

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

**J250/05** Paper 5, P1–P3 and CS7 (PAGs P1–P6)  
(Foundation Tier)

**Wednesday 23 May 2018 – Afternoon**

**Time allowed: 1 hour 10 minutes**



**You must have:**

- a ruler (cm/mm)
- the Data Sheet (for GCSE Physics A (inserted))

**You may use:**

- a scientific or graphical calculator
- an HB pencil



First name										
Last name										
Centre number						Candidate number				

## INSTRUCTIONS

- The Data Sheet will be found inside this document.
- 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. If additional space is required, use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

## 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 **20** pages.

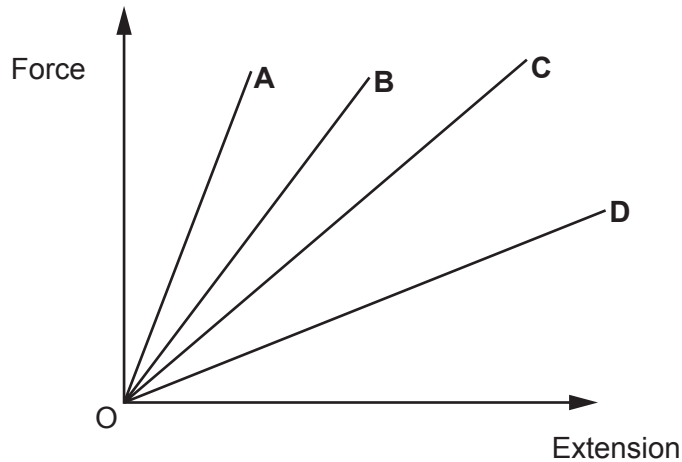
**2**  
**SECTION A**

Answer **all** the questions.

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

- 1** Four springs **A**, **B**, **C** and **D** are made of four different materials.

Use the equation: Force = Extension  $\times$  Spring constant

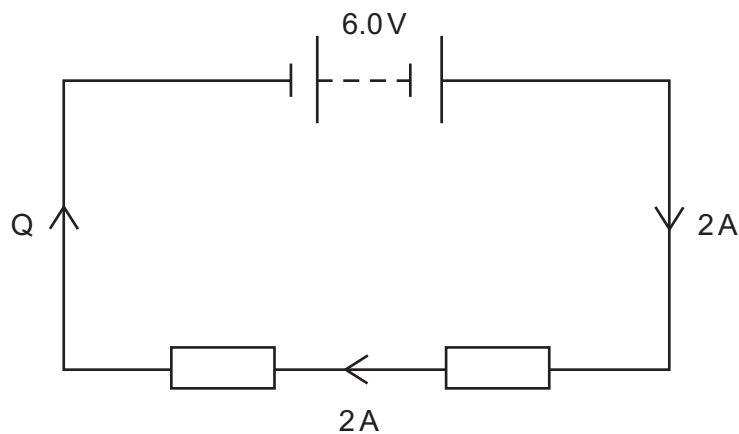


Which of the springs has the **greatest** spring constant?

Your answer

[1]

- 2** What is the current at point Q in the circuit?



- A** 0A
- B** 2A
- C** 4A
- D** 6A

Your answer

[1]

3 What is the gravitational field strength on Earth?

- A 1.0 N/kg
- B 1.6 N/kg
- C 10.0 N/kg
- D 98.9 N/kg

Your answer

[1]

4 Which of the following is a scalar quantity?

- A Displacement
- B Distance
- C Force
- D Velocity

Your answer

[1]

5 A solenoid can be used to produce a magnetic field.

Which of the following **increases** the magnetic field strength produced?

- A Decreasing the current
- B Decreasing the number of turns
- C Increasing the current
- D Removing magnetic material from the core

Your answer

[1]

6 Which of the following transfers the **most** energy?

- A 1.0kW over one hour
- B 2.0kW over two hours
- C 3.0kW over one hour
- D 500W over four hours

Your answer

[1]

7 Which of the following is **not** part of the atomic model?

- A Almost all of an atom's mass is contained in the nucleus.
- B An atom's nucleus contains positive neutrons.
- C An atom's nucleus is located in the centre of the atom.
- D An atom's nucleus is surrounded by electrons.

