Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012

Science: Double Award (Non-Modular)

Paper 3
Foundation Tier

[G8403]

G8403

FRIDAY 15 JUNE, AFTERNOON

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
Total Marks	

TIME

1 hour 30 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 fifteen** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 110.
Quality of written communication will be assessed in question **13(a)(i)**.
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 in numerical answers where appropriate.

Examiner Only	
Marks	Remark

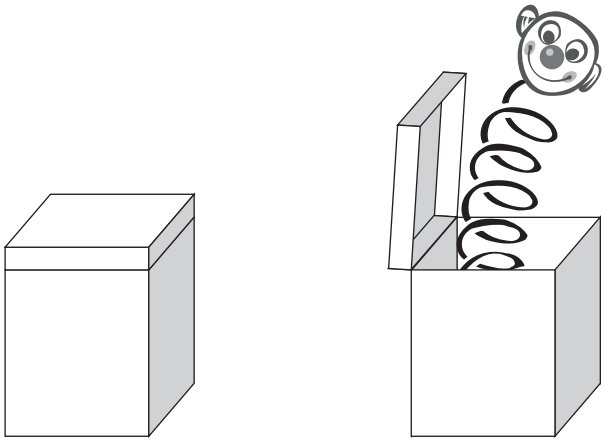
1 What is the energy **input** in each of the following:

(i) a petrol driven car?

© Hemera / Thinkstock

[1]

(ii) a "jack in the box" toy?



[1]

(iii) a sailing boat?

[1]

Examiner Only

Marks	Remark

2 **(a)** In the table below tick (✓) the boxes to show whether the energy resource is renewable or non-renewable.

Energy resource	Renewable	Non-renewable
Gas		
Geothermal		
Nuclear		

[3]

(b) One of the energy resources above is a fossil fuel. Which one?

_____ [1]

3 The diagram shows:

A a cyclist

B a racing car

© Hemera / Thinkstock

A

© iStockphoto / Thinkstock

B

(i) Which is more stable?

Answer _____ [1]

(ii) Give two reasons for your answer.

1. _____ [1]

2. _____ [1]

4 The table shows the planets in order of their distance from the Sun.

1	Mercury
2	
3	Earth
4	
5	
6	Saturn
7	Uranus
8	

(a) Complete the table by naming the missing planets. [2]

(b) What is at the centre of the Solar System?

_____ [1]

(c) What is a galaxy?

_____ [1]

(d) The Sun is a member of a galaxy. What is the name of this galaxy?

_____ [1]

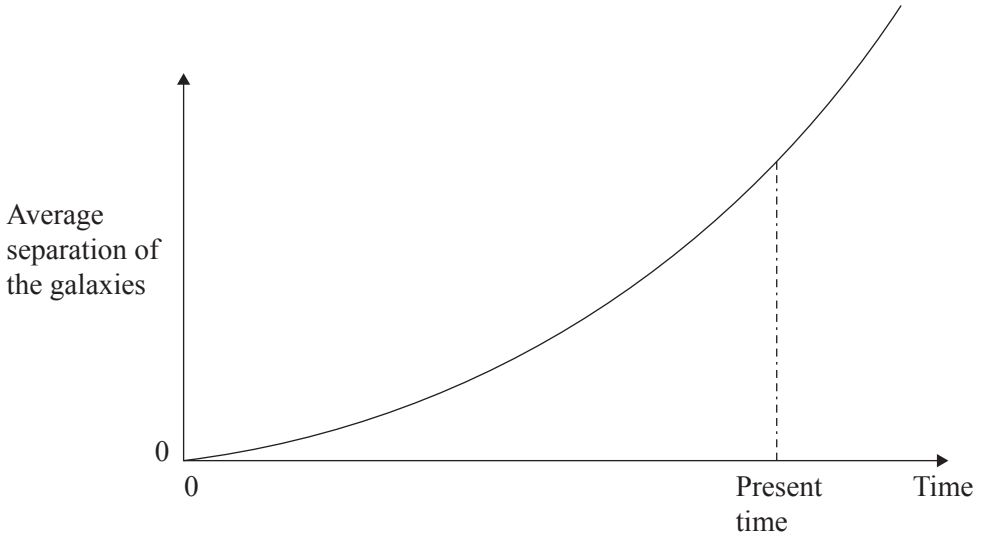
Examiner Only

Marks	Remark

5 The Big Bang theory explains the origin and expansion of the universe.

Examiner Only

Marks	Remark



The graph above shows how the average separation of the galaxies has increased over time, according to the Big Bang theory.

