Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2014–2015

Science: Single Award

Unit 3 (Physics)
Foundation Tier

ML

[GSS31]

THURSDAY 26 FEBRUARY 2015, MORNING

TIME

1 hour, plus your additional time allowance.

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 eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **8(a)**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

Examiner Only	
Marks	Remark

1 Look at the table below. It gives information about some of the planets in our Solar System.

Planet	Diameter/km	Gravity/ N/kg
Mercury	4878	4
Venus	12 104	9
Earth	12 756	10
Neptune	48 600	12
Jupiter	142 800	25

(a) Complete the following sentence to give a trend shown by this information.

As the diameter increases _____

_____ [1]

(b) **(i)** Use the equation:

weight = mass × gravity

to calculate the weight of a 70 kg man on Earth.

(Show your working out.)

Answer _____ [2]

(ii) Name the unit of weight.

Choose from:

kilogram **newton** **joule**

Answer _____ [1]

(c) **(i)** What name is given to objects which orbit planets in our Solar System?

_____ [1]

(ii) What name is given to the **current** model of the Solar System?

Choose from:

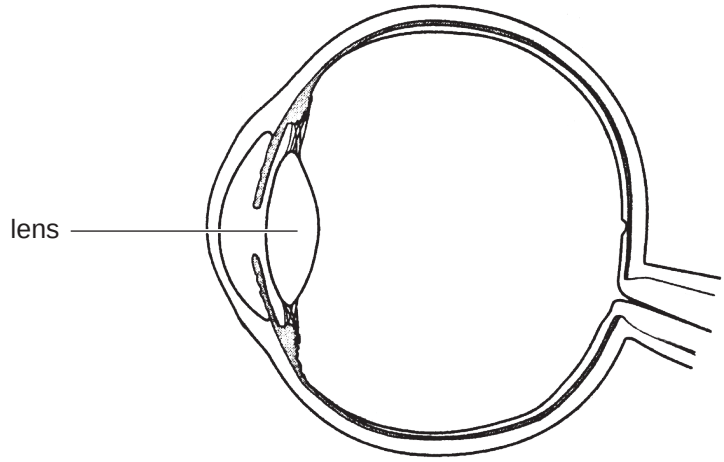
geocentric **concentric** **heliocentric**

Answer _____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

2 **(a)** The diagram below shows the human eye.



(i) Name the type of lens found in the eye.

Answer _____ [1]

(ii) Complete the following sentence.

Choose from:

reflected **refracted** **returned**

Light entering our eyes is _____ by the lens. [1]

(b) Name the part of the eye where the image is formed.

Answer _____ [1]

(c) The man shown below has an eyesight problem.
When he holds the paper at arm's length it appears blurry but when he brings it closer to his eyes the words become clear.

© Toonstyle.com / iStock / Thinkstock

Name this man's eyesight problem.

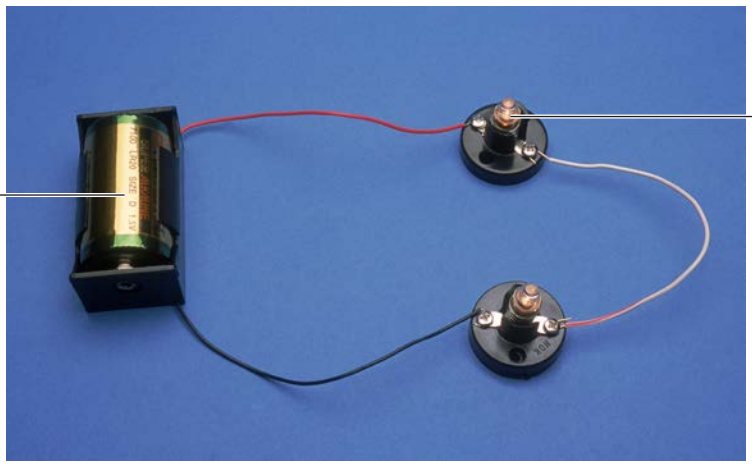
Circle the correct answer.

long sight : **short sight** : **astigmatism** [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

3 The picture below shows a simple electrical circuit.



(a) Use the correct symbols to draw the circuit diagram in the space below.

[2]

(b) State **two** things that will happen if another battery is added to this circuit.

1. _____

_____

2. _____

_____ [2]

(c) What will you see happen if one of the bulbs is broken?
Explain your answer.

