



Rewarding Learning

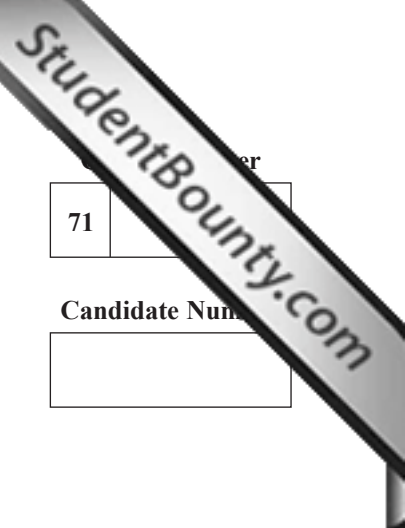
General Certificate of Secondary Education
2010

Science: Physics

Paper 2
Foundation Tier

[G7603]

WEDNESDAY 16 JUNE, MORNING



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Candidate Number	
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TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all five** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.
Quality of written communication will be assessed in question 2(b).
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Details of calculations should be shown.
Units must be stated with numerical answers where appropriate.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
Total Marks	

- 1 (a) Mass is an unchanging property of an object whereas weight is the force that gravity exerts on the object. State the units in which each quantity is measured.

Mass is measured in _____

Weight is measured in _____ [2]

- (b) A large steel beam weighs 20 000 N.



- (i) On the diagram mark carefully, with an X, the point where all of its weight can be regarded as acting. [1]

- (ii) What is this point called?

_____ [1]

- (iii) When the beam rests on the ground its area of contact with the ground is 8 m^2 .

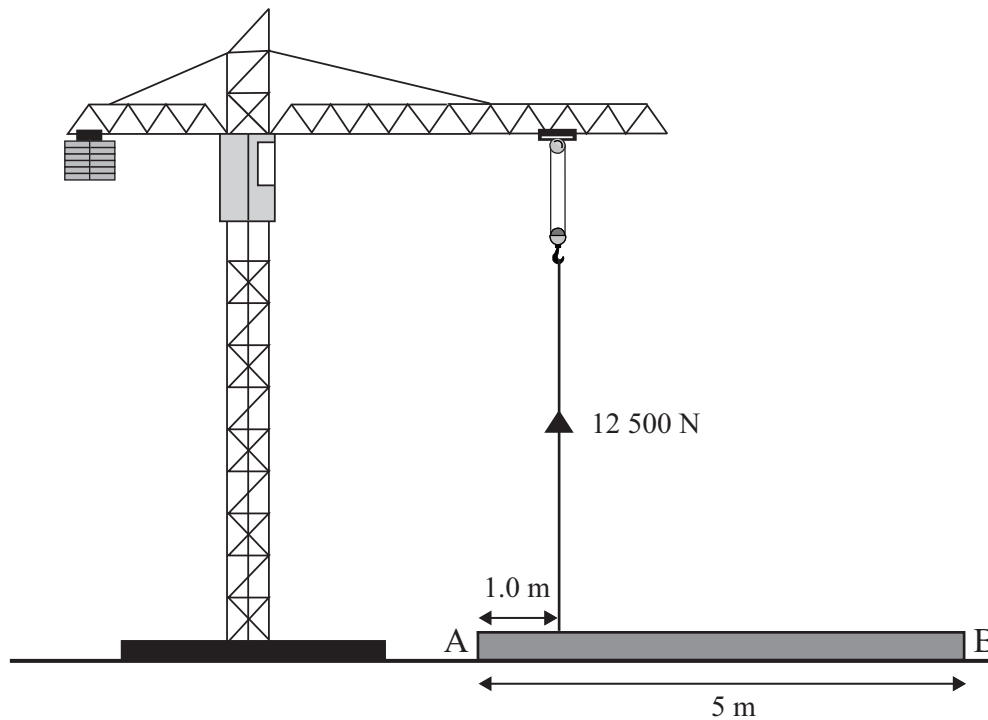
Calculate the pressure that the beam exerts on the ground.

Remember to include the unit with your answer.

You are advised to show clearly how you get your answer.

Pressure = _____ [4]

A crane is used to raise this large steel beam into a vertical position. The crane exerts a force of 12 500 N to just lift the end A off the ground. The length of the beam is 5 m.



