AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
PHYSICS

F

Foundation Tier

Paper 2F

Specimen 2018 (set 2)

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:
- a ruler
- a scientific calculator
- the Physics Equations Sheet (enclosed).

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information
- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
TOTAL	

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

0 1 . 1 There are eight planets in orbit around the Sun.

Which other type of object orbits the Sun?

[1 mark]

Tick **one** box.

Dwarf planet ☐

Galaxy ☐

Moon ☐

Star ☐

0 1 . 2 Complete the sentences.

Choose the answers from the box.

[2 marks]

black hole	**gravity**	**friction**
nebula	**protostar**	**upthrust**

The Sun was formed when a _____ in space was pulled together by _____ .

0 1 . 3 The Sun has reached the Main Sequence stage in its lifecycle.

What stage in the lifecycle of the Sun will follow the Main Sequence stage?

[1 mark]

_____

Question 1 continues on the next page

Table 1 shows some data about the eight planets that orbit the Sun.

Table 1

Planet	**Distance from the Sun compared to the Earth**	**Time to orbit the Sun in years**	**Mean surface temperature in °C**
Mercury	0.4	0.2	+125
Venus	0.7	0.6	+465
Earth	1.0	1.0	+22
Mars	1.5	1.9	-48
Jupiter	**X**	12	–108
Saturn	9.6	30	–180
Uranus	19.3	84	–216
Neptune	30.0	165	–201

0 1 . 4 What pattern links the distance a planet is from the Sun and the time taken by the planet to orbit the Sun?

[1 mark]

0 1 . 5 Estimate the value of **X** in **Table 1**.

[1 mark]

Distance = _____

0 1 . 6 A student looked at the data in **Table 1** and wrote the following conclusion:

'The mean surface temperature of a planet decreases the further the planet is from the Sun.'

Explain why this conclusion is **not** totally correct.

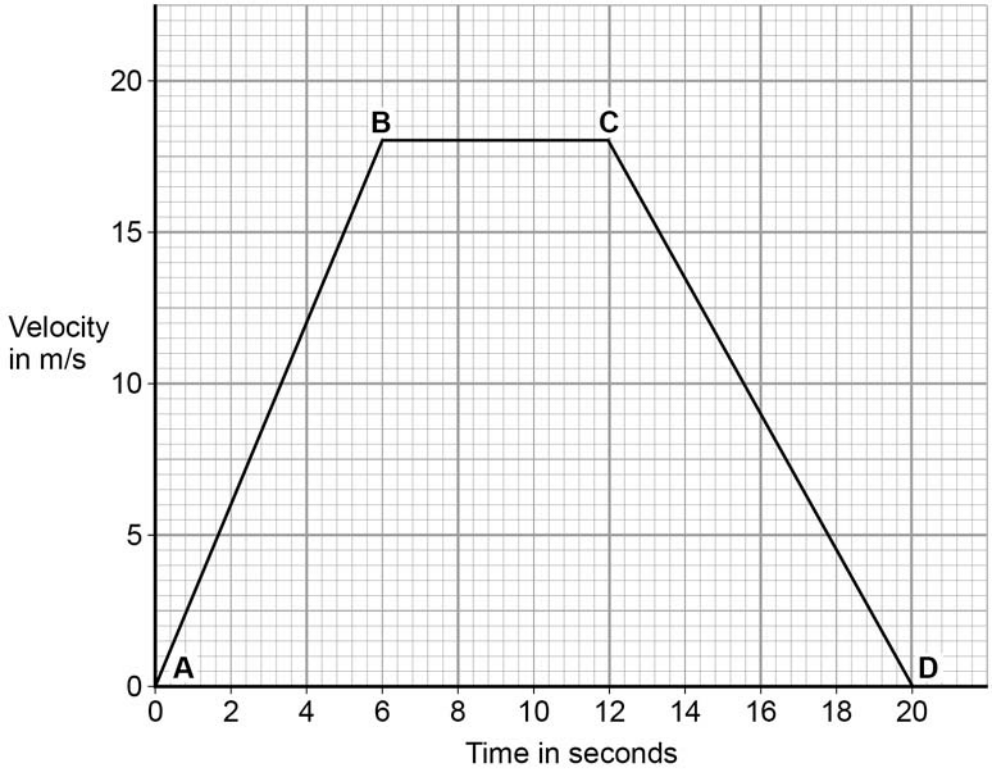
[3 marks]

9

Turn over for the next question

0 2 **Figure 1** shows the velocity-time graph for a car driven along a straight road.

Figure 1



0 2 . 1 From **B** to **C** the car is moving at a constant velocity.

Complete the sentence.

Choose the answer from the box.

[1 mark]

equal to	**greater than**	**less than**

From **B** to **C** the forward driving force is _____ the backward resistive force.

0 2 . 2 From **C** to **D** the car is slowing down.

What word is used to describe the motion of an object that is slowing down?

[1 mark]

_____

0 2 . 3 Between **A** and **B** the car is accelerating.

Calculate the acceleration of the car between **A** and **B**.