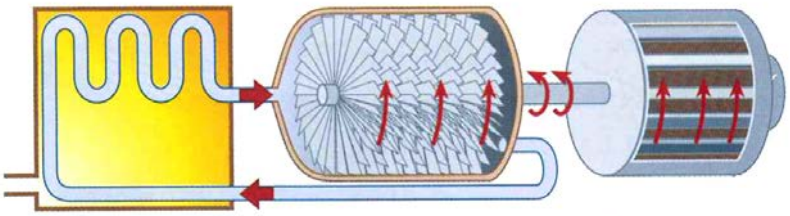
_____

_____

_____ [2]

Examiner Only	
Marks	Remark

(d) The diagram below shows the component parts of a fossil fuel power station.



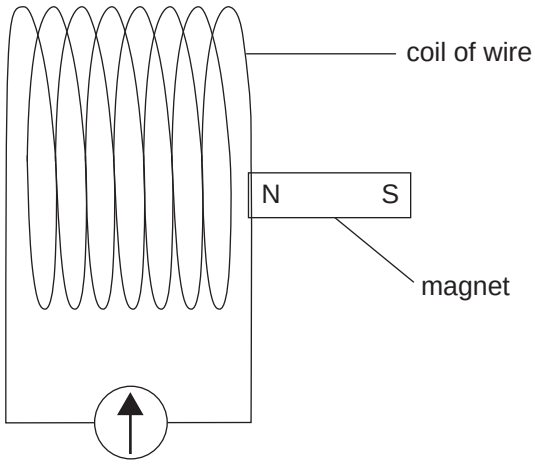
Place these parts in the correct order for the generation of electricity.

turbine **boiler** **generator**

_____ → _____ → _____

[2]

(e) The diagram below shows a magnet and a coil of wire.



(i) Describe how you would use this equipment to make electricity.

_____

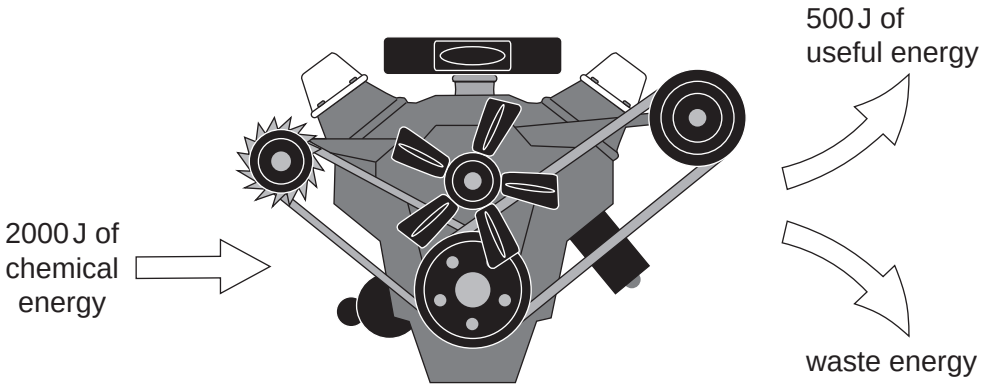
_____ [1]

(ii) Give **one** way the amount of electricity produced could be increased.

_____ [1]

Examiner Only	
Marks	Remark

4 **(a)** The diagram below shows 2000 J of energy going into a car engine.



(i) Name **one** type of waste energy produced by a car engine.

_____ [1]

(ii) Calculate the amount of energy wasted by this engine.

Answer _____ J [1]

(iii) Use the equation:

$$\textbf{efficiency} = \frac{\textbf{useful energy out}}{\textbf{total energy in}}$$

to calculate the efficiency of this engine.

(Show your working out.)

Answer _____ [2]

(b) Look at the photograph below. It shows the inside of a car after an accident.

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Name **two** safety features shown in this photograph.

1. _____

2. _____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

5 **(a)** The table below shows the percentage of electricity generated from different energy sources between 1960 and 2000.

	Energy source				
Year	**Coal %**	**Oil %**	**Gas %**	**Nuclear %**	**Renewables %**
1960	74.0	25.4	0	0.6	0
1980	36.7	37.0	21.6	4.5	0.2
2000	14.7	39.2	33.2	12.2	0.7

Use this information to answer the following questions.

(i) Which fossil fuel shows the largest percentage increase between 1960 and 2000?