(a) What other feature of the graph supports the Big Bang theory?

_____ [1]

(b) Name the other scientific theory which attempts to explain the origin of the universe.

_____ [1]

(c) State two reasons, not related to cost, why it is difficult to send a manned spacecraft to another planet outside our solar system.

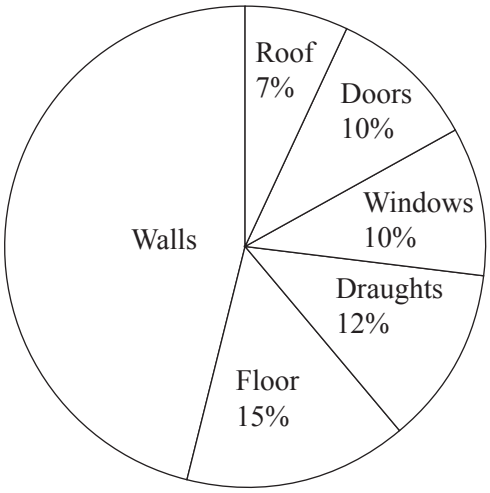
1. _____

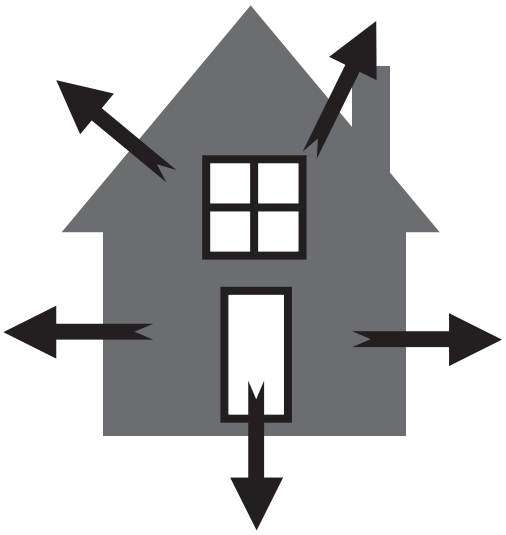
2. _____ [2]

(d) What nuclear process in stars generates energy?

_____ [1]

6 The pie chart shows the main sources of heat loss from a house which has not been properly insulated.





(a) What is the percentage of heat loss through the walls?

You are advised to show your working out.

_____ % [2]

(b) Name the main method of heat transfer through the walls.

_____ [1]

(c) Explain fully why fibreglass is a suitable material for roof space insulation.

_____

_____ [2]

Double glazing, with a vacuum between the panes, is used to reduce heat loss through the windows.

(d) State the two methods of heat transfer that are reduced.

1. _____

2. _____ [2]

Examiner Only

Marks	Remark

7 A photograph of a toaster is shown below.

Source: CCEA – Copyright: John Boyd

(a) State the main method of heat transfer from the hot elements of the toaster to the bread.

_____ [1]

(b) Why is the inside of the toaster silvered?

_____ [1]

(c) Explain fully the advantage of having the outsides of toasters silvered rather than matt black.

_____

_____ [2]

Examiner Only

Marks	Remark

8 **(a)** State Hooke's Law.

