Collins

AQA

GCSE

PHYSICS

F

SET A – Paper 2 Foundation Tier

Author: Lynn Pharaoh

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a ruler
- a calculator.
- the Physics Equation Sheet (found at the end of the paper).

Instructions

- 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.

Information

- There are 100 marks available on this paper.
- 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.
- When answering questions 04.5 and 09.1 you need to make sure that your answer:
  – is clear, logical, sensibly structured
  – fully meets the requirements of the question
  – shows that each separate point or step supports the overall answer.

Advice

- In all calculations, show clearly how you work out your answer.

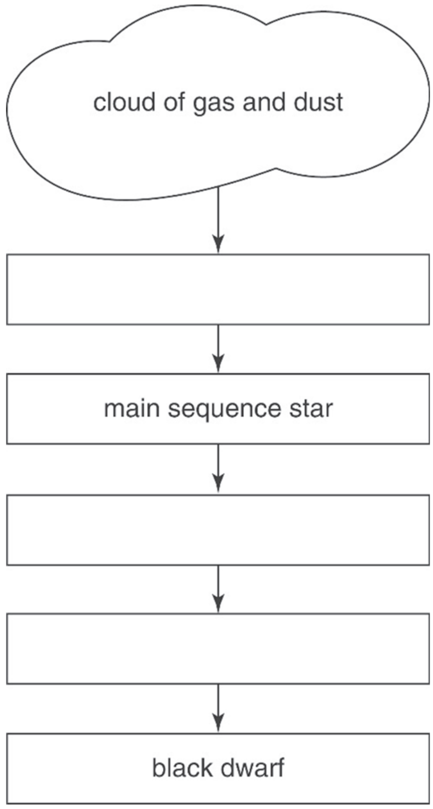
Name: ....

01.1 Give the name of the force that pulls gas and dust together to start the formation of a star.

[1 mark]

01.2 **Figure 1.1** shows some of the stages in the life cycle of a star that is about the **same size** as the Sun.

Figure 1.1

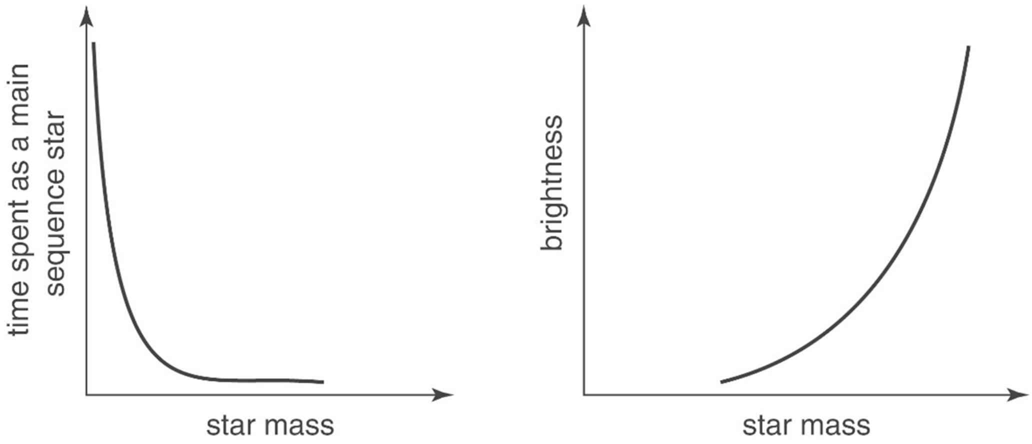


Complete **Figure 1.1** by writing the names of the 3 missing stages for such a star.

[3 marks]

01.3 The two sketch graphs in **Figure 1.2** show information about **main sequence** stars.

Figure 1.2



Using information from the graphs, complete the following sentences.

Choose words from the box.

greater	**smaller**	**the same as**

A A high-mass star spends a .... amount of time as a main sequence star than a low-mass star spends as a main sequence star.

