

New  
Specification

Rewarding Learning

General Certificate of Secondary Education  
2012–2013

## Science: Single Award

Unit 3 (Physics)

Higher Tier

[GSS32]

WEDNESDAY 29 FEBRUARY, 2012

9.30 am–10.45 am



### 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 nine** questions.

### INFORMATION FOR CANDIDATES

The total mark for this paper is 75.

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 questions **3(a)** and **9(a)(i)**.

Centre Number

71

Candidate Number

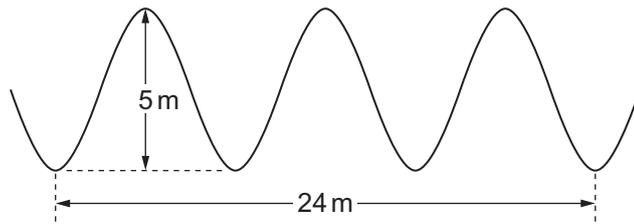
For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	

<b>Total Marks</b>	
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1 The diagram below shows some sea waves.



(a) Use the information in the diagram to answer the following questions.

(i) What is the amplitude of these waves?

Answer \_\_\_\_\_ m [1]

(ii) What is the wavelength of these waves?

Answer \_\_\_\_\_ m [1]

(b) A student notes that **four** complete waves pass him in **two** seconds.

What is the frequency of these waves?

Answer \_\_\_\_\_ Hz [1]

(c) (i) Sea waves are transverse waves. Describe the motion of the particles in a transverse wave.

\_\_\_\_\_  
 \_\_\_\_\_ [2]

(ii) Name another example of a transverse wave.

\_\_\_\_\_ [1]

Examiner Only

Marks Remark

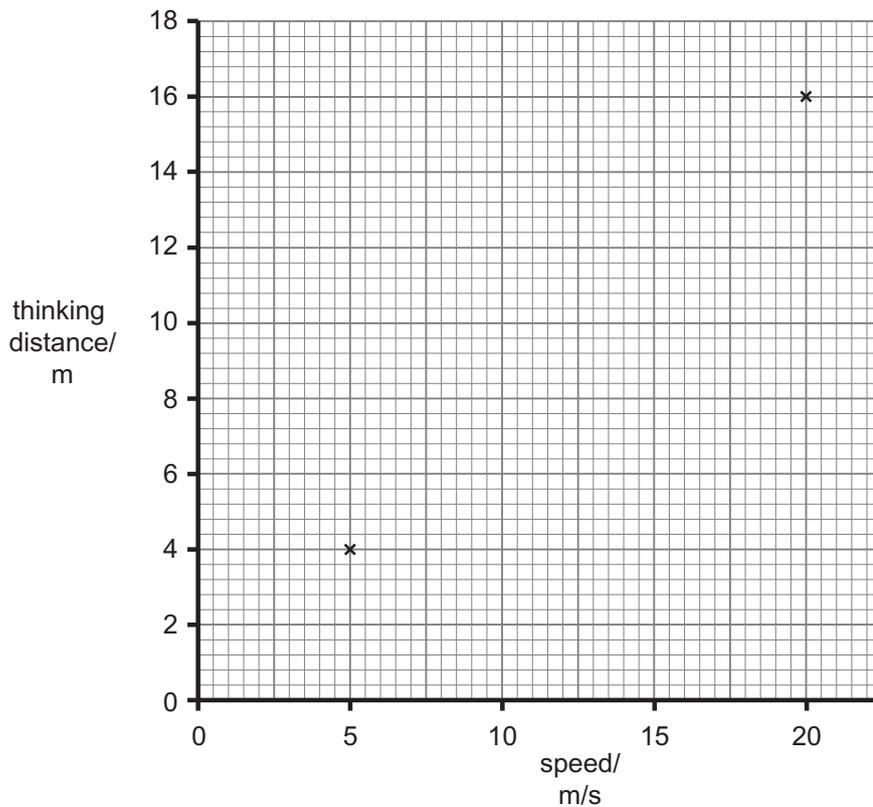
- 2 (a) Complete the following equation about the stopping distance of a car.

Stopping distance = thinking distance + \_\_\_\_\_ distance  
[1]

- (b) The table below gives the thinking distance at different speeds on a dry day.

Speed/ m/s	Thinking distance/ m
5	4
8	6.4
12	9.6
15	12
20	16

- (i) Complete the plots for these values and draw a line graph on the grid below.



[2]

- (ii) State the trend shown in this information.