Your answer

[1]

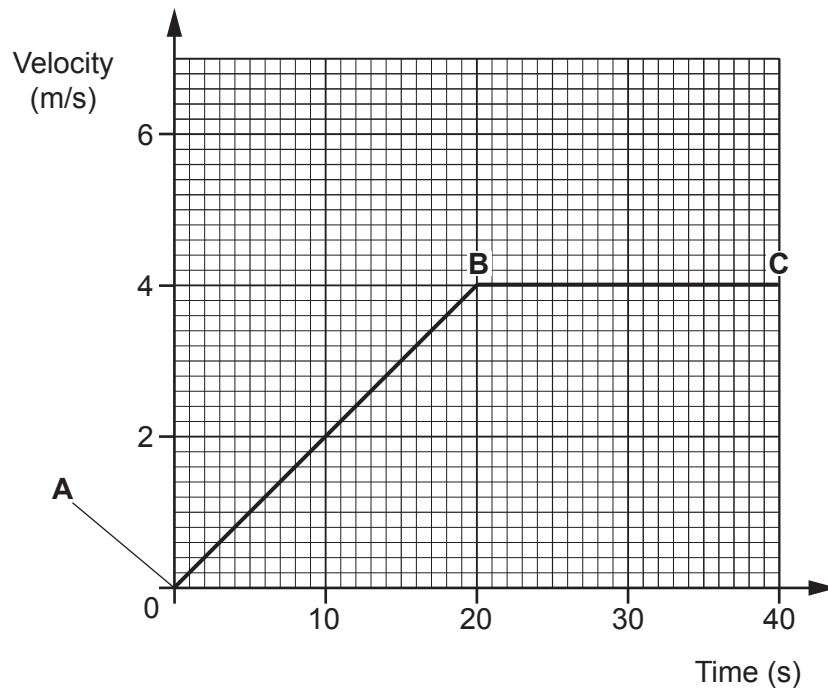
8 Which row, **A**, **B**, **C** or **D** shows the **largest** change in thermal energy?

	Mass (kg)	Specific heat capacity (J/kg °C)	Temperature change (°C)
<b>A</b>	1	4200	40
<b>B</b>	1	4200	20
<b>C</b>	2	4200	10
<b>D</b>	2	4200	5

Your answer

[1]

- 9 What is the acceleration between points **A** and **B** on the graph?

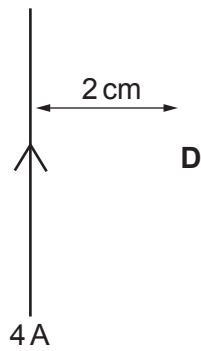
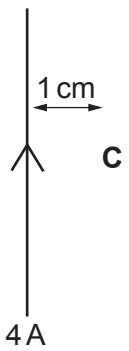
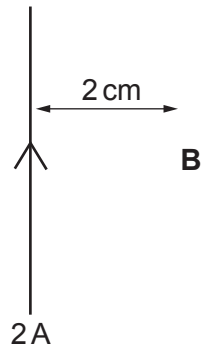


- A**  $0.1 \text{ m/s}^2$   
**B**  $0.2 \text{ m/s}^2$   
**C**  $0.3 \text{ m/s}^2$   
**D**  $0.4 \text{ m/s}^2$

Your answer

[1]

- 10 Four compasses are each placed near to a wire at points **A**, **B**, **C** and **D**. Each wire has a current flowing through it. The distance of each compass from its wire is shown.



Which compass experiences the **greatest** magnetic field strength?

Your answer

[1]

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## SECTION B

Answer **all** the questions.

- 11** A student has one cell and two lamps. She wishes to connect them so that both lamps have maximum brightness.