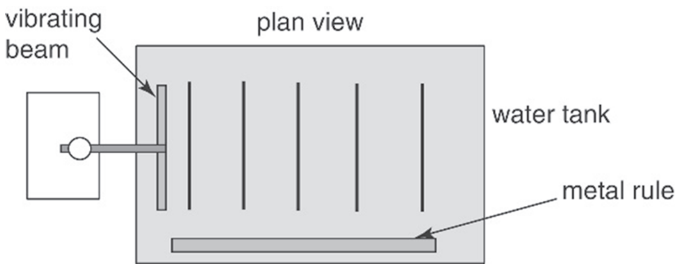
B The brightness of a high-mass star is .... than the brightness of a low-mass star.

[2 marks]

Turn over >

02 **Figure 2.1** shows a plan view of a ripple tank used to investigate the behaviour of waves.

Figure 2.1



02.1 The vibrating beam in the ripple tank produces waves which travel across the tank.

The beam makes 20 waves in 4 s

What is the frequency of the waves?

Tick **one** box.

20 Hz ☐

5.0 Hz ☐

80 Hz ☐ **[1 mark]**

02.2 The parallel lines on the ripple tank in **Figure 2.1** represent lines of wave crests.

What is the name given to the distance from one line of crests to the next line of crests?

Tick **one** box.

wavelength ☐

amplitude ☐

speed ☐ **[1 mark]**

02.3 The frequency of the waves on the ripple tank is changed to 3.0 Hz

The wavelength of the waves is measured at 4.0 cm

Calculate the speed of these ripple tank waves.

Use the following equation.

speed = frequency × wavelength

....

Wave speed = ... cm/s **[2 marks]**

02.4 A student investigates how the speed of a wave on water varies with the depth of the water in the tank.

Identify the **independent** variable and the **dependent** variable.

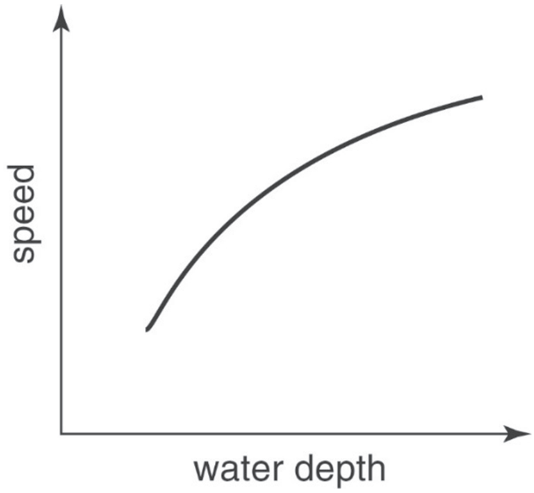
Independent variable: ....

Dependent variable: .... **[2 marks]**

Question 2 continues on the next page

02.5 **Figure 2.2** is a sketch graph of the student's results.

Figure 2.2



Which **two** statements are correct conclusions to the data shown in **Figure 2.2**?

Tick **two** boxes.

The wave travels faster in deeper water. ☐

The wave travels slower in deeper water. ☐

Wave speed increases steadily as the water gets deeper. ☐

Wave speed is not directly proportional to depth of water. ☐ **[2 marks]**

03.1 Which **two** of these quantities have both magnitude and direction?

Tick **two** boxes.

force ☐

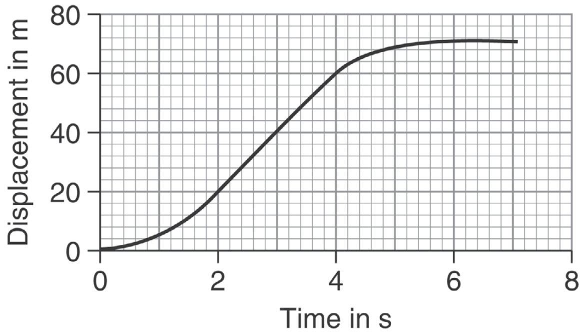
distance ☐

speed ☐

displacement ☐ **[2 marks]**

03.2 **Figure 3.1** represents the motion of a car on a straight road.