Use the equation:

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

[2 marks]

_____

_____

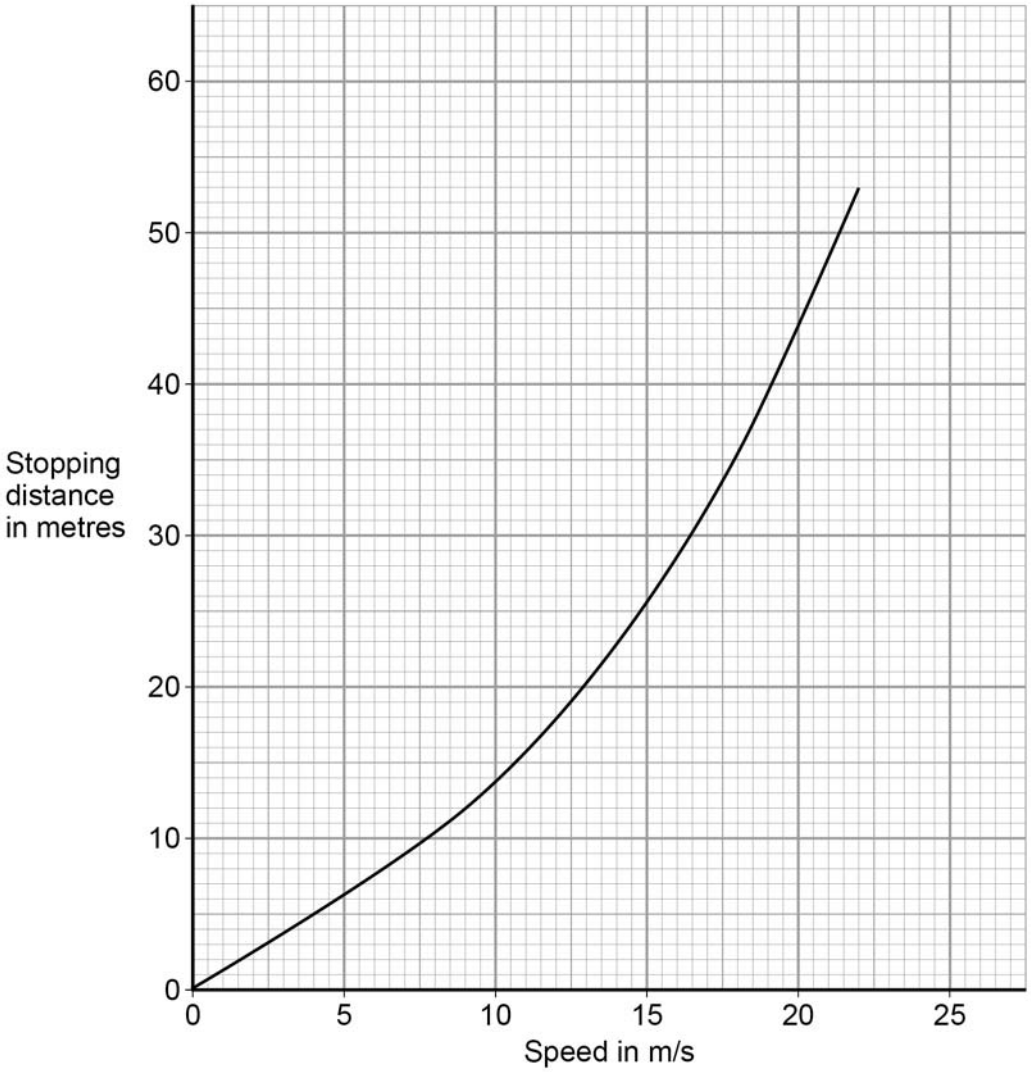
_____

Acceleration = _____ m/s^2

Question 2 continues on the next page

0 2 . 4 **Figure 2** shows how the stopping distance of a car depends on the speed of the car.

Figure 2



Describe what happens to the stopping distance of the car when the speed of the car doubles.

[2 marks]

6

Turn over for the next question

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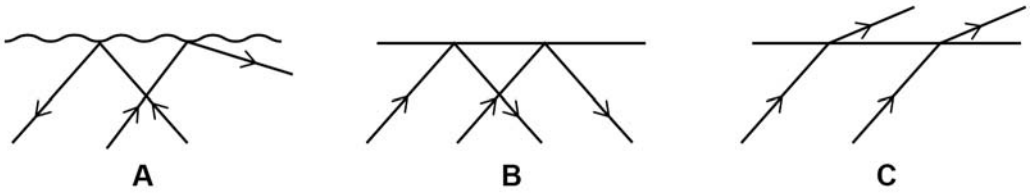
ANSWER IN THE SPACES PROVIDED

0 3 . 1 **Figure 3** shows what happens to rays of light incident on three different surfaces.

Figure 3



Which **one** of the diagrams shows diffuse reflection?

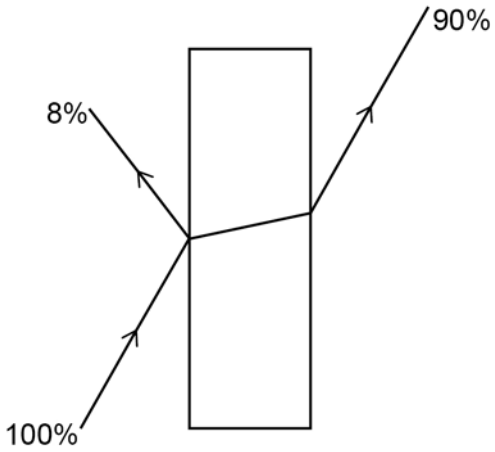
[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐

0 3 . 2 **Figure 4** shows what happens to the energy transferred by a ray of light when the ray of light hits a glass block.

Figure 4



Calculate the percentage of the energy absorbed by the glass block.

[1 mark]

Percentage of energy absorbed = _____ %

Question 3 continues on the next page

0 3 . 3 Viewing an object through a colour filter may make the object look a different colour.

Complete the sentences.

Choose the answers from the box.