\_\_\_\_\_

\_\_\_\_\_

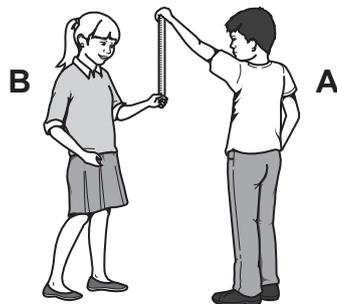
[1]

Examiner Only	
Marks	Remark

- (iii) Suggest how the thinking distances shown in the table opposite will change, if at all, if taken on a wet day.

\_\_\_\_\_ [1]

- (c) The picture below shows two people investigating how fast their reactions are.



The boy on the right (**A**) drops the metre stick and the girl on the left (**B**) catches it as quickly as possible.

- (i) Explain fully how the distance the metre stick falls is used to show how good the girl's reactions are.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [2]

- (ii) State what can be done to make the results as:

1. reliable as possible.

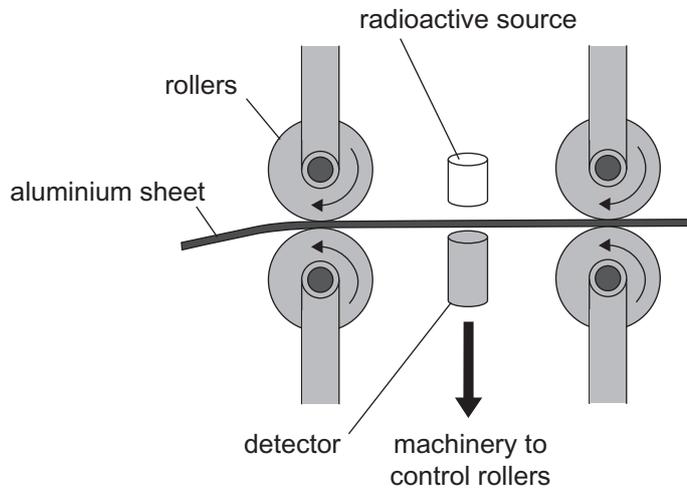
\_\_\_\_\_  
 \_\_\_\_\_

2. accurate as possible.

\_\_\_\_\_  
 \_\_\_\_\_ [2]

Examiner Only	
Marks	Remark

- 3 The diagram below shows how a radioactive source is used to monitor the thickness of an aluminium sheet during manufacture. If the thickness of the aluminium sheet changes, the force applied to the rollers will adjust to maintain the correct thickness.



- (a) Beta is the best type of radiation to use as a source. With reference to the penetration properties of all types (alpha, beta and gamma) explain fully why beta is the best.

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

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[6]

Examiner Only

Marks Remark

- (b) Radiation is used to kill bacteria and fungi found in fresh food to stop decay. The radiation is applied after packaging.

The table below gives details of some isotopes.

Isotope	Type of radiation emitted	Half-life
Radon-220	Alpha	54.5 seconds
Polonium-210	Alpha	138 days
Bismuth-83	Beta	61 minutes
Hydrogen-3	Beta	12 years
Technetium-99	Gamma	6 hours
Cobalt-60	Gamma	5 years

Which isotope would be best for a food producer to use with a packet of fresh strawberries? Explain your answer.

Isotope \_\_\_\_\_ [1]