Figure 3.1



Use **Figure 3.1** to give **three** conclusions about the car's journey.

1. ....

....

2. ....

....

3. ....

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

Question 3 continues on the next page

03.3 Use **Figure 3.1** to determine the displacement of the car at 4 s

Distance = ... m **[1 mark]**

03.4 Calculate the average speed of the car during the first 4 s of its motion.

Use the following equation.

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

....

Average speed = ... m/s **[2 marks]**

04.1 Complete the following sentences about magnets.

Use the terms from the box below.

an attractive force	**a repulsive force**	**no force**

The north pole of a magnet exerts .... on the south pole of another magnet.

The north pole of a magnet exerts .... on a piece of magnetic material such as iron.

The north pole of a magnet exerts .... on the north pole of another magnet.

The south pole of a magnet exerts .... on the south pole of another magnet.

[4 marks]

04.2 Which description of the magnetic force between two magnets is correct?

Tick **one** box.

A contact force ☐

A non-contact force ☐ **[1 mark]**

04.3 Describe the differences between a **permanent magnet** and an **induced magnet**.

....

....

....

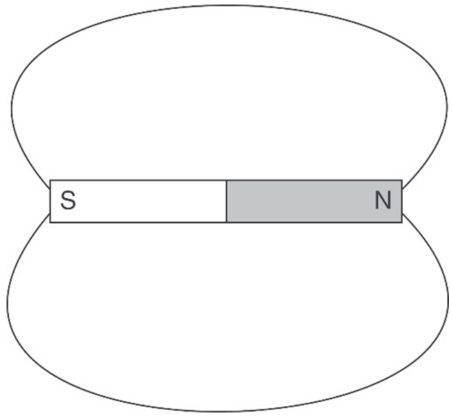
.... **[2 marks]**

Question 4 continues on the next page

04.4 **Figure 4.1** shows two magnetic field lines in the space around a bar magnet.

Add an arrow to **each** of the field lines to show the direction of the magnetic field.

Figure 4.1



[2 marks]

04.5 Write a set of instructions for plotting a magnetic field line around a bar magnet using a compass.

You may include a diagram as part of your answer.

[4 marks]

05.1 Which **two** statements represent Newton's first law of motion correctly?

Tick **two** boxes.

The resultant force on a stationary object is zero. ☐

Acceleration is proportional to resultant force. ☐

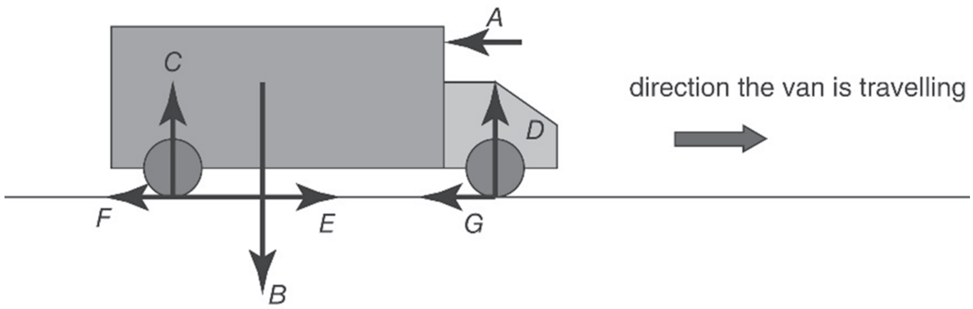
When two objects exert forces on each other, the forces are equal and opposite. ☐

The resultant force on an object moving at a steady speed is zero. ☐ **[2 marks]**

05.2 **Figure 5.1** shows a van travelling along a straight road.

The arrows represent the forces acting on the van.

Figure 5.1



Which arrow in **Figure 5.1** represents the driving force created by the van's engine?