[3 marks]

absorbs	**black**	**blue**
red	**reflects**	**transmits**

A red object viewed through a blue filter will look _____ .

This is because the red object only _____ red light and the blue filter only _____ blue light.

0 3 . 4 A white surface is viewed through a green filter.

What colour will the surface look?

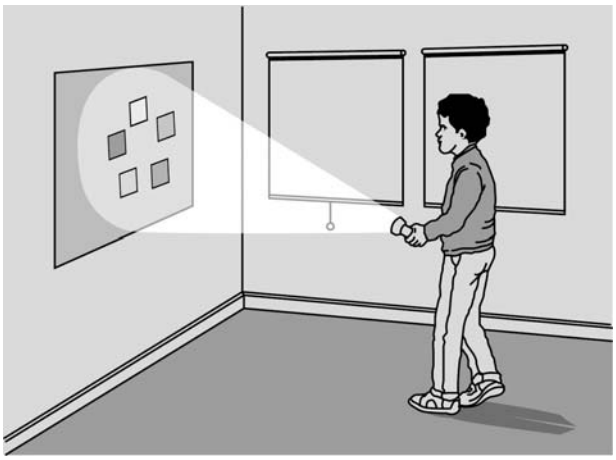
[1 mark]

_____

Cyclists often wear clothing that reflects a lot of light.

Figure 5 shows a student investigating which colours are best at reflecting light.

Figure 5



This is the method used.

1. Small squares of different coloured material were stuck onto a piece of black paper at one end of a darkened laboratory.
2. The student switched on a torch and walked slowly towards the coloured squares.
3. The student stopped walking as soon as he could clearly see a coloured square.
4. The student measured the distance between the torch and the coloured square.

0 3 . 5 Give a reason why it was important the student did the investigation in a darkened laboratory.

[1 mark]

0 3 . 6 Give a reason why it was important the area of each coloured square was the same.

[1 mark]

Turn over ►

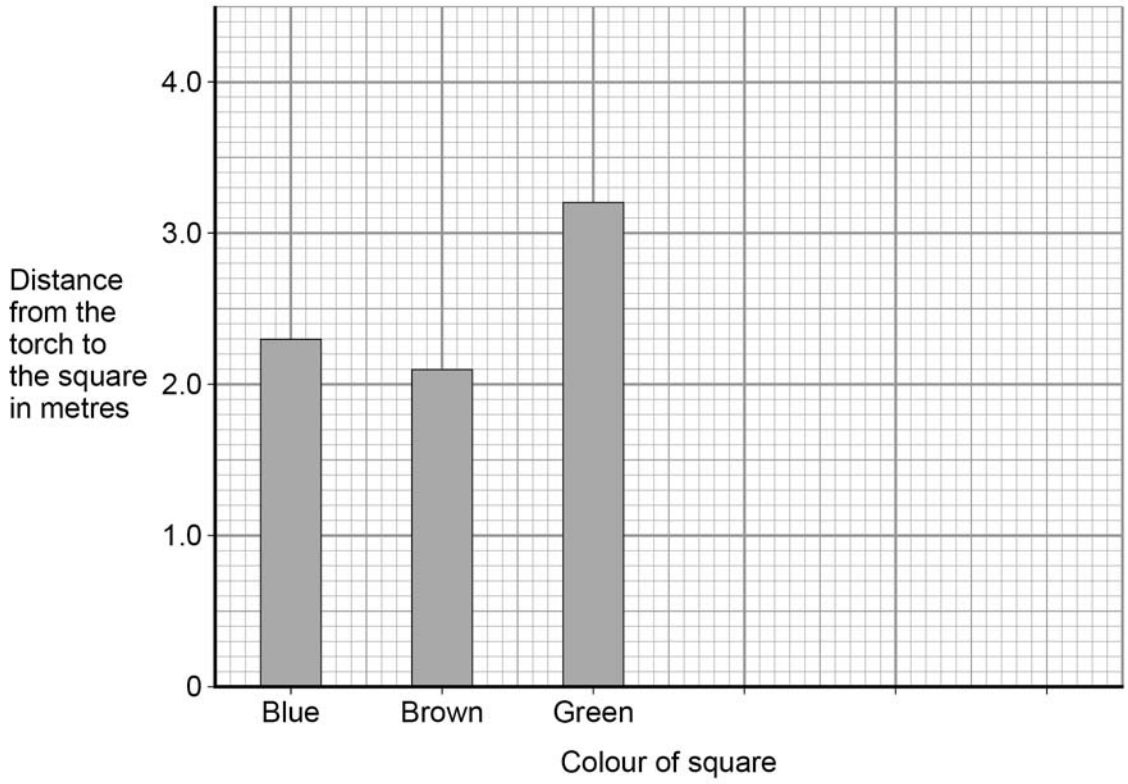
Table 2 shows the student's results.

Table 2

Colour of square	Distance from the torch to the square in metres
Blue	2.3
Brown	2.1
Green	3.2
Orange	3.4
Red	2.6

Figure 6 shows a bar chart with only three of the student's results.

Figure 6



0 3 . 7 Complete the bar chart to show all of the results.

[3 marks]

0 3 . 8 Which colour clothing would be best for a cyclist to wear?

Use the data in **Table 6**.

[2 marks]

Tick **one** box.

Blue ☐ Brown ☐ Green ☐ Orange ☐ Red ☐

Give a reason for your answer.

_____

_____

_____

0 3 . 9 The student did the investigation again to obtain a second set of results.

The second set of results showed the same pattern as the first set.

Complete the sentence.

Choose the answer from the box.