(iv) The beam can be treated as a lever. Mark the pivot with the letter P. [1]

(v) Calculate the moment of the 12 500 N force about the pivot. Remember to include the unit with your answer. **You are advised to show clearly how you get your answer.**

Moment = _____ [4]

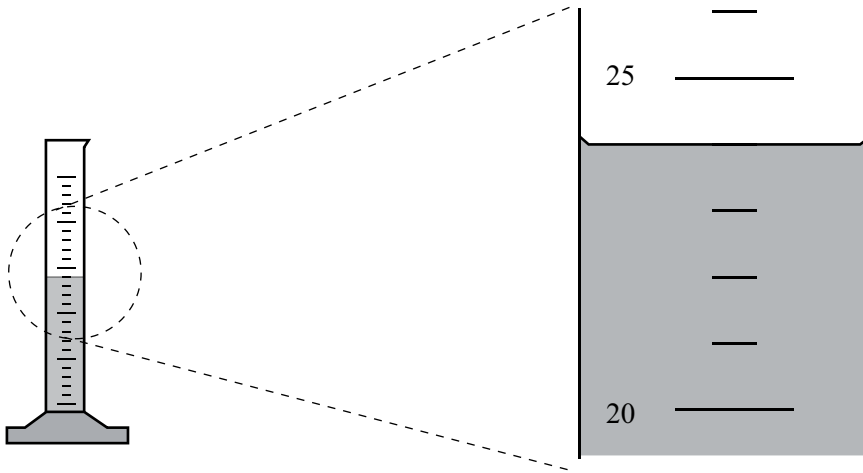
Examiner Only	
Marks	Remark

(c) Gail has a pendant which she believes to be gold.



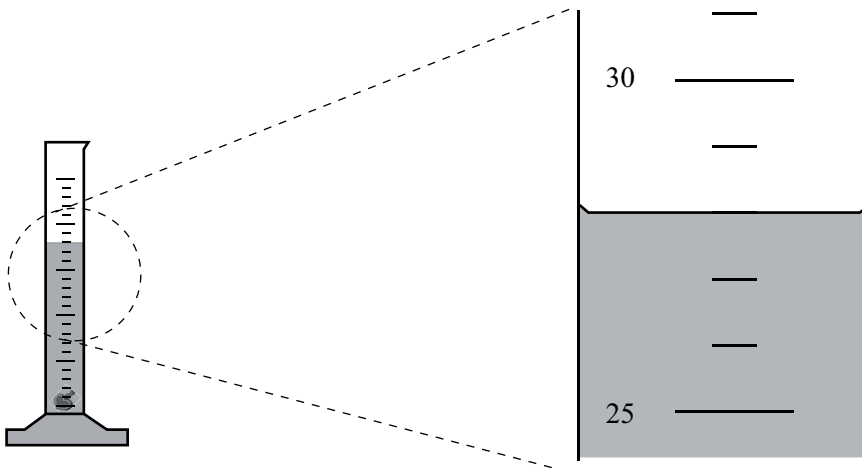
To verify this she carries out an experiment to measure the density of the material used to make the bracelet.

She pours some water into a measuring cylinder.



(i) The volume of water in the cylinder is _____ cm^3 [1]

She carefully places the pendant in the measuring cylinder so that it is completely covered by the water.



(ii) What is the volume of the pendant?

Volume of pendant = _____ cm^3 [2]

Examiner Only	
Marks	Remark

When she measures the mass of the pendant, it is found to be 42 g.

(iii) Calculate the density of the material of the pendant.

You are advised to show clearly how you get your answer.

$$\text{Density} = \text{_____} \text{ g/cm}^3 \text{ [3]}$$

The table shows the densities of some metals.

Metal	Density in g/cm ³
Aluminium	2.7
Brass	8.8
Silver	10.5
Gold	19.3

(iv) Using your answer to part (iii), decide what Gail's pendant is made of.

_____ [1]

Examiner Only	
Marks	Remark

- 2 (a) The diagrams below show a cyclist moving in various ways. For each diagram, how are the kinetic energy and potential energy changing, if at all?

Choose your answers from the words in the box below.

increasing	decreasing	constant
------------	------------	----------

(i)



Constant speed on a level road.

The kinetic energy is _____

The potential energy is _____ [2]

(ii)



Speeding up on a level road.

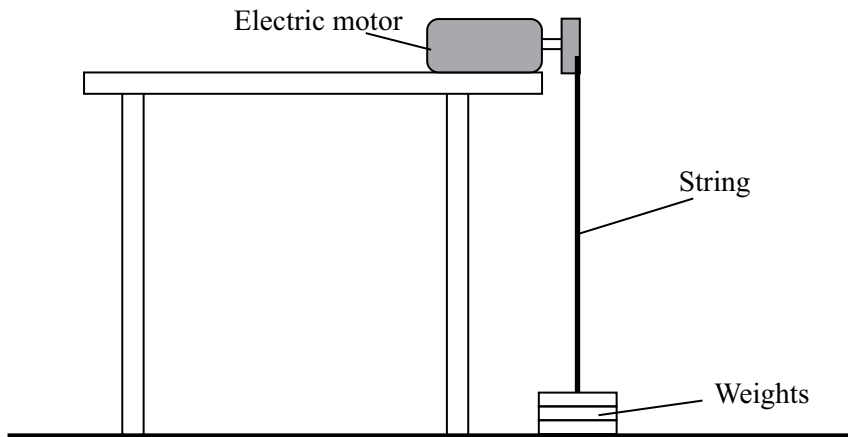
The kinetic energy is _____

The potential energy is _____ [2]

Examiner Only

Marks	Remark

(b) An electric motor is used to raise a load. Describe how the apparatus could be used to measure the output power of the motor. In your account you need to clearly state the measurements to take and the apparatus used to take them.