Tick **one** box.

A	B	C	D	E	F	G

[1 mark]

05.3 Which **two** forces shown in **Figure 5.1** represent friction between the tyres and the road?

Tick **two** boxes.

A	B	C	D	E	F	G

[2 marks]

Question 5 continues on the next page

05.4 The van in **Figure 5.1** is travelling at a velocity of 10 m/s

The van now accelerates to a velocity of 14 m/s

It takes 2.5 s to reach a velocity of 14 m/s

Use the following equation to calculate the van's acceleration.

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

Give the correct unit with your answer.

....

....

Acceleration = ...

Unit: .... **[3 marks]**

05.5 Write down the equation that links resultant force, mass and acceleration.

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

05.6 The mass of the van is 4000 kg

Calculate the resultant force acting on the van while it is accelerating.

....

....

Resultant force = ... N **[2 marks]**

05.7 The driving force from the van's engine during the acceleration is 8000 N

Calculate the total resistive force acting on the van during the acceleration.

....

....

Resistive force = ... N **[2 marks]**

06.1 Explain what causes air to exert a force on a surface.

[1 mark]

06.2 Write down the equation that links pressure to normal force and surface area.

[1 mark]

06.3 Atmospheric pressure at sea level is 100 000 Pa

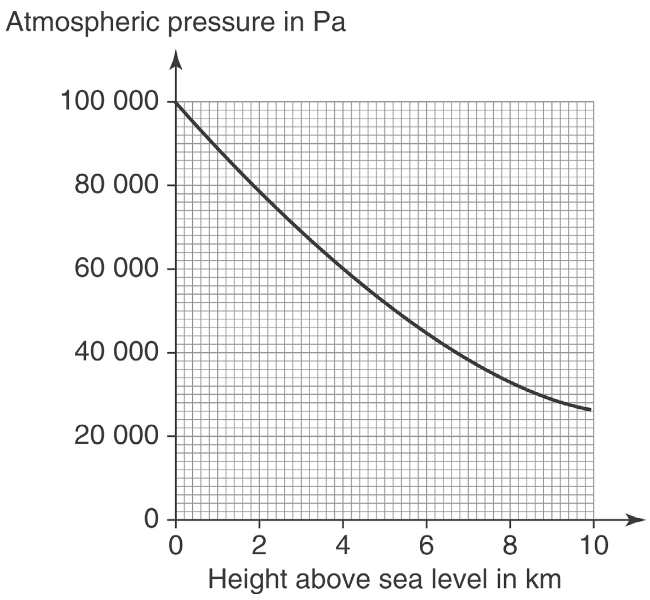
The average surface area of an adult human is 1.8 m^2

Calculate the force exerted by the atmosphere on the surface of an adult human.

Force = ... N [3 marks]

06.4 **Figure 6.1** shows the variation of atmospheric pressure with height.

Figure 6.1



Write down a conclusion you can make from the graph.

[1 mark]

Question 6 continues on the next page

06.5 A student suggests that atmospheric pressure **halves** when height above sea level **doubles**.

Use data from the graph in **Figure 6.1** to show whether or not the student's suggestion is correct.

[3 marks]

06.6 Explain why the pressure exerted by the atmosphere on a person is greatest at sea level.

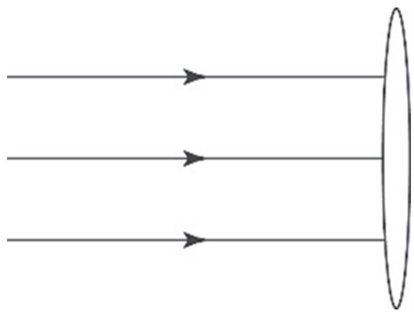
[2 marks]

07.1 **Figure 7.1** shows 3 parallel rays of light incident on a convex lens.

Draw in the paths of the three rays after they pass through the lens.

Mark with the letter **F** the position of the **principal focus** of the lens.