[1 mark]

accurate	**precise**	**repeatable**	**reproducible**

The measurements taken by the student were _____ .

14

Turn over ►

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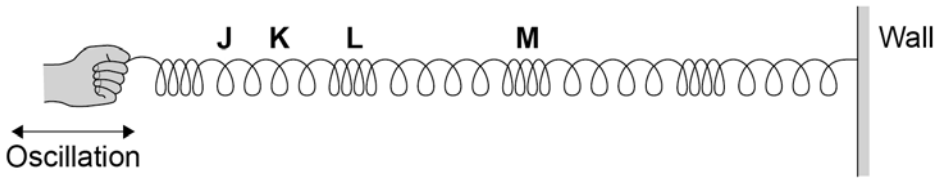
ANSWER IN THE SPACES PROVIDED

0 4 **Figure 7** shows a longitudinal wave being produced in a stretched spring.

Figure 7



0 4 . 1 Which of the letters on **Figure 7** shows the centre of a rarefaction?

[1 mark]

Tick **one** box.

J ☐ **K** ☐ **L** ☐ **M** ☐

0 4 . 2 Which two letters in **Figure 7** have a distance of one wavelength between them?

[1 mark]

Tick **one** box.

J and **K** ☐ **K** and **L** ☐ **L** and **M** ☐ **J** and **M** ☐

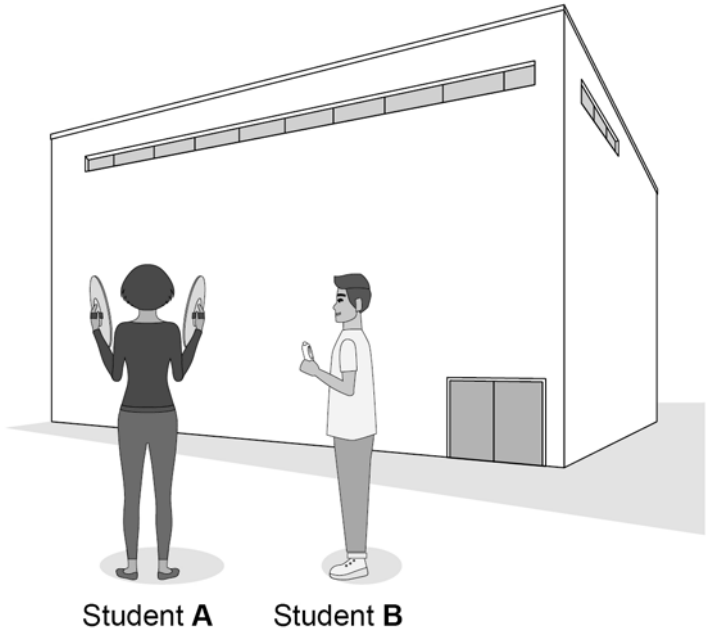
0 4 . 3 Describe how the end of the stretched spring should be moved in order to produce a transverse wave.

[1 mark]

Question 4 continues on the next page

Figure 8 shows how two students used the sound reflected off a building (an echo) to measure the speed of sound.

Figure 8



This is the method used.

1. Student **A** hit two cymbals together and student **B** started a stopwatch.
2. When student **A** heard an echo she hit the cymbals together again.
3. Student **B** stopped the stopwatch after timing 5 echoes.

Table 3 shows the results.

Table 3

Time for 5 echoes in seconds
3.1
2.7
2.2
3.2

0 4 . 4 The students decided that the time of 2.2 s was an anomalous result.

What was the most likely cause for this anomalous result?

[1 mark]

Tick **one** box.

Not resetting the stopwatch to zero. ☐

Starting the stopwatch too soon. ☐

Timing less than five echoes. ☐

Timing more than five echoes. ☐

0 4 . 5 Calculate the mean value of the time for 5 echoes.

Ignore the anomalous result.

[1 mark]

Mean time = _____ s

0 4 . 6 The distance between student **A** and the building is 75 metres.

Calculate the distance the sound travels in going from student **A** to the building and back again five times.

[1 mark]

Distance = _____ m

Question 4 continues on the next page

0 4 . 7 Calculate the speed of sound.

Use your answers to Questions **04.5** and **04.6** and the equation:

$$\text{speed} = \frac{\text{distance travelled}}{\text{time}}$$

[2 marks]

Speed of sound = _____ m/s

0 4 . 8 The value for the speed of sound obtained by the students is not very accurate.

Suggest **two** changes to the method used by the students that would improve the accuracy.

[2 marks]

1 _____

2 _____

10

0 5 . 1 Which **one** of the following is **not** an electromagnetic wave?

[1 mark]

Tick **one** box.

Gamma rays ☐

Sound ☐

Ultraviolet ☐

X-rays ☐

0 5 . 2 What type of electromagnetic wave do our eyes detect?

[1 mark]

_____

0 5 . 3 What is a practical use for infrared waves?

[1 mark]

Tick **one** box.

Cooking food ☐

Energy efficient lamps ☐

Medical imaging ☐

Satellite communications ☐

Question 5 continues on the next page

Scientists have detected radio waves emitted from a distant galaxy.

Some of the radio waves from the distant galaxy have a frequency of 1 200 000 000 hertz.

0 5 . 4 Which is the same as 1 200 000 000 hertz?

[1 mark]

Tick **one** box.

1.2 gigahertz ☐

1.2 kilohertz ☐

1.2 megahertz ☐

1.2 millihertz ☐

0 5 . 5 Radio waves travel through space at 300 000 kilometres per second (km/s).

How is 300 000 km/s converted to metres per second (m/s)?