Answer _____ [1]

(ii) Fossil fuels produce **greenhouse gases**. The government is trying to reduce the amount of these gases in the air. How might this change the future percentage use of the energy sources shown in the table?

_____

_____

_____

_____ [2]

(iii) Fossil fuels are used to generate electricity.
Give **one** other use of fossil fuels.

_____ [1]

Examiner Only

Marks	Remark

(b) Look at the diagram below. It shows solar cells on the roof of a house. The cells can be tilted to different angles.

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Look at the table below. It shows the average energy (in arbitrary units) collected in different months and at different angles.

Month	Angle of tilt					
	20°	**25°**	**30°**	**35°**	**40°**	**45°**
April	600	610	620	615	610	600
June	710	715	720	700	680	640
August	640	650	660	650	640	580
October	480	490	520	510	500	460

(i) Give the month and angle that collect the most energy.

month _____ angle _____ [1]

(ii) Describe fully how the amount of energy depends on the angle of tilt.

_____

_____

_____ [2]

(iii) How would these figures change during the winter months? Explain your answer.

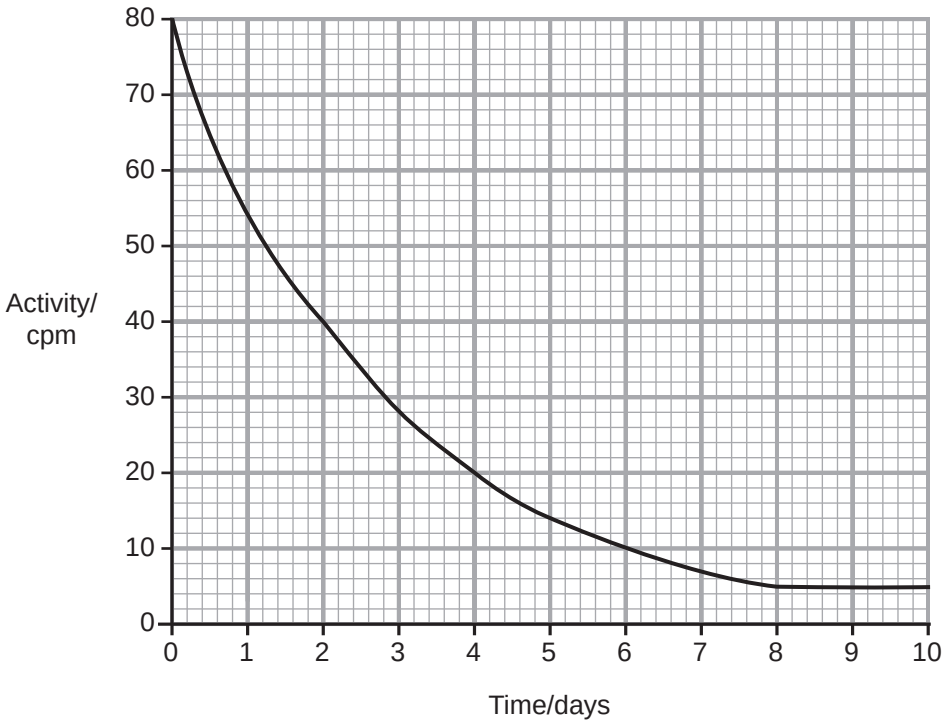
_____

_____

_____ [2]

Examiner Only	
Marks	Remark

6 **(a)** Look at the graph below. It shows how the activity of a radioactive isotope changes with time.



(i) What is the activity at 5 days?

Answer _____ cpm [1]

(ii) What is the half-life of this isotope?

Answer _____ days [1]

(iii) Use the graph to find the value of background radiation.

Answer _____ cpm [1]

(b) Explain fully why some atoms are described as radioactive.

_____

_____

_____ [2]

(c) Look at the table below. It gives information about some radioactive materials. Each of these materials costs the same amount of money.

Material	Half-life	Radiation emitted
A	6 hours	gamma
B	432 years	alpha
C	28 years	beta
D	11 years	gamma
E	138 days	alpha

Radiotherapy machines use radiation to destroy tumours in the body. Hospitals need radiotherapy machines to be cost effective and give value for money.

(i) Which material (**A**, **B**, **C**, **D** or **E**) would be best suited for radiotherapy? Explain fully your choice.