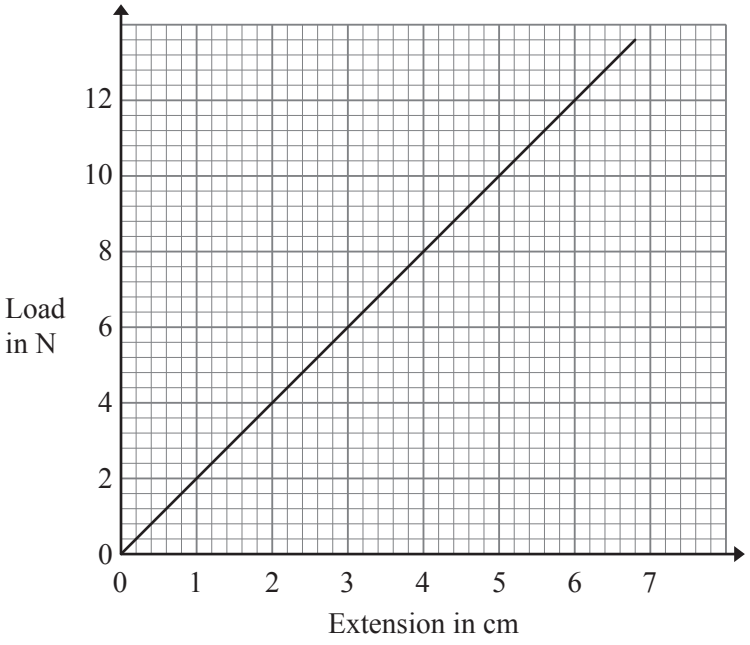
_____

_____ [2]

Examiner Only

Marks	Remark

The load–extension graph for a helical spring is shown below.



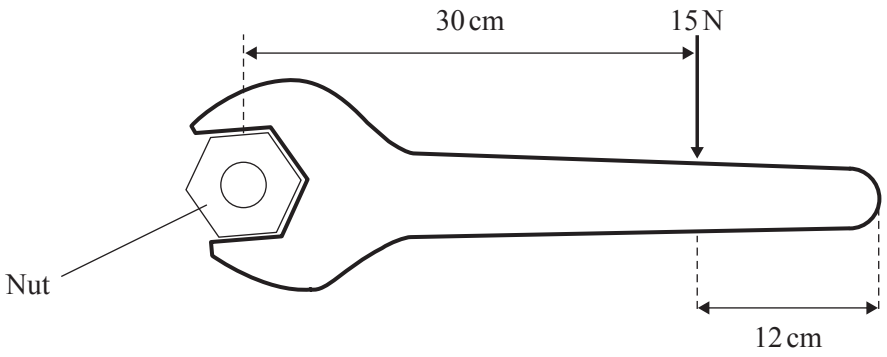
The unstretched length of the spring is 7 cm. When a load is hung on the spring its **total length** is 12 cm.

(b) Use the graph to find the load.

You are advised to show your working out.

Load = _____ N [2]

9 A car mechanic is using a spanner to loosen a nut.



He applies a 15 N force as shown.

(i) Mark the pivot in the diagram with a point labelled P. [1]

(ii) Calculate the moment of the force, in N cm, the mechanic applies.

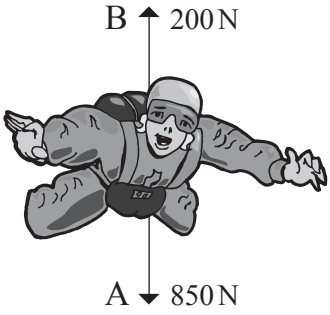
You are advised to show your working out.

Moment = _____ N cm [3]

Examiner Only

Marks	Remark

10 A skydiver jumps from a plane. Two forces are shown on the diagram below.



(a) Identify the two forces.

Force A is _____ Force B is _____ [2]

Initially force A is 850 N and force B is 200 N.

(b) Describe the motion of the skydiver.

_____ [1]

Later in the fall, force B increases to 850 N and force A remains at 850 N.

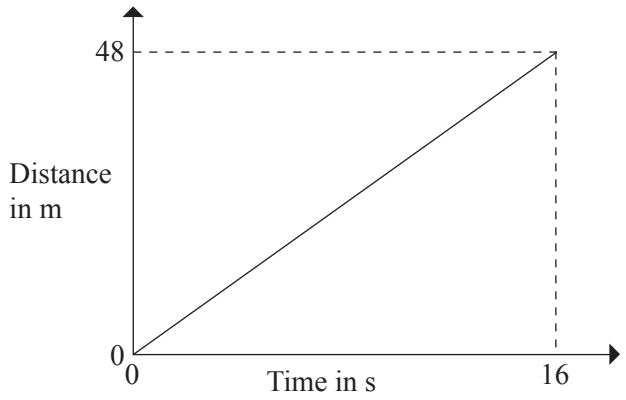
(c) Describe the motion of the skydiver when the two forces are equal.

_____ [1]

Examiner Only

Marks	Remark

11 The following graph shows how the distance a man walks varies with time.



Use the graph to calculate the speed of the man.