**(a)** Draw a **complete** circuit diagram to show how she can achieve this.

**[3]**

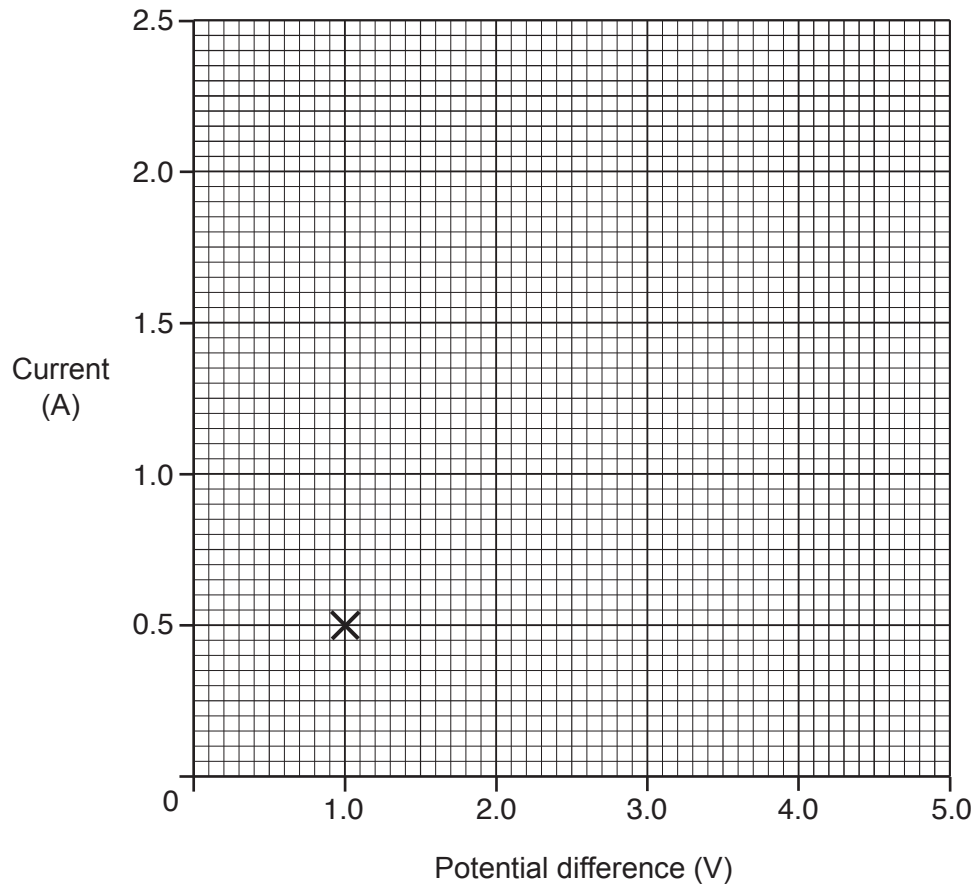
- (b)** The student then investigates an unknown component. She records values for current through the component and the potential difference across the component.

Potential difference (V)	Current (A)
1.0	0.5
2.0	1.0
3.0	1.5
4.0	2.0
5.0	2.5



- (i) Plot a graph of the data and draw a line of best fit.

One of the points has already been completed for you.



[3]

- (ii) Describe what these results show.

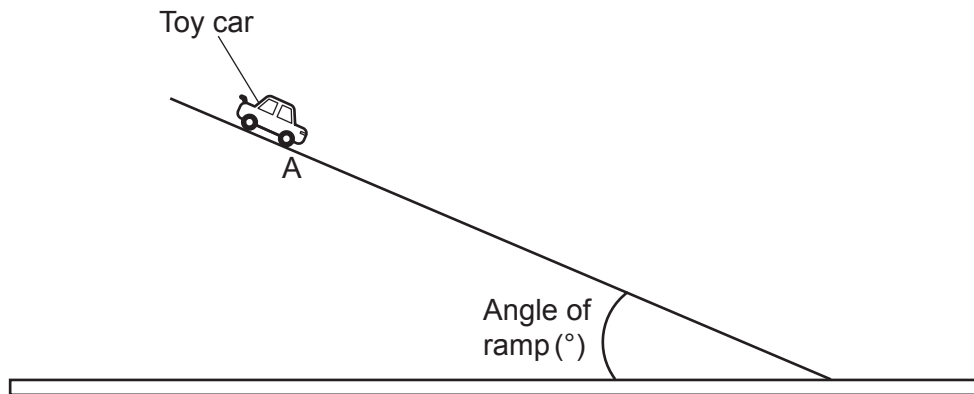
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 .....  
 ..... [1]

- (iii) Calculate the resistance of the unknown component.

Use the equation: Resistance = Potential difference  $\div$  Current

Answer = ..... ohms [2]

- 12 A student wishes to calculate the average speed of a toy car travelling down a ramp. He releases the car without pushing it from the start point A.



He takes measurements of distance and time.

- (a) (i) Write down the instruments the student could use to measure distance and time.

Distance .....

Time .....

[2]

- (ii) State how he can calculate the average speed using these measurements.

.....

..... [1]

- (b) The student has an idea about this experiment. He thinks that the greater the angle of the ramp, the greater the average speed of the car.