_____

_____

_____

_____ [3]

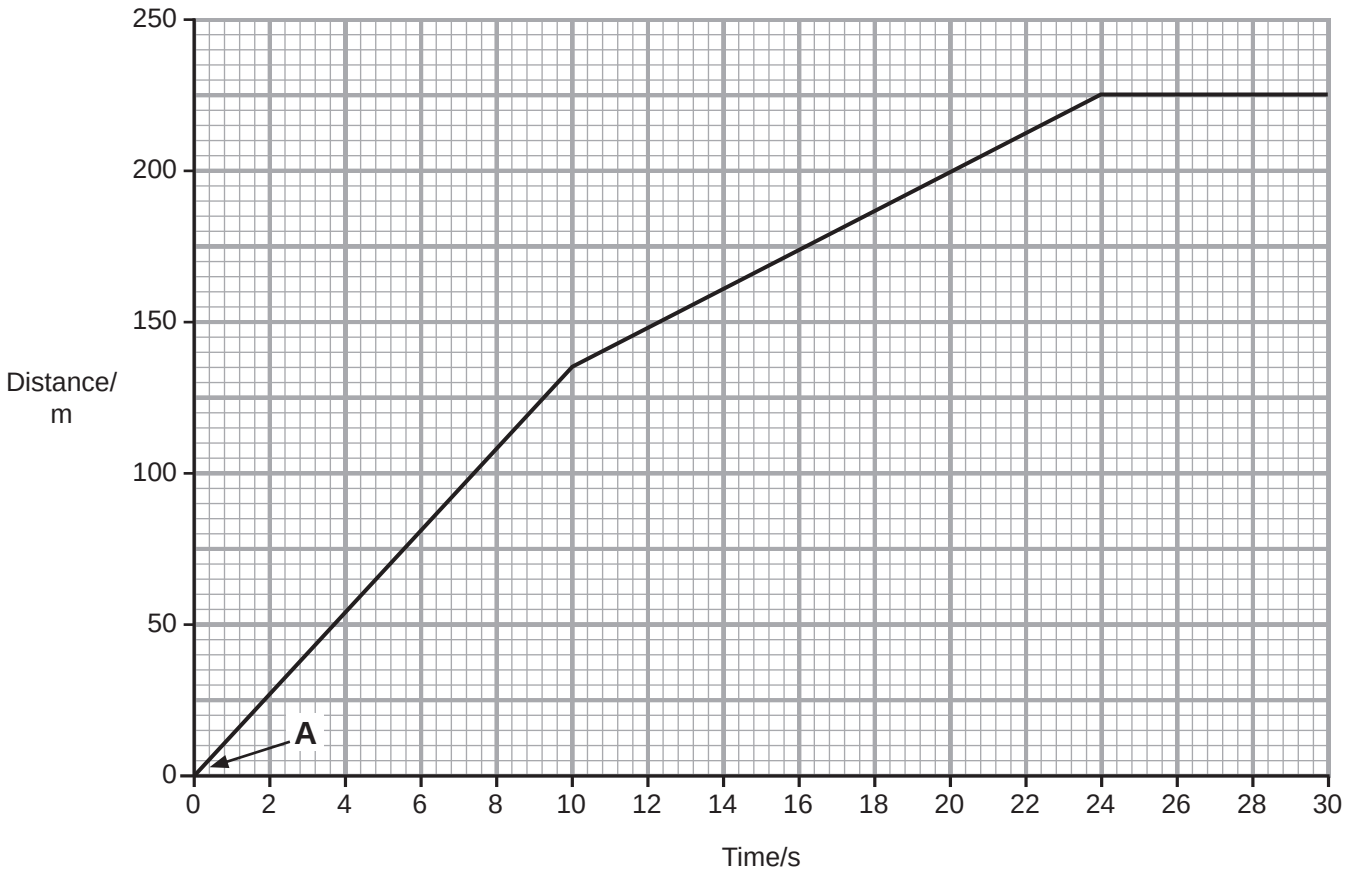
(ii) Ionising radiation is used for radiotherapy. Give **one** other use for ionising radiation.

_____ [1]

Examiner Only

Marks	Remark

7 **(a)** Look at the graph below. It is a distance-time graph for a car moving on a straight, level road.



Examiner Only	
Marks	Remark

At point **A** (0,0) a driver sees traffic lights changing to red. He drives another 135 m before braking.

(i) At what time does the driver start to brake?

Answer _____ s [1]

(ii) At what time does the car stop?