You are advised to show your working out.

Speed = _____ m/s [3]

12 The hot plate on a cooker transfers 840 kJ of heat energy to a saucepan full of water. This requires 1200 kJ of electrical energy.

(a) What, if any, is the unit for the efficiency?

_____ [1]

(b) Calculate the efficiency of the hotplate.

You are advised to show your working out.

Efficiency = _____ [3]

Examiner Only
Marks | Remark

Examiner Only	
Marks	Remark

13 (a) James was wearing a woollen sweater and a nylon shirt. When he removes the sweater he sees a spark.

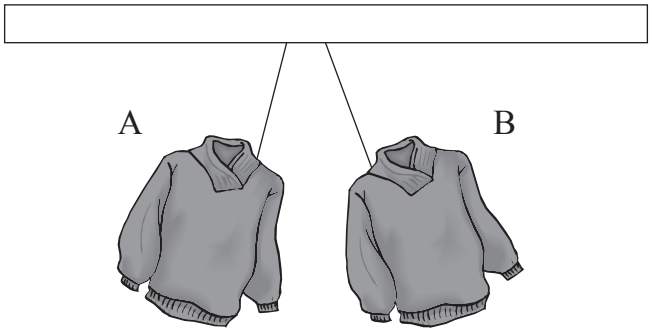
(i) Explain fully in terms of charge movement how the sweater became charged.

_____

_____ [2]

Quality of written communication [1]

When two charged sweaters (A and B) were suspended on threads they moved apart as shown below.



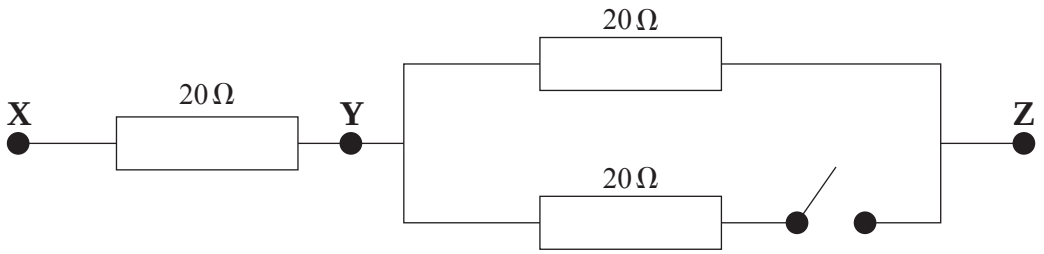
(ii) What does this indicate about the charges on the sweaters?

_____ [1]

(iii) Explain your answer to part **(ii)**.

_____ [1]

(b) Three 20 Ω resistors are connected as shown below.



Complete the following table to show the total resistance between the different points for the switch settings indicated.

Points	Switch	Resistance in Ω
Y and **Z**	Closed	
X and **Z**	Open	
X and **Z**	Closed	

[3]

(c) **(i)** The power rating of an electric hob is 1.5 kW. How much energy is used (in kWh) if it is switched on for 2 hours?

Electric energy = _____ kWh [1]

(ii) What is the cost of switching on the hob for 2 hours if one kWh of electricity costs 13p?

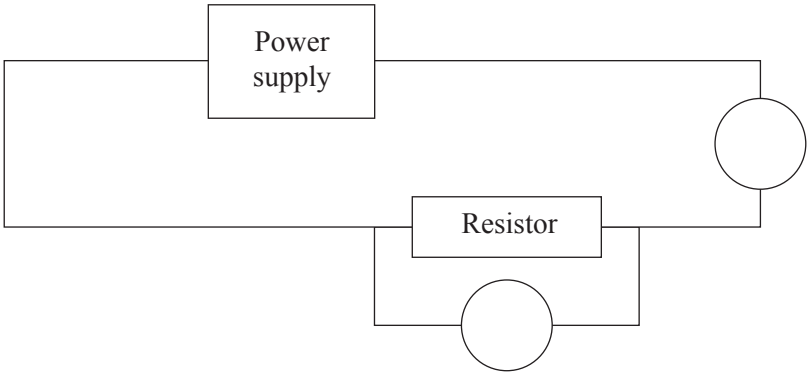
Cost = _____ p [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