Figure 7.1



[4 marks]

07.2 Define the term **focal length**.

....

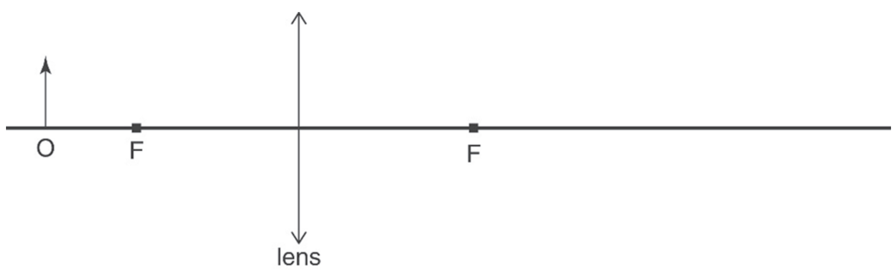
.... **[1 mark]**

07.3 A convex lens is set up to produce an image of an illuminated object on a screen.

Figure 7.2 shows an incomplete ray diagram of the set-up.

O represents the object.

Figure 7.2



Complete the ray diagram to show the formation of the image on the right hand side of the lens.

Draw **two** rays from the object to do this.

Mark the image I.

[3 marks]

Question 7 continues on the next page

07.4 A student uses the apparatus in **Figure 7.3** to produce an image of a cross-wire on a screen.

The position of the screen is adjusted to produce a clear, focused image.

Figure 7.3

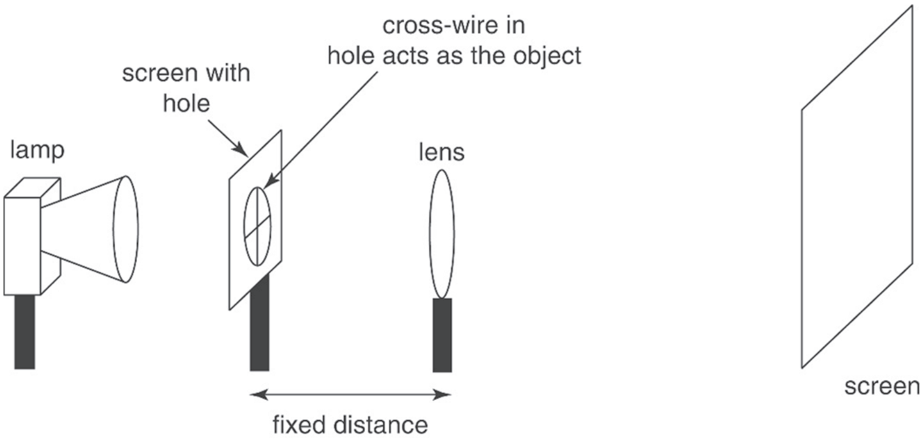
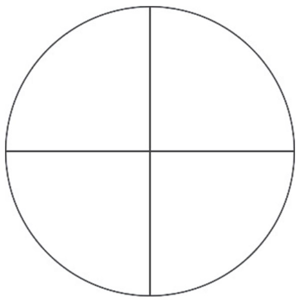


Figure 7.4 shows the appearance of the image on the screen.

Figure 7.4



Describe how the student could measure the **magnification** produced by the lens.

Include any additional apparatus that the student may need.

....

....

....

....

....

.... **[4 marks]**

07.5 The student wants to find out if the focal length of a convex lens affects its magnification.

The student uses the apparatus shown in **Figure 7.3** with three convex lenses in turn.

Each lens has a different focal length.

During the experiment, she keeps the distance from the object to the lens fixed.

Table 7.1 shows her results.

Table 7.1

Focal length in mm	Object height in mm	Image height in mm	Magnification
100	20	20	1.0
120	20	30	1.5
150	20	60	

Write the missing magnification value in the table.

Use the equation for magnification from the Physics Equation Sheet.

[1 mark]

07.6 Give **one** conclusion that can be made from the data in **Table 7.1**

....