Look at his results.

Angle (°)	Distance (m)	Time (s)	Average speed (m/s)
10	1.2	1.9	0.63
20	1.2	2.0	
30	1.2	1.3	0.92

- (i) Calculate the average speed for the 20° angle.

Write your answer to 2 significant figures.

Answer = ..... [3]

- (ii) Do these results support the student's idea?

Explain your answer.

.....

.....

..... [1]

- (c) Another student thinks that this experiment could be improved.

Suggest **one** problem with this experiment and explain how the experiment could be improved.

Problem: .....

Improvement: .....

.....

..... [3]

12  
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..... [6

- 14 (a)** A student has a wooden cube.

Explain how she could find the density of the wooden cube.

Include the measurements needed.

.....

.....

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.....

..... [3]

- (b)** When a material changes state, its density changes.

Explain how.

Use ideas about particles.

You may draw diagrams of solids, liquids and gases to help.

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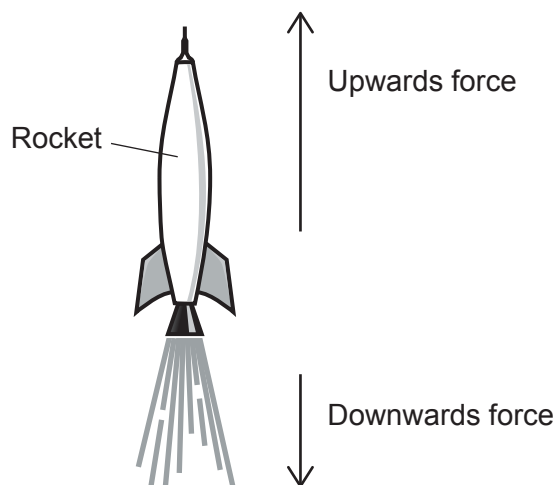
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..... [4]

- 15 During launch, a rocket accelerates when the upwards force is greater than the downwards force.



- (a) (i) Name the upwards and downwards forces on the rocket during launch.

Upwards force: .....

Downwards force: .....

[2]

- (ii) At launch, the upwards force is 10 000 N and the downwards force is 8 000 N.

Write down the size of the resultant force in Newtons.

Answer = ..... N [1]

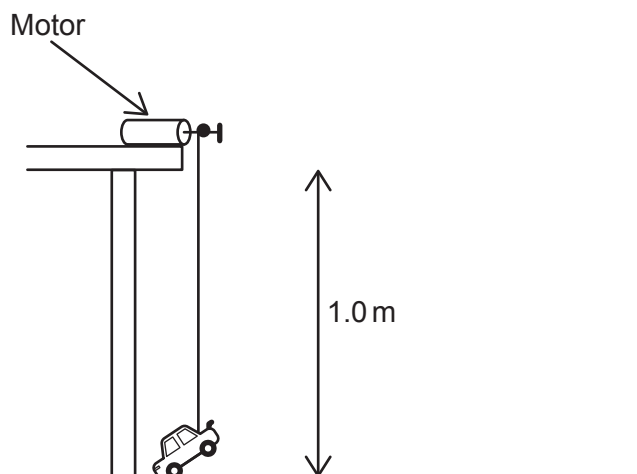
- (iii) The rocket has a mass of 800 kg.

Calculate its acceleration.

Use the equation: Force = Mass  $\times$  Acceleration

Answer = .....  $\text{m/s}^2$  [3]

- 16 (a) A student uses a small motor to lift a toy car through a vertical distance of 1.0 m.



The car has a weight of 0.05 N.

- (i) Calculate the work done when lifting the car through this distance.

Answer = ..... J [3]

- (ii) Calculate the power of the motor if the car takes 5.0 seconds to travel the 1.0 m distance.

State the unit.

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



- (b) The motor uses 2 cells in series.

Each cell has a potential difference of 1.5 V.

- (i) Write down the total potential difference of the cells.

Answer = ..... V [1]

- (ii) The motor has a resistance of  $6.0\ \Omega$ .

Calculate the current in the circuit when the motor is in use.

Use the equation: Potential difference = Current  $\times$  Resistance

Answer = ..... A [3]

- (c) The student wishes to increase the time taken to lift this toy car vertically through the 1.0 m distance shown.

Suggest a change he could make to this experiment to achieve this.

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

**END OF QUESTION PAPER**

[illegible]



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