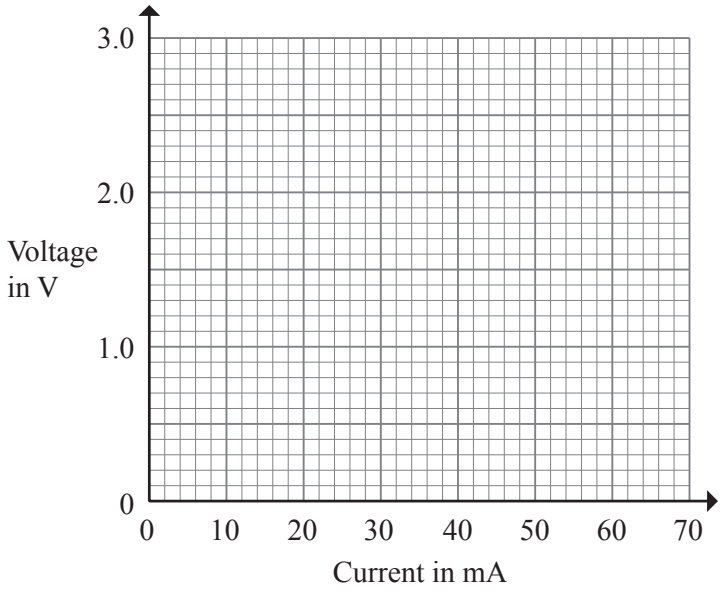
(d) James uses the following circuit to investigate the variation of current with voltage for a resistor.



Label the ammeter and voltmeter with the correct symbols. [2]

(e) The results are given below.

Voltage in V	0	0.8	1.2	1.6	2.0	2.8
Current in mA	0	20	30	40	50	70



(i) Plot the points on the grid. [1]

(ii) Draw the best fit straight line through the points. [1]

(iii) Convert 60 mA to A. Remember 1 mA = 0.001 A

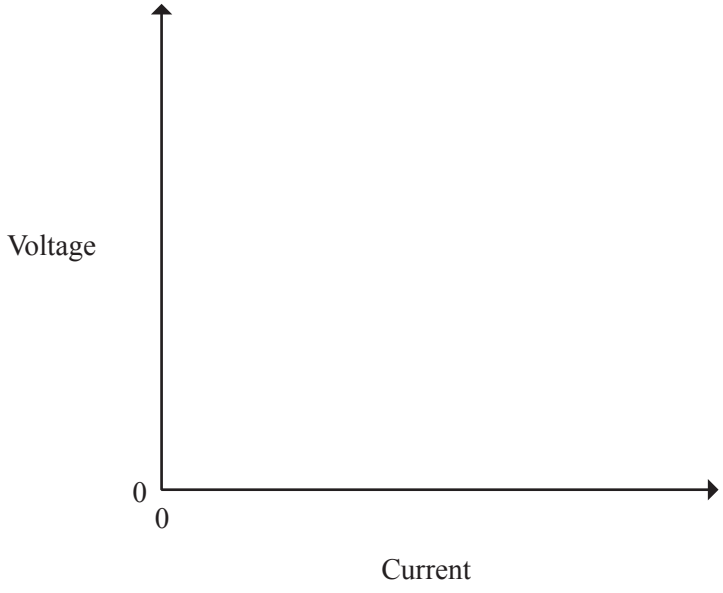
Current = _____ A [1]

(iv) When the voltage across the resistor is 2.4 V, the current through it is 60 mA. Use your answer to part **(iii)** to calculate the resistance of the resistor.

You are advised to show your working out.

Resistance = _____ Ω [3]

(f) Sketch below a graph to show how voltage varies with current for an electric light bulb.



[2]

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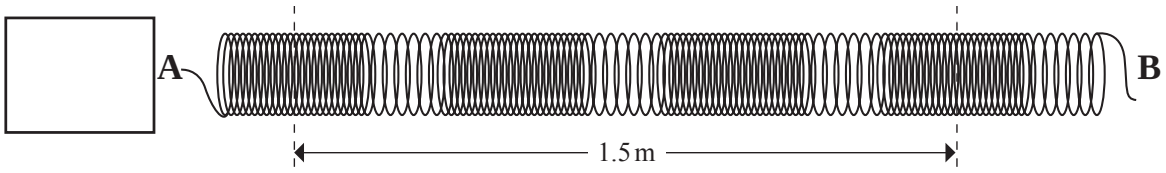
Marks	Remark

14 (a) Shauna uses a stretched slinky to make longitudinal waves.