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

07.7 The student wants to learn more about the way that focal length affects the magnification.

Suggest improvements to the experiment and the analysis of the data that could achieve this.

....

....

....

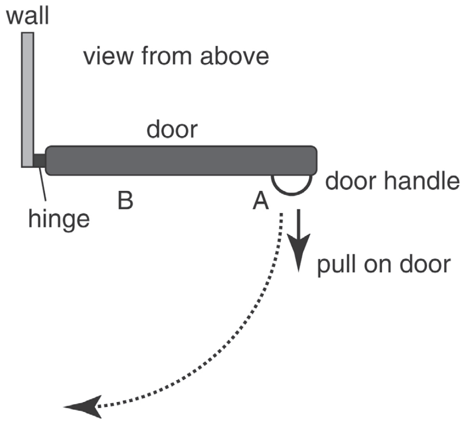
.... **[3 marks]**

Turn over >

08 **Figure 8.1** is a plan view of a door.

Pulling the door handle causes the door to open by rotating about its hinges.

Figure 8.1



08.1 Explain why it is easier to open the door by pulling at position A rather than pulling at position B.

[2 marks]

08.2 Write down the equation which links moment, force and distance.

[1 mark]

08.3 The door handle is 75 cm from the hinge.

A person pulls with a force of 2.0 N on the door handle.

Calculate the size of the clockwise moment exerted on the door.

Give your answer in N m.

[3 marks]

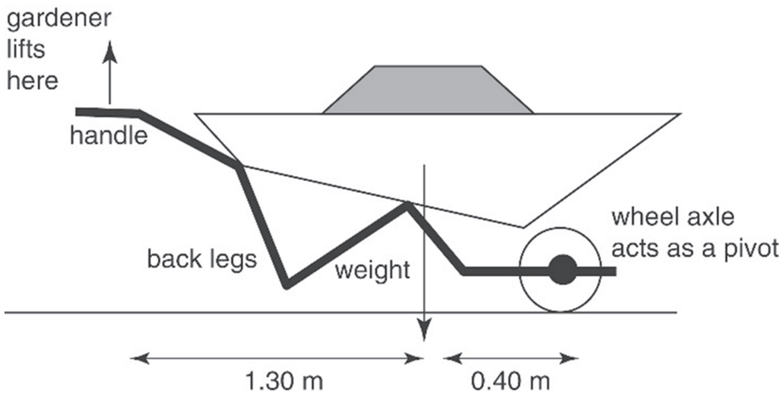
Moment = ... N m

08.4 **Figure 8.2** shows a stationary wheelbarrow.

A gardener is applying an upward force to the handle of the wheelbarrow.

This holds the back legs of the wheelbarrow just off the ground.

Figure 8.2



The front wheel of the wheelbarrow acts as a pivot.

Complete the following sentence.

Choose from **a clockwise moment** or **an anticlockwise moment**.

The total weight of the wheelbarrow and its load creates

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

08.5 The total weight of the wheelbarrow and its load is 200 N

Calculate the size of the moment due to the total weight.

Take the front wheel as the pivot.

....

....

Moment = ... N m **[2 marks]**

08.6 Give the direction of the moment produced by the force exerted by the gardener.

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

Question 8 continues on the next page

08.7 Give the size of the moment produced by the gardener to keep the wheelbarrow balanced.

Take the front wheel as the pivot.

Moment = ... N m **[1 mark]**

08.8 Calculate the upward force that the gardener must exert to keep the wheelbarrow balanced with its back legs just off the ground.

Give your answer to 2 significant figures.

....

