(b)		points – accurate plotting of all points (1) best fit line – straight line through all points (1)	2	2 x 1.2	
	(c)		best fit line is straight / extension increases by same amount per N (1)	1	3.2b	
	(d)		Rearrange formula to give: spring constant = force ÷ extension (1) Substitute values: k = 15.0/3.0 (1) Answer: 5.0 (1)	3	1.2 2.1 2.1	

Question			Answer	Marks	AO element	Guidance
14	(a)			3	3 x 1.1	**IGNORE** annotations about water pressure
	(b)		Rearrange given formula: Power = work done / time (1) Convert 0.18kJ to 180J Use of formula, substituting values: 180/4 (1) Answer: 45 (W) (1)	4	 1.2 1.2 2.1 2.1	
15	(a)	(i)	180 seconds (1) Horizontal line from 200 °C intersecting line at 180 (1)	2	3.1b 1.2	
		(ii)	Any number between 375 and 400 (1)	1	3.2a	
	(b)		E= 0.4 x 2 260 000 (1) 904 000 (1) J/Joules (1)	3	2.1 2.1 1.1	**ALLOW** 904.0 kJ or 0.9041 MJ with correct units for full marks

Question			Answer	Marks	AO element	Guidance
16	(a)		measure: time and distance along ramp (1) Use of: average speed = distance ÷ time (1) Prediction: the greater the distance travelled along the ramp the greater the average speed (1)	3	2.2 2.2 3.1a	**ALLOW** use of light gates to measure time at 2 points a set distance apart (2) **ALLOW** use of light gate with interrupt card
	(b)		Any two from: Height of ramp (1) Angle of slope (1) How much friction there was between the wheels and surface (1)	2	2 x 3.3a	
17	(a)		2 (1)	1	1.2	
	(b)		Use of V = I x R (1) Re-arrange 6/2000 (1) 0.003 (1) A / Amps (1)	4	1.1 2.1 2.1 1.1	**ALLOW** 3 (with correctly prefixed unit) mA
18	(a)	(i)	Gain of electrons to become negative (1)	1	1.1	
		(ii)	The charge cannot flow / the charge is static (1)	1	1.1	
		(iii)	Rod induces charge onto paper (1) Charge at the top of the paper is opposite in charge to the rod (1) They attract one another as they have opposite charges(1)	3	3 x 2.1	

Question			Answer	Marks	AO element	Guidance
19*			Please refer to the marking instructions on page 3 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** **Complete explanation of how an electromagnet works AND suggestions of multiple improvements to the design with reasons.** *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** **Explanation for why the steel is attracted AND a suggestion of an improvement.** *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** **Simple description of how a magnetic field is induced in an electromagnet.** *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** *No response or no response worthy of credit.*	**6**	**2 x 3.3b** **2.2** **3 x 1.2**	**AO3.3b: Suggestions of improvements to the design** • improvements to include iron core/more coils/more current through the wire/ greater surface area of plate • idea of how these improvements increase the strength of the electromagnet **AO2.2: Explanation of how this electromagnet works** • plate acts as a magnet • scrap-steel lost quickly when the switch is opened as the electromagnet is only a temporary magnet • links loss of current and magnetic field and loss of induced magnetism in coil **AO1.2: Simple description of how a magnetic field is induced in an electromagnet** • closed switch allows current to flow/ **ORA** • current so magnetic field formed around wire/ solenoid • magnetic field so attraction between core and steel • core acts as a magnet • induced magnetism in core

Summary of updates

Date	Version	Change
May 2018	2	We've reviewed the look and feel of our papers through text, tone, language, images and formatting. For more information please see our assessment principles in our "Exploring our question papers" brochures on our website.
October 2019	2.1	Question 12(b)- Mark Scheme correction. Answer shoud be: $P = (2^2) \times 5$ (1) = 20 (W) (1) Question 15(b)- Mark Scheme correction from 904300 to 904000 J/joules. Guidance column has been amended from 904.3 to 904.0 kJ and 0.9043 to 09041 MJ