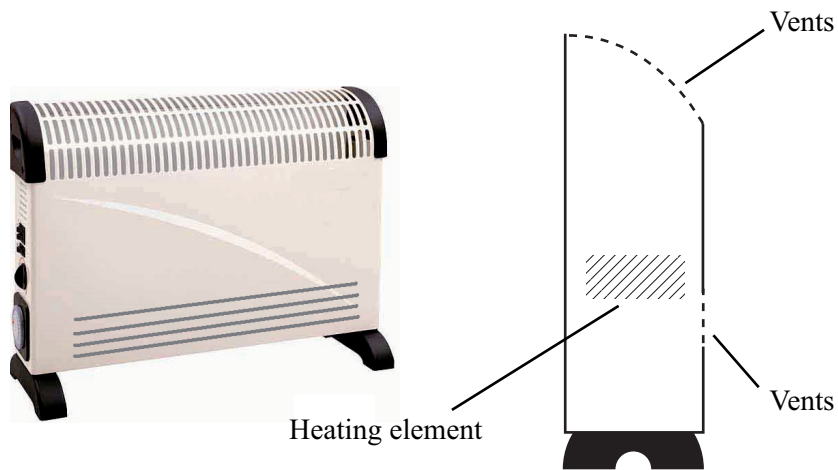
[5]

Quality of written communication

[1]

Examiner Only	
Marks	Remark

- (c) The picture below shows a convector heater. The heating element is connected to the electricity supply. The diagram on the right shows some of the internal parts of the heater.

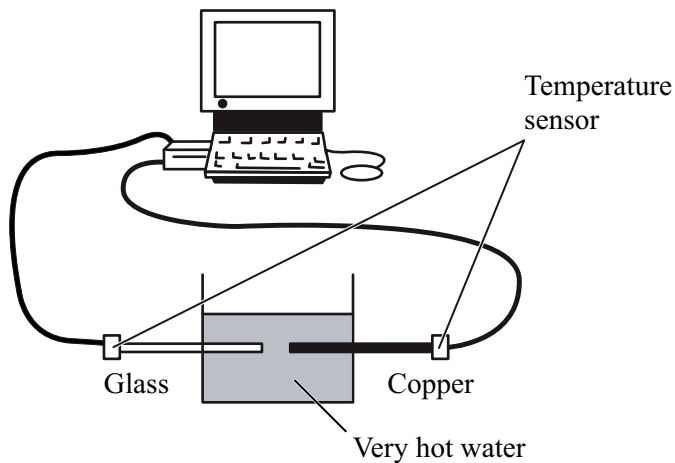


- (i) On the diagram on the right, mark carefully the flow of air in and out of the heater. [2]
- (ii) Convection is how heat is transferred through a gas such as air. Apart from gases, name another material where heat is transferred by convection.

_____ [1]

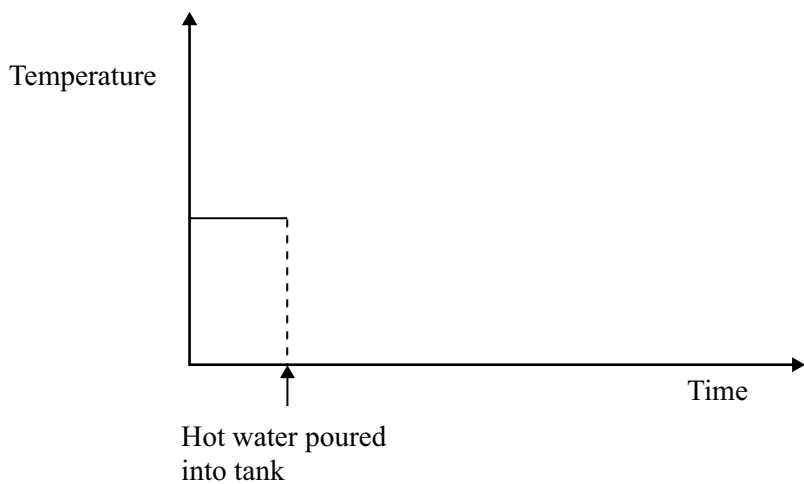
Examiner Only	
Marks	Remark

- (d) Temperature sensors and a computer can be used to compare the thermal conduction of two materials. A sensor is attached to each material as shown in the diagram below. The tank is filled with very hot water.