(i) What do the longitudinal waves transfer from **A** to **B**?

_____ [1]

(ii) In the box, draw a double-headed arrow to indicate the direction Shauna would have to move end **A** to make longitudinal waves. [1]

(iii) Shauna sends 18 waves along the slinky in 6 seconds.
How many waves does she make in 1 second?

_____ [1]

(iv) Use your answer to part **(iii)** to state the frequency of the waves.

Frequency = _____ Hz [1]

(v) What is the wavelength of the longitudinal waves?

Wavelength = _____ m [1]

(vi) Use your answers to parts **(iv)** and **(v)** to calculate the speed of the longitudinal waves.

You are advised to show your working out.

Speed = _____ m/s [3]

(vii) Give another example of a longitudinal wave.

_____ [1]

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Marks	Remark

Examiner Only	
Marks	Remark

(b) Transverse waves can also be made with a slinky spring.

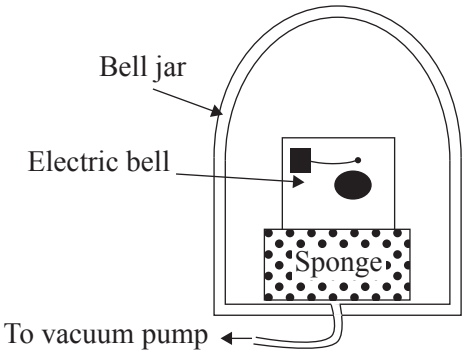
(i) How would the vibrations of the slinky spring be different if Shauna made a transverse wave?

_____ [1]

(ii) Give another example of a transverse wave.

_____ [1]

(c) An electric bell is set ringing inside a bell jar.



When the hammer strikes the gong, sound is produced.

(i) Why is sound produced by the gong?

_____ [1]

(ii) What happens to the loudness of the sound from the gong when the vacuum pump is switched on?

_____ [1]

(iii) What does this experiment demonstrate about sound waves?

_____ [1]

(iv) If the experiment is repeated without the sponge, the sound of the electric bell can always be heard. Explain why this is so.

_____

_____ [1]

(d) What are the frequency limits of human hearing?

(i) Lower limit = _____ Hz [1]

(ii) Upper limit = _____ Hz [1]

(iii) How, if at all, does the upper limit change with increasing age?

_____ [1]

(iv) What damage can long exposure to loud sound cause to the ears?

_____ [1]

(v) How can people who operate very noisy machines reduce damage to their ears?

_____ [1]

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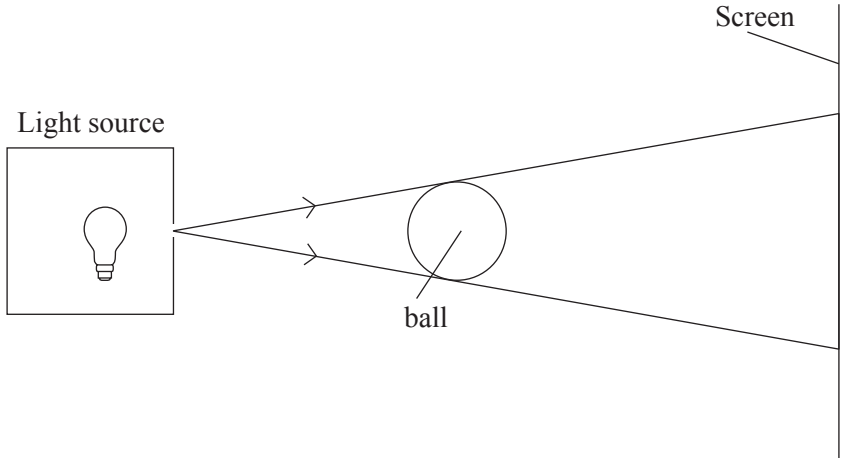
Marks	Remark

15 (a) (i) Indicate with a tick (✓) in the table below whether the object is luminous or non-luminous.

Object	Luminous	Non-luminous
Star		
Moon		
Planet		
White paper		

[4]

The diagram below shows a shadow of a ball being formed on a screen by a point source of light.