[1 mark]

Tick **one** box.

300 000 ÷ 1000 = 300 m/s ☐

300 000 × 1000 = 300 000 000 m/s ☐

300 000 + 1000 = 301 000 m/s ☐

300 000 – 1000 = 299 000 m/s ☐

0 5 . 6 Write the equation which links frequency, wavelength and wave speed.

[1 mark]

_____

0 5 . 7 Calculate the wavelength of the radio waves emitted from the distant galaxy.

Give your answer in metres.

[3 marks]

_____

_____

_____

Wavelength = _____ m

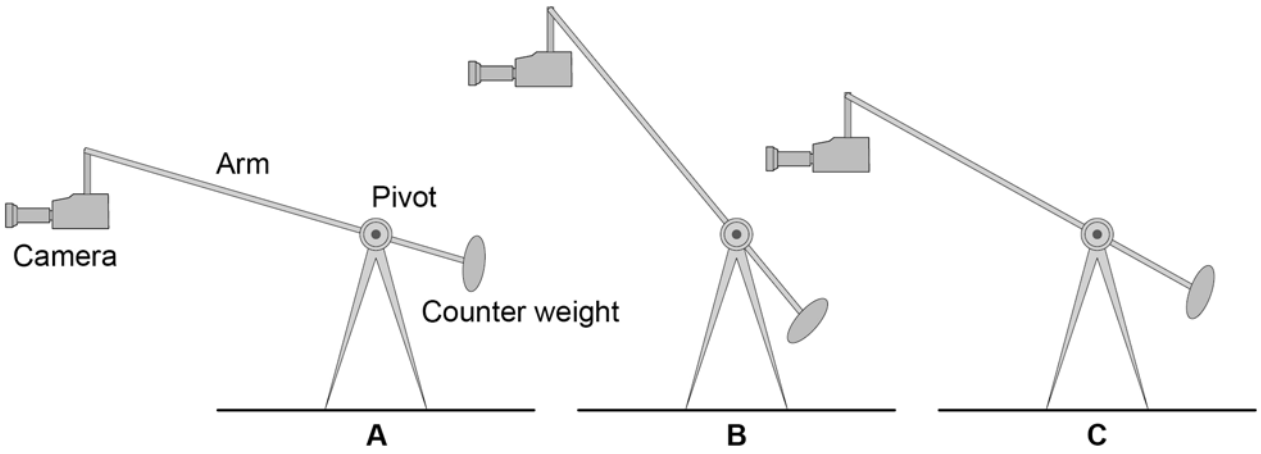
9

Turn over for the next question

0 6 A camera boom is used at a television studio to allow filming from different positions.

Figure 9 shows the arm of the boom in three different positions.

Figure 9



0 6 . 1 In which position will the weight of the camera cause the largest moment about the pivot?

[2 marks]

Tick **one** box.

A ☐ **B** ☐ **C** ☐

Give the reason for your answer.

0 6 . 2 Complete the sentence.

Choose the answer from the box.

[1 mark]

decreases	**does not change**	**increase**

When the moment caused by the weight of the camera increases, the moment caused by the counterweight _____ .

0 6 . 3 The camera has a mass of 5.0 kg

gravitational field strength = 9.8 N/kg

Calculate the weight of the camera.

Use the equation:

weight = mass x gravitational field strength

Give the unit.

Choose the answer from the box.

joule	**kilogram**	**newton**

[3 marks]

_____

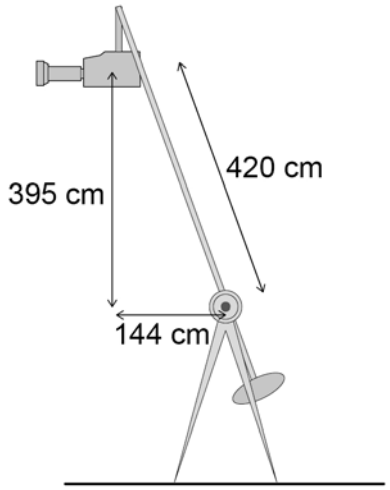
_____

Weight = _____ Unit _____

Question 6 continues on the next page

Figure 10 shows the camera boom in a new position, **D**.

Figure 10



0 6 . 4 Write the equation which links distance, force and moment of a force.

[1 mark]

0 6 . 5 Calculate the moment about the pivot caused by the weight of the camera when the arm of the boom is in position **D**.

[3 marks]

Moment = _____ Nm

10

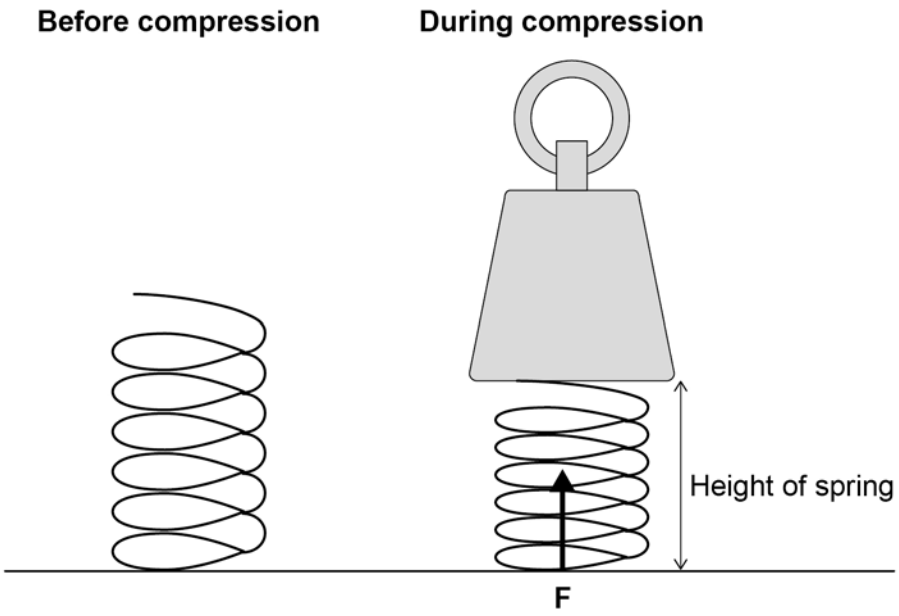
Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

0 7 **Figure 11** shows a spring before and during compression.