One rod is made of copper, the other is made of glass.

- (i) Using the axes below, sketch the graphs that would be obtained for these two materials. Label each one. The sensor readings are equal until the water is poured into the tank.



[2]

- (ii) The conduction process in metals involves electrons. How do these electrons transfer the heat energy to the copper atoms?

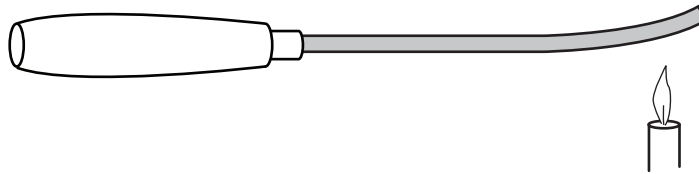
_____ [1]

- (iii) Materials such as glass do not have free electrons. How is the heat energy transferred from one atom to the next?

_____ [1]

Examiner Only	
Marks	Remark

(e) A bimetal strip bends when it is heated.



(i) Explain why this happens.

_____ [1]

The photograph shows an expansion joint on a bridge.



© JLM Visuals

(ii) Describe how it moves and explain what is likely to happen if the bridge is not fitted with an expansion joint.

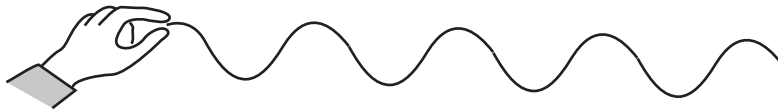
_____ [2]

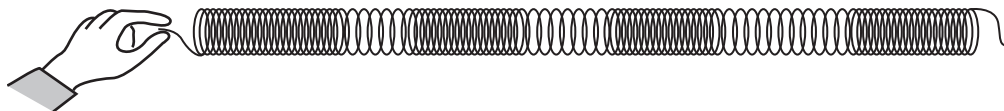
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Marks	Remark

Examiner Only	
Marks	Remark

3 (a) Pat uses a length of rope and a slinky coil to demonstrate different types of wave motion. The wave patterns obtained are shown in the diagrams below.

(i) Beside each diagram, state the type of wave being produced.



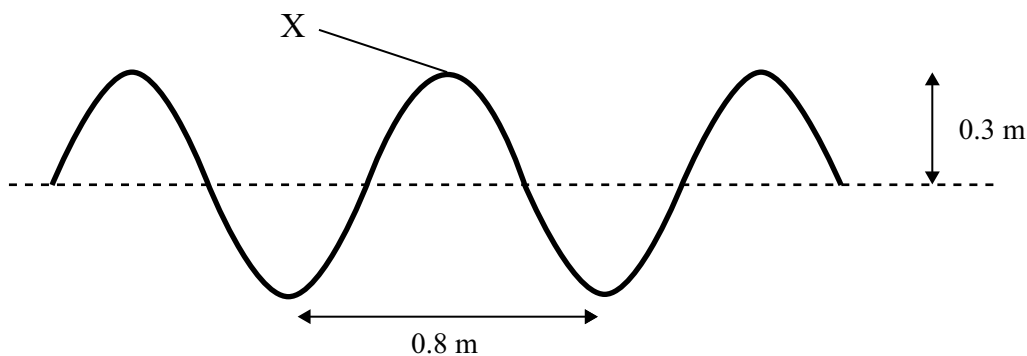


_____ [2]

(ii) What do the waves transfer as they move from left to right?

_____ [1]

The wave pattern obtained with the rope is shown again below.



(iii) Describe, fully, how the point X moves as the wave passes along the rope.

 _____ [2]

(iv) State the amplitude of the wave.

Amplitude = _____ m [1]

(v) State the wavelength of the wave.

Wavelength = _____ m [1]

The end of the rope makes 24 vibrations in 8 seconds.

(vi) Calculate the frequency of the wave.

Frequency = _____ Hz [2]