(ii) Which statement below best describes the shadow formed on the screen?

A The shadow is uniformly black.

B The shadow contains partial shadow AND uniformly black shadow.

C The entire shadow is partial shadow.

Answer _____ [1]

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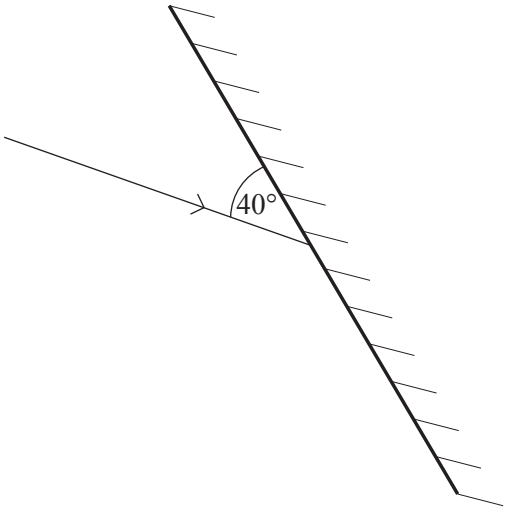
Marks | Remark

A ray of light is incident on a plane mirror as shown.



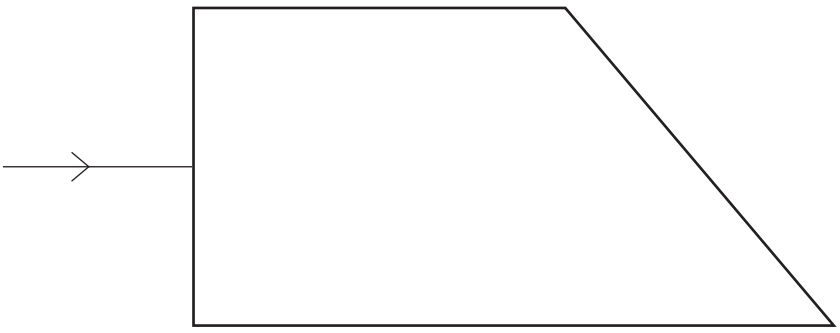
(b) (i) Draw and label the normal. [1]

(ii) What size is the angle of reflection?

Angle of reflection = _____ ° [1]

Different shapes of glass prism are often used to change the direction of light rays.

(c) (i) Continue the path of the ray shown until it emerges into the air.



[3]

(ii) Does the speed of light increase, decrease or remain the same as it enters the glass?

_____ [1]

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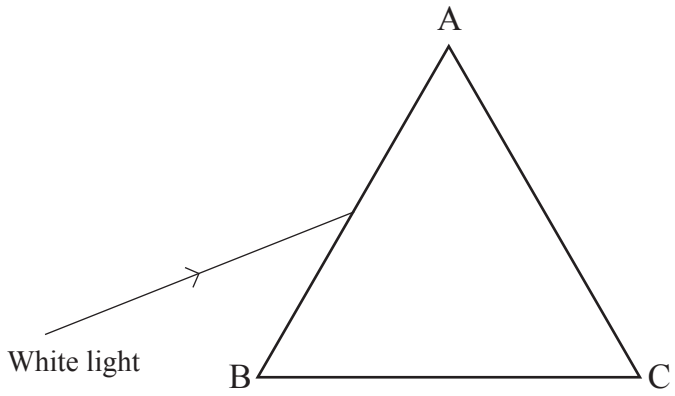
Marks	Remark

White light enters a prism.



The prism is used to split white light into its component colours.

(d) (i) What is this process called?

_____ [1]

(ii) List the component colours produced **beginning with** the colour nearest the corner C.

_____ [2]

(iii) What name is given to this group of colours?

_____ [1]

Examiner Only

Marks	Remark

The box contains the names of some electromagnetic waves.

Ultraviolet	Gamma rays	Microwaves	Radio waves	Infrared

(e) (i) Which one has the shortest wavelength?

_____ [1]

(ii) Which one comes from a coal fire?

_____ [1]

(iii) Which one can be used to sterilise medical equipment?

_____ [1]

(iv) Which one can cause skin cancer?

_____ [1]

(v) Which one has the longest wavelength?

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

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