The arrow **F** represents one of the two forces involved in compressing the spring.

Figure 11



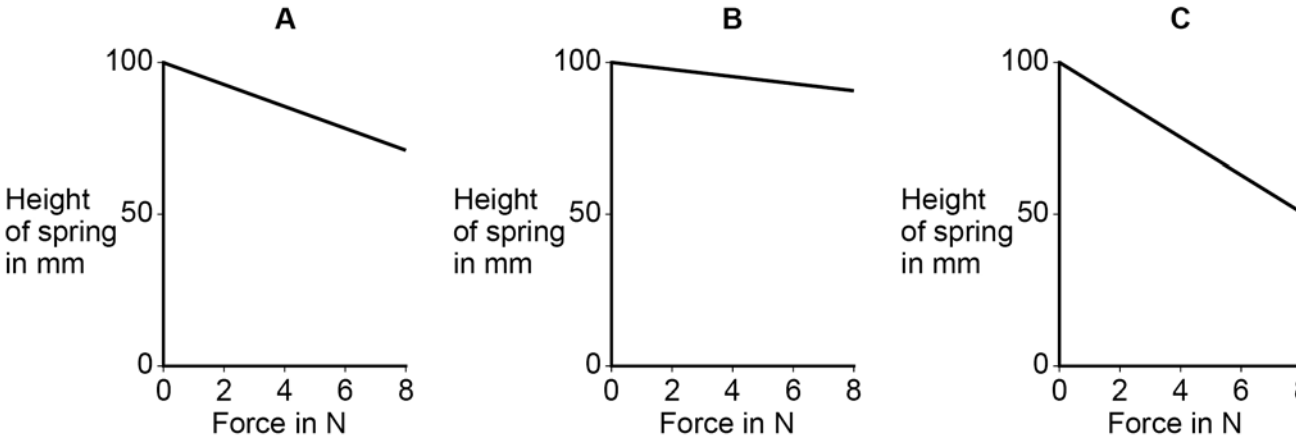
0 7 . 1 Draw another arrow on **Figure 11** to represent the second force involved in compressing the spring.

[2 marks]

A student investigated three different springs to compare the spring constants.

The results of the investigation are shown in **Figure 12**.

Figure 12



0 7 . 2 Which **one** of the springs has the smallest spring constant?

[2 marks]

Tick **one** box.

A ☐ **B** ☐ **C** ☐

Give the reason for your answer.

_____

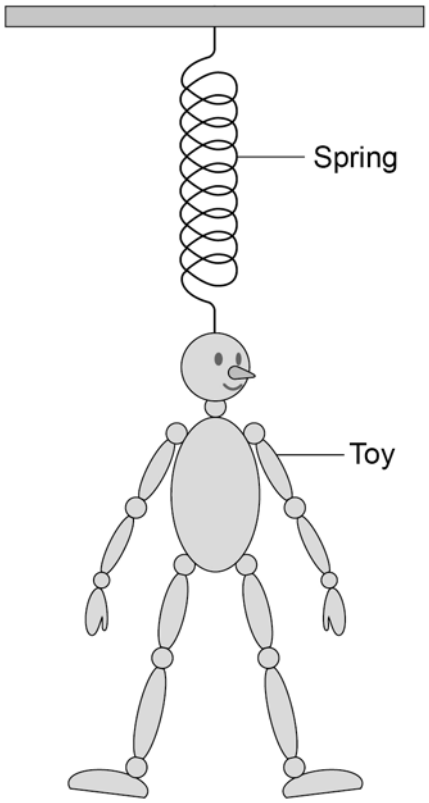
_____

Question 7 continues on the next page

Turn over ►

Figure 13 shows a child's toy. The toy hangs from a hook in the ceiling.

Figure 13



A child pulls the toy downwards and then releases it.

The toy oscillates up and down with a frequency of 1.25 Hz

0 7 . 3 How many times each second will the toy oscillate up and down?

[1 mark]

0 7 . 4 Calculate the period of the oscillating toy.

Use the Physics Equations Sheet.

[2 marks]

Period = _____ s

0 7 . 5 When the toy is stationary, its weight causes the length of the spring to increase from 0.05 m to 0.25 m

The spring constant = 7.0 N/m

Calculate the elastic potential energy stored in the spring.

Use the Physics Equations Sheet.

[3 marks]

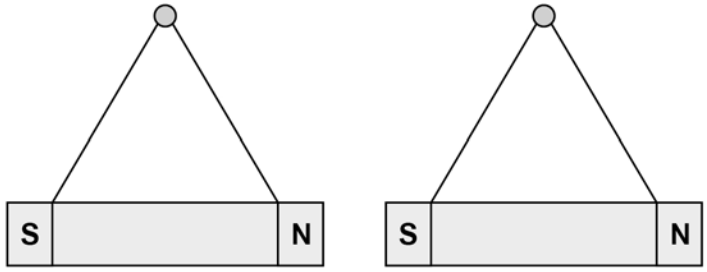
Elastic potential energy stored = _____ J

10

Turn over for the next question

0 8 **Figure 14** shows two bar magnets suspended close to each other.