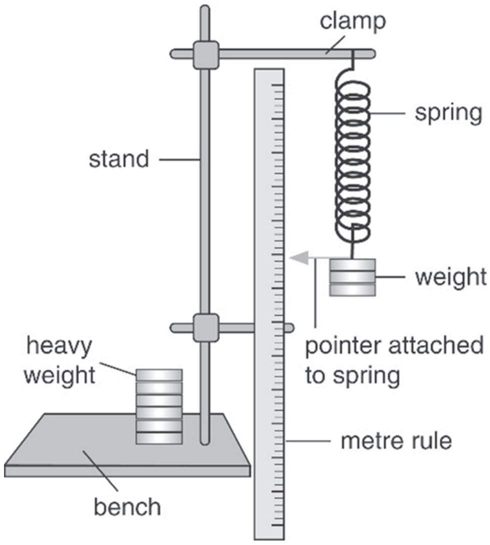
....

Force = ... N **[3 marks]**

09.1 A student is asked to use the apparatus in **Figure 9.1** to obtain a series of measurements of the extension of a spring.

She has a range of standard weights to attach to the spring.

Figure 9.1



Write a set of instructions that the student could follow to obtain the measurements as accurately as possible.

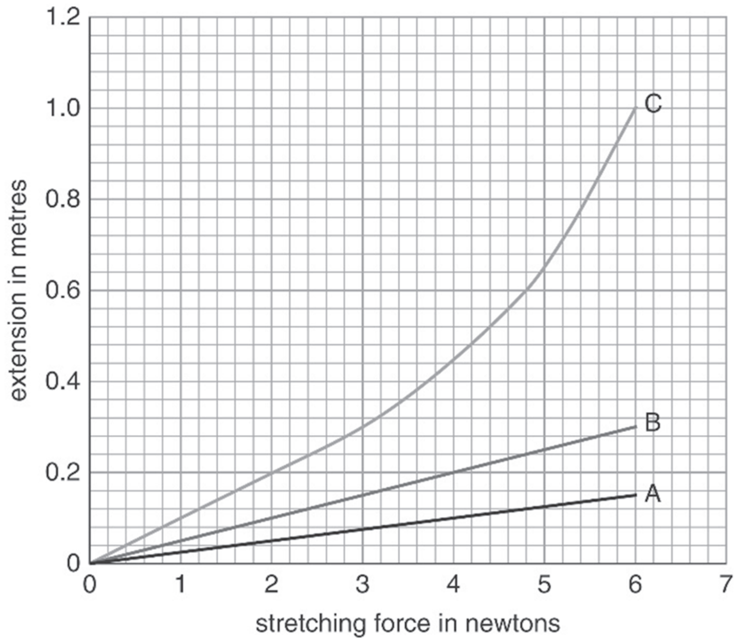
[6 marks]

Question 9 continues on the next page

09.2 The student repeats the experiment for two more springs.

Data for the three springs, **A**, **B** and **C**, are displayed on the graph in **Figure 9.2**

Figure 9.2



Which one of the springs has been stretched beyond its limit of proportionality?

Tick **one** box.

A ☐

B ☐

C ☐ **[1 mark]**

09.3 Which is the stiffest spring?

Tick **one** box.

A ☐

B ☐

C ☐ **[1 mark]**

09.4 Which of the springs is the easiest to stretch?

Tick **one** box.

A ☐

B ☐

C ☐

[1 mark]

09.5 Which one of the springs requires a force of 4.0 N to extend it by 0.20 m?

A ☐

B ☐

C ☐

[1 mark]

END OF QUESTIONS

Physics Equation Sheet

Equation Number	Word Equation	Symbol Equation
1	(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance	$v^2 - u^2 = 2\,a\,s$
2	elastic potential energy = 0.5 × spring constant × (extension)^2	$E_e = \frac{1}{2}\,ke^2$
3	change in thermal energy = mass × specific heat capacity × temperature change	$\Delta E = m\,c\,\Delta\theta$
4	period = $\frac{1}{\text{frequency}}$	
5	magnification = $\frac{\text{image height}}{\text{object height}}$	
6	thermal energy for a change of state = mass × specific latent heat	$E = m\,L$
7	potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil	$V_p I_p = V_s I_s$
8	For gases: pressure × volume = constant	pV = constant