Explanation \_\_\_\_\_

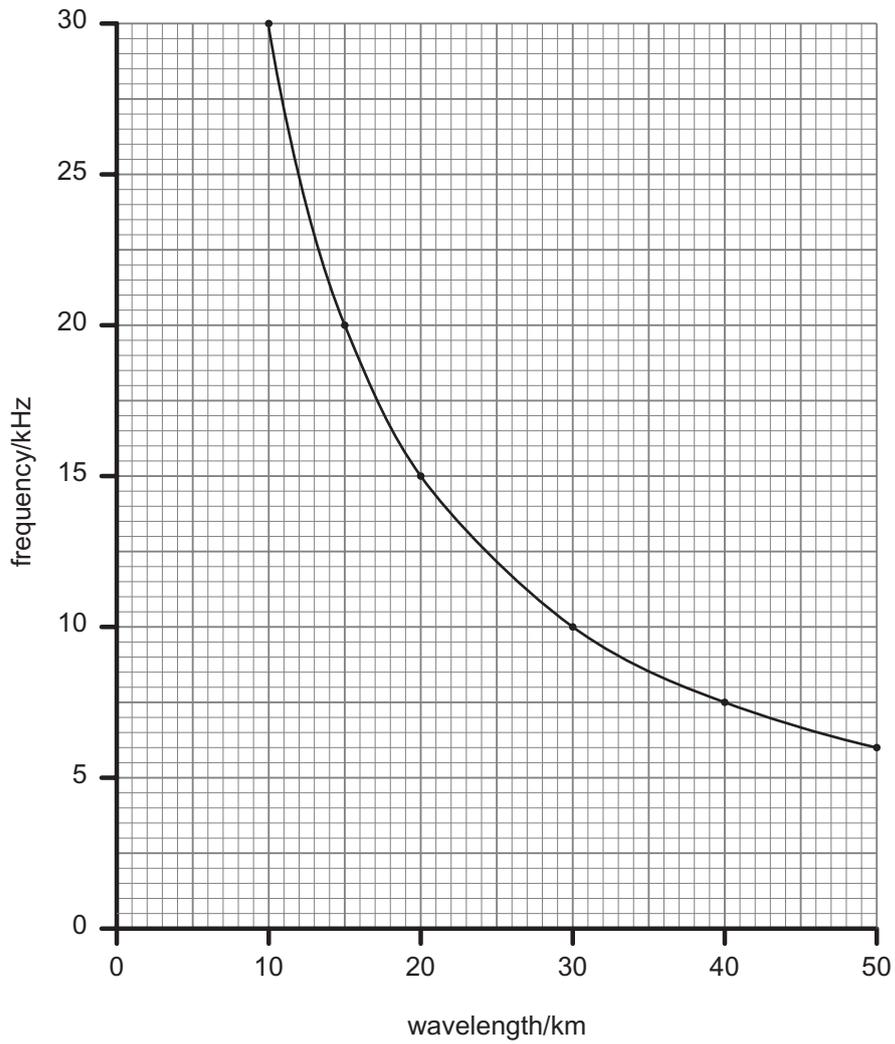
\_\_\_\_\_

\_\_\_\_\_ [2]

Examiner Only

Marks Remark

- 4 The graph below shows how the frequency of electromagnetic waves changes with wavelength.



- (a) State the conclusion that can be drawn from this graph.

\_\_\_\_\_

\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark

- (b) (i) Use the graph to find the wavelength of an electromagnetic wave with a frequency of 7.5 kHz.

Answer \_\_\_\_\_ km [1]

- (ii) Use your answer to part (i) and the equation:

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

to calculate the speed of this wave in metres per second (m/s).  
(Show your working out.)

Answer \_\_\_\_\_ m/s [2]

- (c) State **two** features of electromagnetic waves.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

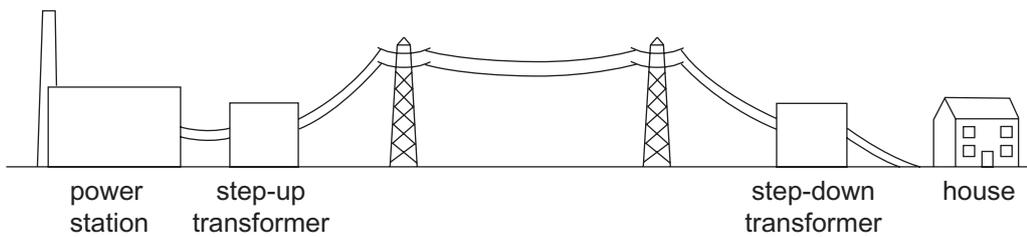
- (d) Name **two** types of electromagnetic wave that can be used in mobile phone communications.

\_\_\_\_\_

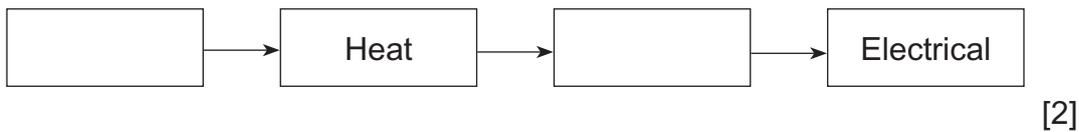
\_\_\_\_\_ [2]

Examiner Only	
Marks	Remark

- 5 The diagram below shows how electricity gets from power stations to consumers.



- (a) (i) Complete the following energy change diagram for a fossil fuel power station.



- (ii) Why is electrical the most useful type of energy?

\_\_\_\_\_ [1]

- (b) Electricity from the power station is passed through a step-up transformer.

- (i) What change, if any, does the step-up transformer make to the:

1. current?

\_\_\_\_\_ [1]

2. voltage?