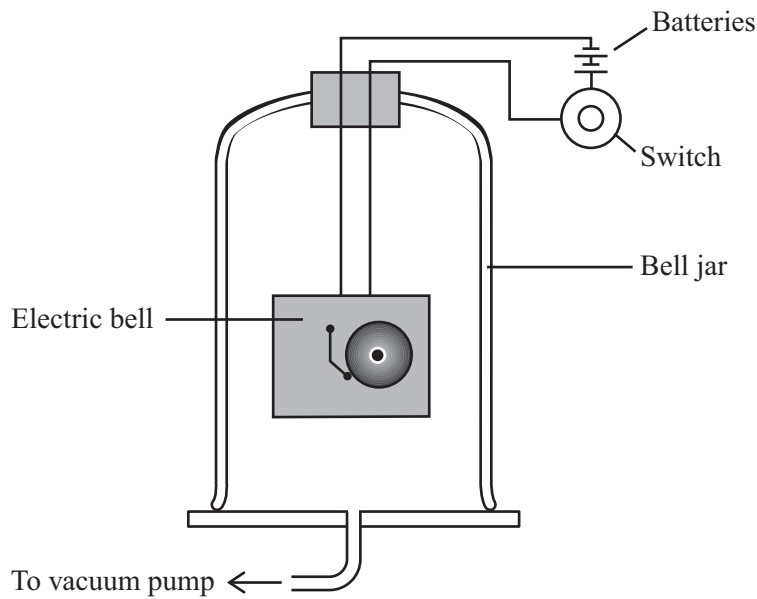
(vii) Use your answers to parts (v) and (vi) to calculate the speed of the wave.

Speed = _____ m/s [3]

Examiner Only	
Marks	Remark

[Turn over

(b) The diagram below shows the apparatus frequently used in school laboratories to illustrate an important property of sound.



The bell is made to ring by pressing the switch. The vacuum pump is switched on.

(i) Describe carefully two important observations that can be made, when all the air is pumped out of the jar.

1. _____
2. _____ [2]

(ii) What conclusion can be drawn from this experiment?

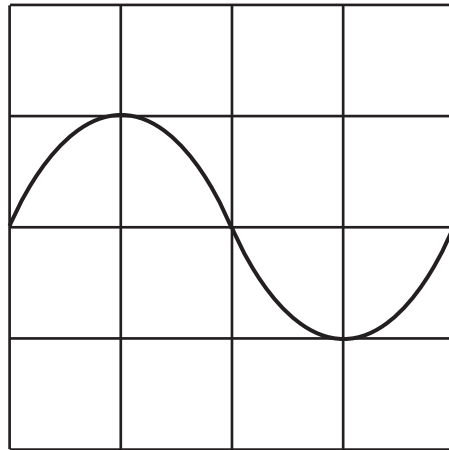
 _____ [1]

(iii) What name is given to sound of frequency greater than 20 kHz?

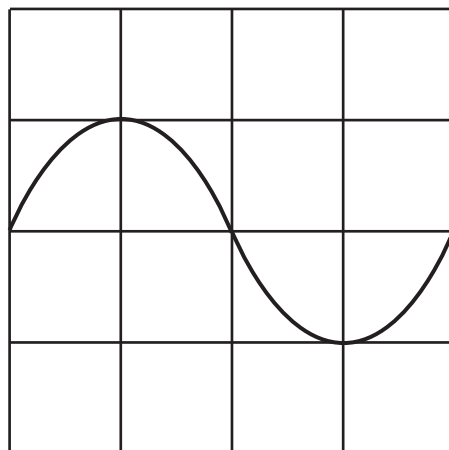
_____ [1]

Examiner Only	
Marks	Remark

- (c) The waveform of the sound produced by a loudspeaker is displayed on a CRO. The diagram below shows the trace obtained.



- (i) On the same grid, sketch the trace you expect to see when the loudspeaker produces a **louder** sound of the same frequency. Assume the settings of the CRO are unaltered. [2]
- (ii) The sound is now returned to its original loudness. The diagram below shows this waveform. On the grid below, sketch the waveform you expect to see when the loudspeaker produces a sound of **twice the frequency**, but the same loudness.



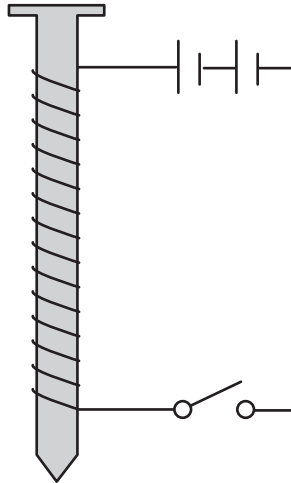
[2]

Examiner Only	
Marks	Remark

[Turn over

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- 4 (a) An electromagnet can be made by wrapping insulated copper wire around an iron nail as shown below.



- (i) How would you turn on this electromagnet?

_____ [1]

- (ii) Other than reducing the current, state two other ways to make the electromagnet **weaker**.

1. _____

2. _____ [2]

- (iii) Why is it essential to use insulated wire rather than bare wire for the coil?

 _____ [1]

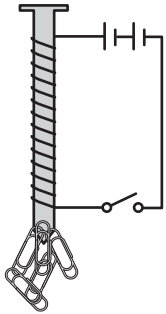
- (iv) Why is steel **not** a suitable core for an electromagnet?