Figure 14



0 8 . 1 Explain what is meant by the following statement.

'A non-contact force acts on each magnet'.

[2 marks]

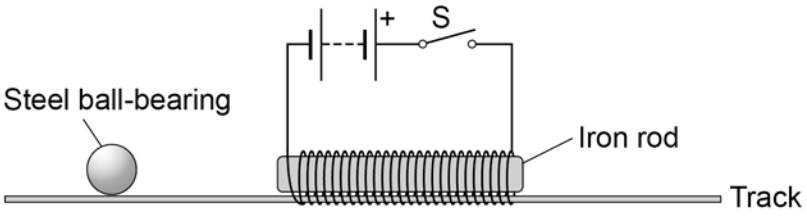
0 8 . 2 Describe how to plot the magnetic field pattern of a bar magnet.

[3 marks]

A student has set up the apparatus shown in **Figure 15**.

The iron rod is fixed to the track and cannot move.

Figure 15



0 8 . 3 The student gives the steel ball bearing a gentle push in the direction of the iron rod.

At the same time the student closes the switch **S**.

Explain the effect on the motion of the ball bearing when the switch **S** is closed.

[4 marks]

9

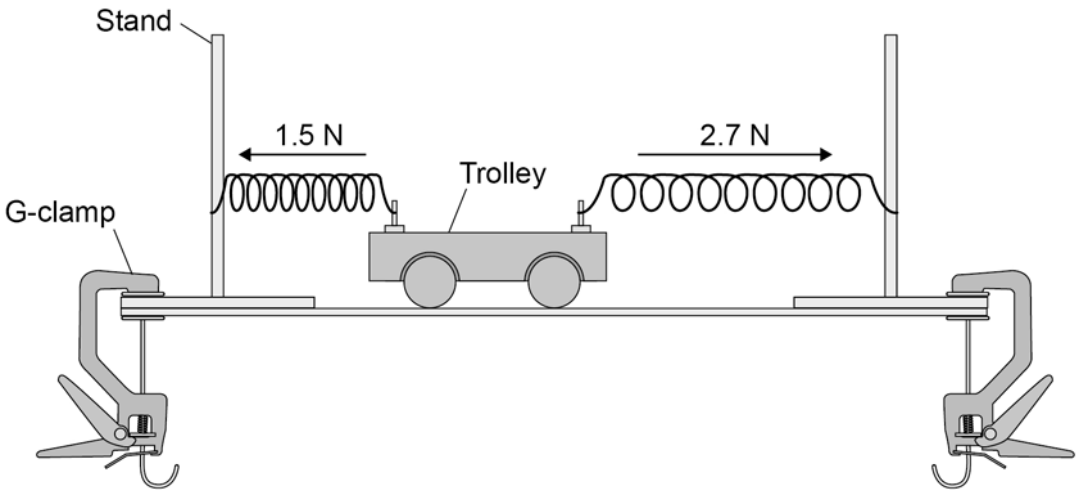
Turn over for the next question

0 9 A trolley is attached to two identical springs.

The trolley is pushed to the left and then released.

Figure 16 shows the horizontal forces acting on the trolley just after it is released.

Figure 16



0 9 . 1 Write the equation which links acceleration, mass and resultant force.

[1 mark]

_____

0 9 . 2 The trolley has a mass of 0.75 kg

Calculate the acceleration of the trolley just after it is released.

Give the unit.

[4 marks]

_____

_____

_____

_____

_____

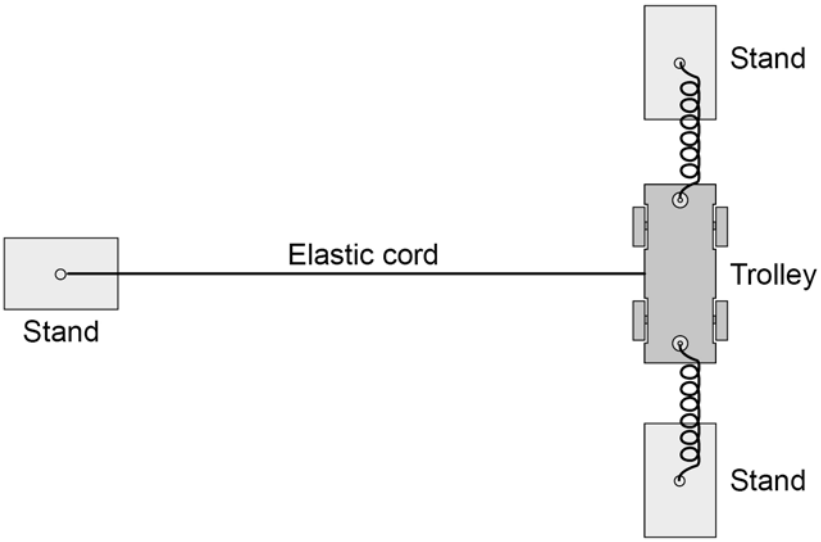
Acceleration = _____ Unit _____

An elastic cord is fixed to the trolley.

Figure 17 shows the arrangement viewed from above.

Figure 17

View from above



When the trolley is pushed and released a wave travels along the cord.

0 9 . 3 What type of wave travels along the cord?

[2 marks]

Give the reason for your answer.