Answer _____ s [1]

(iii) Calculate the braking distance of the car.

(Show your working out.)

Answer _____ m [2]

(b) This braking distance was for a car on a dry road.

What effect will a **wet** road have on the braking distance of a car? Explain fully, in terms of forces.

_____

_____

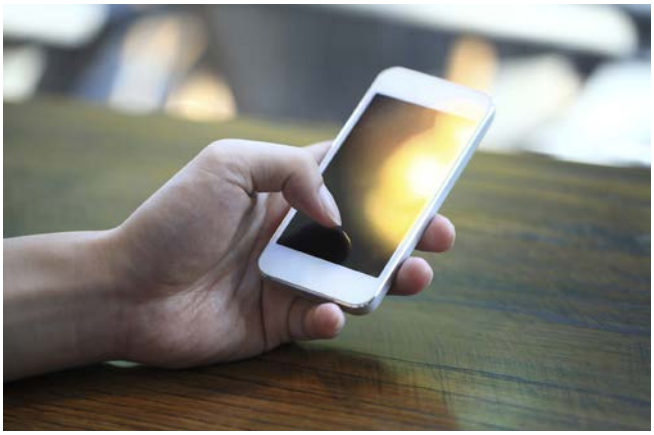
_____ [2]

Examiner Only	
Marks	Remark

8 **(a)** Describe fully how mobile phones work and the risks of using them.

Your answer should include:

- the type of electromagnetic wave used
- how the signal is transmitted across the country
- the possible health risks of mobile phone use
- how the risks can be reduced.



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In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

Examiner Only	
Marks	Remark

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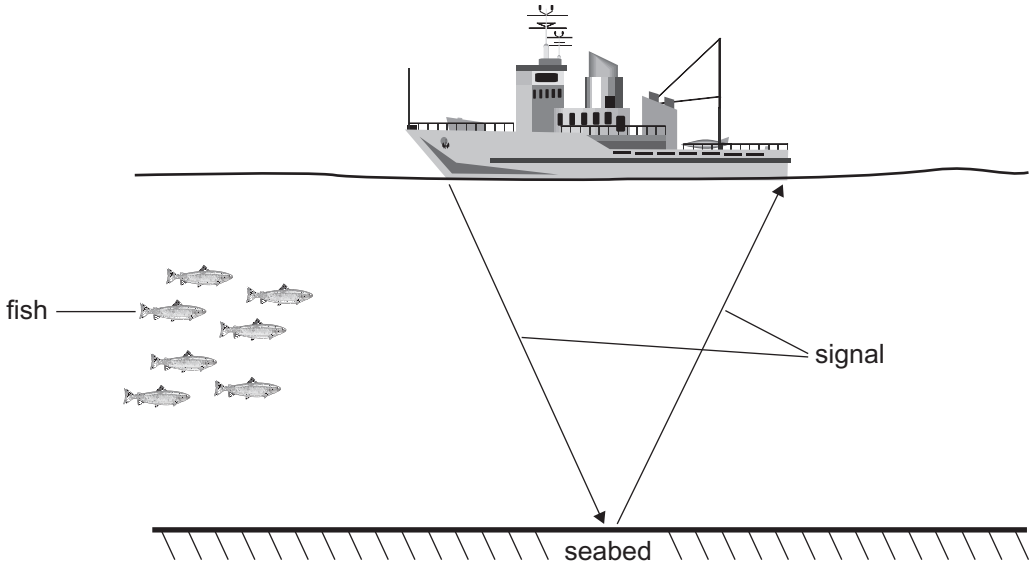
Examiner Only	
Marks	Remark

(b) The diagram below shows a boat using ultrasound to measure the depth of the sea.



The table below shows the results from different areas.

Signal return time/s	Distance signal travels/m	Depth of sea/m
0.04	60	30
0.12	180	90
0.20	300	150
0.28	420	
0.36	540	270

(i) Complete the table by calculating the missing value for depth. [1]

Examiner Only	
Marks	Remark

(ii) Using information from the table and the equation below:

$$\textbf{speed} = \frac{\textbf{distance signal travels}}{\textbf{signal return time}}$$

calculate the speed of sound in water.

(Show your working out.)

Answer _____ m/s [2]

(iii) If the fish swim under the boat what effect, if any, will this have on the time it takes for the signal to return?

_____ [1]

THIS IS THE END OF THE QUESTION PAPER