_____ [1]

Examiner Only	
Marks	Remark

[Turn over

- (b) To investigate how the current affected the strength of the electromagnet, it was used to pick up paper clips. The current was changed to different values and the number of paper clips that were attached to the electromagnet was counted. The results are shown in the table below.



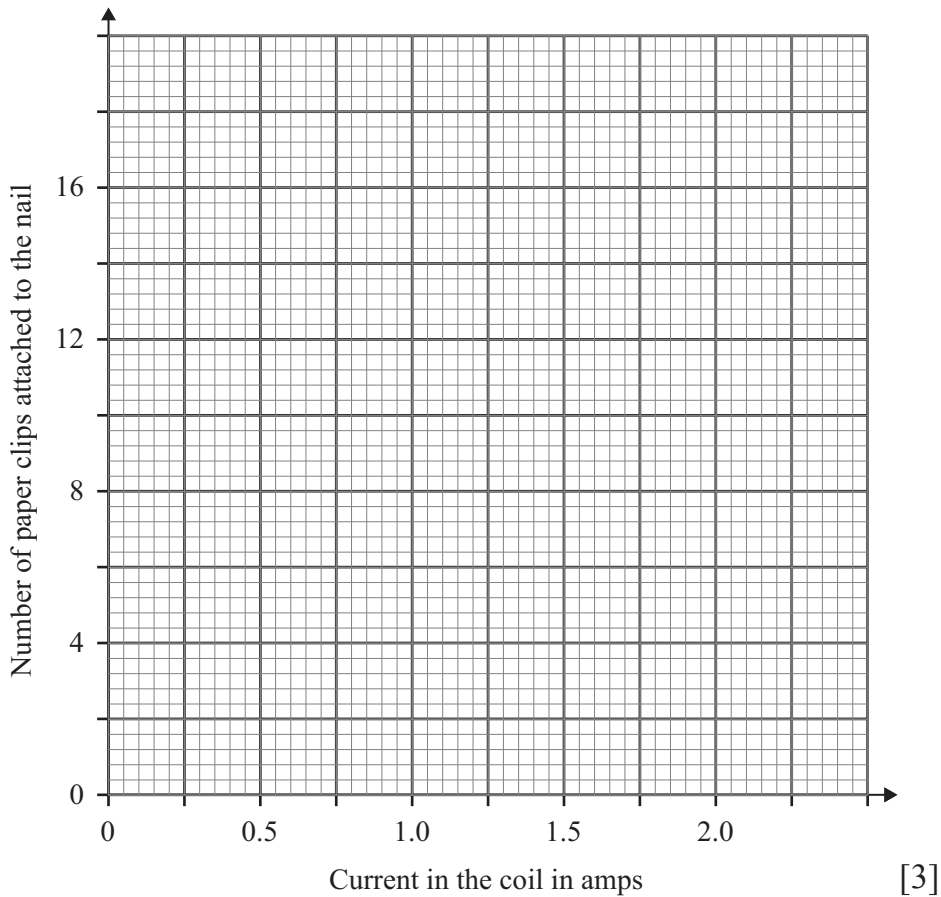
Current in the coil in amps	Number of paper clips attached to the nail
0	0
0.5	4
1.0	9
1.5	12
2.0	17

- (i) What should be added to the circuit above to allow the current in the coil to be varied?

_____ [1]

Examiner Only	
Marks	Remark

- (ii) On the graph paper below, plot the graph of the number of paper clips attached to the nail against the current in the coil.

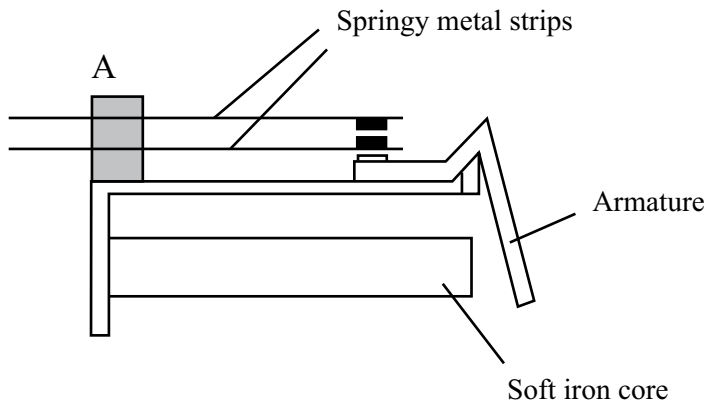


- (iii) Using the graph, how many complete paper clips can be lifted by the electromagnet when the current in the coil is 1.2 A?

Number of complete paper clips lifted = _____ [1]

Examiner Only	
Marks	Remark

- (c) The diagram below shows a simple electromagnetic relay. It is not complete, some parts of the relay and circuits are missing.



- (i) On the diagram, add the parts needed to make the relay operate (switch on). [3]

- (ii) What should the part labelled armature be made of? Explain your answer.