0 9 . 4 Suggest **one** change that could be made to the apparatus shown in **Figure 17** to produce a wave with a lower frequency.

[1 mark]

8

Turn over ►

1 0 Two students investigated how the acceleration of a trolley depends on the force applied to the trolley.

Before starting the investigation each student wrote a hypothesis.

Hypothesis of student **A**:

'The acceleration of the trolley is directly proportional to the force applied to the trolley.'

Hypothesis of student **B**:

'Changing the force applied to the trolley will change the acceleration of the trolley.'

1 0 . 1 Consider the hypothesis of student **A**.

Predict what would happen to the acceleration of the trolley if the force applied to the trolley is doubled.

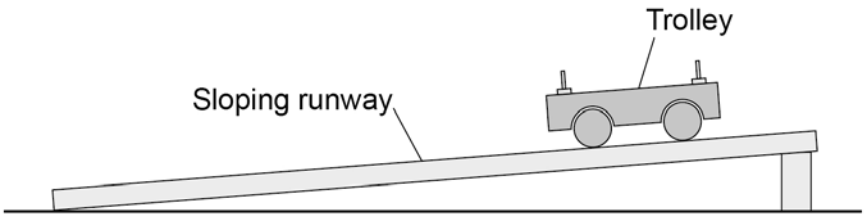
[1 mark]

1 0 . 2 Why is it difficult to make a valid prediction using the hypothesis of student **B**?

[1 mark]

Figure 18 shows some of the equipment used by the students.

Figure 18



1 0 . 3 Write a list of any other equipment the students will need to complete the investigation.

[2 marks]

1 0 . 4 Why should the students use a sloping runway?

[1 mark]

Tick **one** box.

To reduce the effect of friction on the trolley. ☐

To decrease the acceleration of the trolley. ☐

To stop the trolley rolling back up the runway. ☐

Question 10 continues on the next page

1 0 . 5 Describe a method the students could have used for their investigation.

[6 marks]

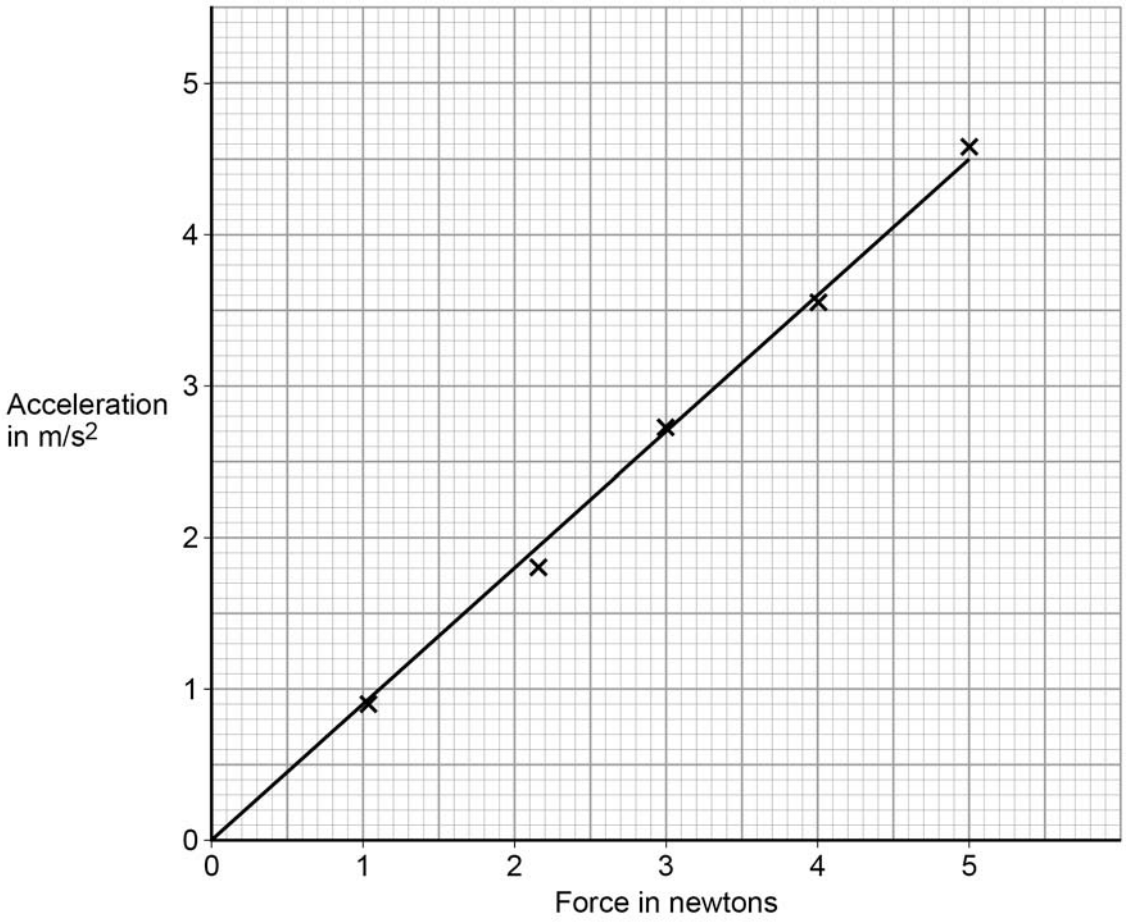
1 0 . 6 The students used the same trolley throughout the investigation.

Suggest why.

[2 marks]

The students' results are shown as a graph in **Figure 19**.

Figure 19



1 0 . 7 Explain why hypothesis **A** gives a better explanation of the results.

[2 marks]

END OF QUESTIONS

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