Material _____

Explanation _____ [2]

- (iii) The relay is used to switch on a second circuit. On the diagram above, mark the points X and Y where the second circuit should be connected. [1]

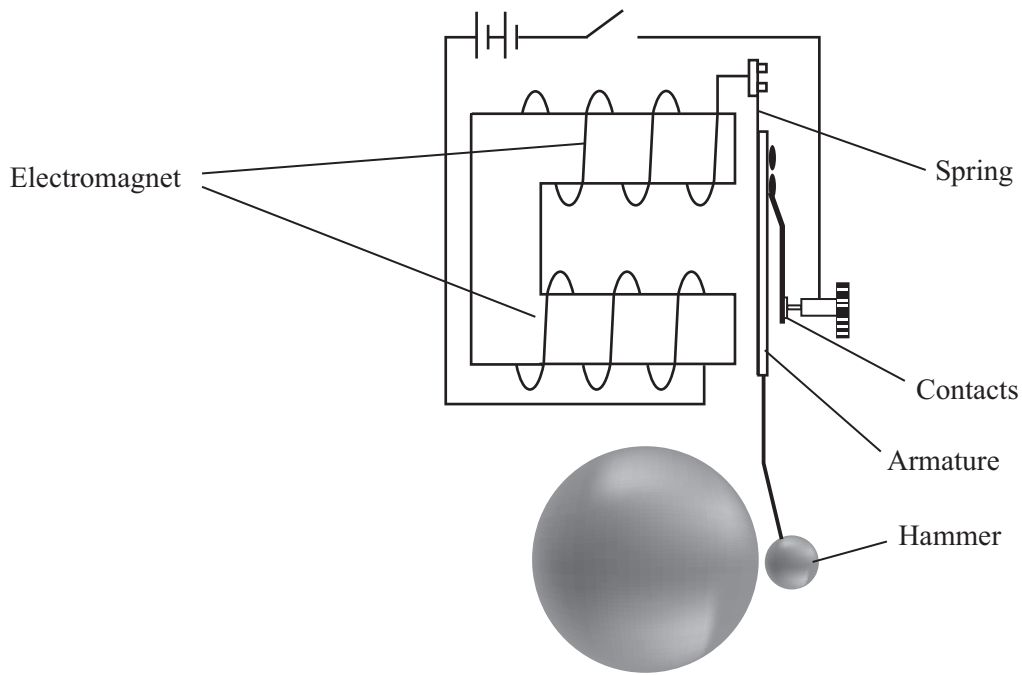
- (iv) What type of material should the part labelled A be made of? Explain your choice of material.

Material _____

Explanation _____ [2]

Examiner Only	
Marks	Remark

(d) The diagram below shows the electromagnetic doorbell.



6. Electromagnet is turned off
3. Armature is attracted towards the electromagnet.
5. When the switch is closed a current flows and the electromagnet is switched on.
2. Armature springs back to starting position.
4. Contacts open and circuit is broken.
1. Contacts touch and circuit is again complete.

The statements above describe how the doorbell works, however, they are **not** in the correct order. Place the above statements in the correct order. Write the numbers in the boxes below. The first one has been done for you.

5					
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[2]

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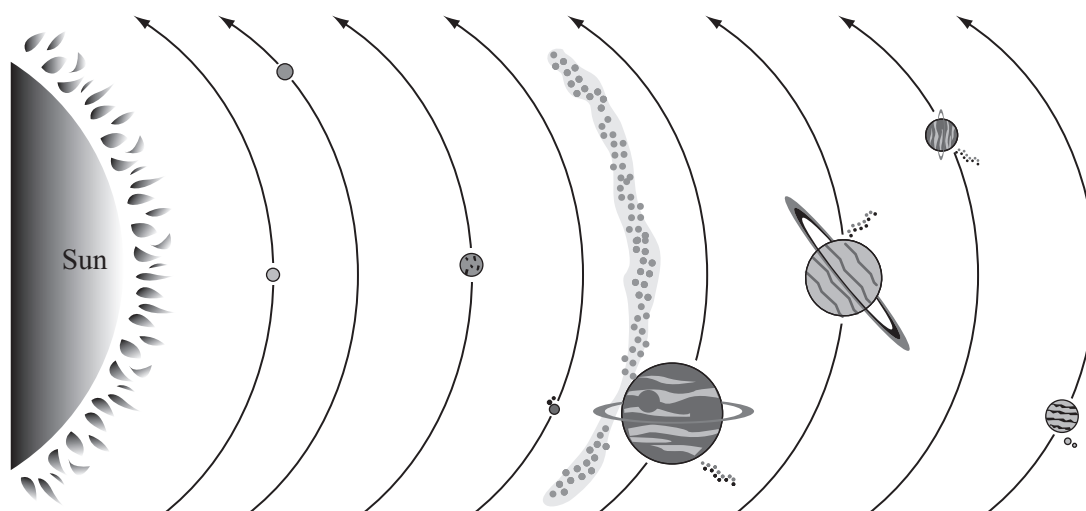
5 (a) (i) What is a galaxy?

_____ [1]

(ii) What is the Milky Way an example of?

_____ [1]

(b) There are eight planets which orbit the Sun.



(i) Which planet is furthest from the Sun? _____ [1]

(ii) Which planet is closest to the Sun? _____ [1]

(iii) Which two planets orbit between the Sun and Earth?

_____ and _____ [2]

(iv) Between which two planets are the asteroids located?

_____ and _____ [1]

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Marks	Remark

Examiner Only	
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(c) The Earth has one natural satellite and a large number of artificial satellites.

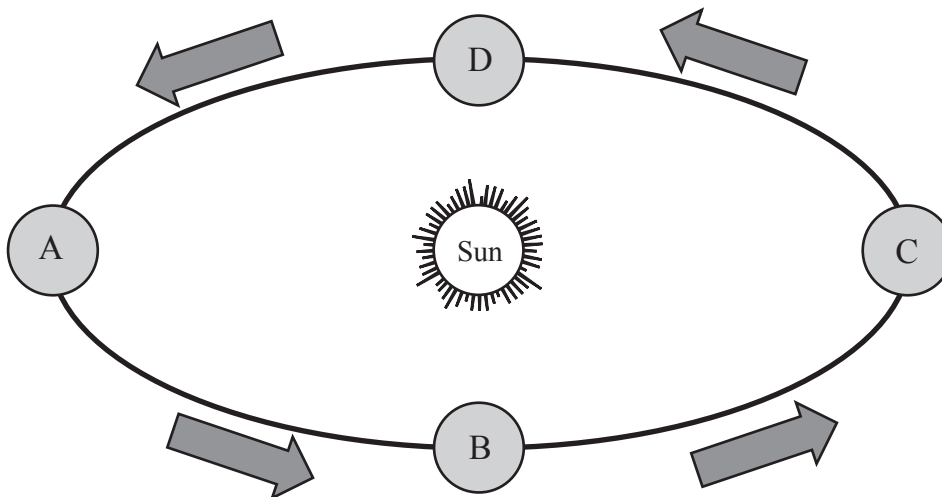
(i) Name the Earth's natural satellite. _____ [1]

(ii) One use of the Earth's artificial satellites is weather forecasting. State two other uses of artificial satellites in orbit around the Earth.

1. _____

2. _____ [2]

(d) The diagram below shows the orbit of the Earth around the Sun. Four different positions along its path are marked A, B, C and D. The arrows show the direction of the Earth's motion around the Sun. In the Northern hemisphere, it is autumn when the Earth is at position B in its orbit.



(i) How long does it take the Earth to complete one orbit? Give your answer in days.

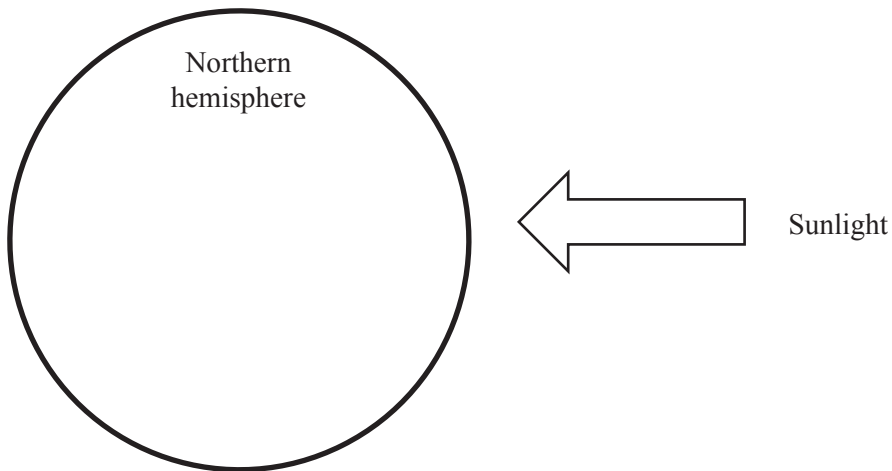
Time = _____ [1]

- (ii) What are the seasons in the **Northern** hemisphere when the Earth is at positions A and C in its orbit?

A is _____

C is _____ [2]

The diagram below shows Earth when it is at position A in its orbit.



- (iii) With a ruler, carefully mark on the diagram the axis about which the Earth spins. [1]
- (iv) On the diagram, carefully shade the portion of the Earth in darkness. [1]

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Marks	Remark

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