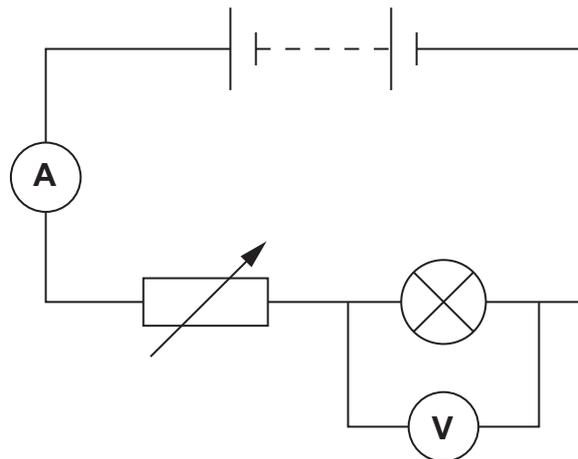
\_\_\_\_\_ [1]

- (ii) Suggest **one** advantage of passing electricity through the step-up transformer.

\_\_\_\_\_  
 \_\_\_\_\_ [1]

Examiner Only	
Marks	Remark

(c) Below is shown a simple circuit which includes a variable resistor.



- (i) Draw an arrow on the diagram to show the direction of conventional current flow. [1]
- (ii) The table below shows the results obtained from the circuit when the variable resistor is adjusted.

Voltage/V	Current/A
2	0.10
3	0.15
5	0.25
7	0.30

State the trend shown by these results.

\_\_\_\_\_ [1]

- (iii) Suggest a suitable application of a variable resistor in the home.

\_\_\_\_\_ [1]

Examiner Only

Marks Remark

- 6 (a) The diagrams below show a filament lamp, a halogen lamp and a compact fluorescent lamp (CFL).



filament lamp  
(wire inside)

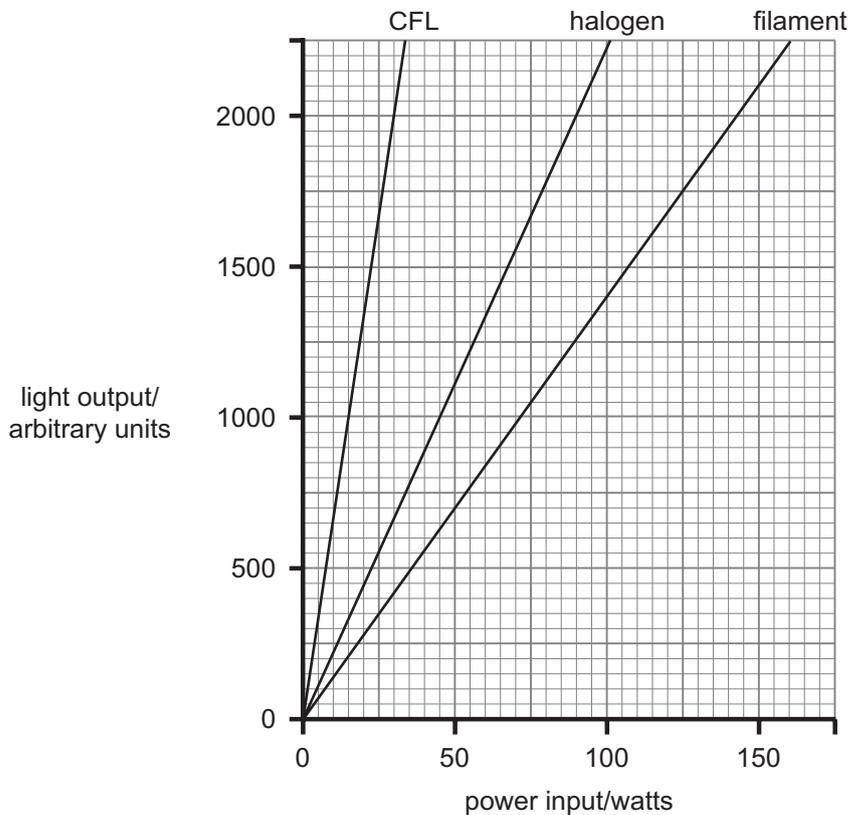


halogen lamp  
(filled with argon)



CFL

The graph below shows how the light output for each type changes with power input.



- (i) At 25 watts calculate how much more light a halogen lamp produces compared with a filament lamp.

\_\_\_\_\_ arbitrary units [1]

Examiner Only	
Marks	Remark

(ii) State two trends that the graph shows.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_ [2]

(b) The government is promoting the use of CFL bulbs and the production of filament bulbs is about to stop. Use the information provided to explain why this is the best course of action.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [3]

(c) State the law of 'conservation of energy'.

\_\_\_\_\_

\_\_\_\_\_

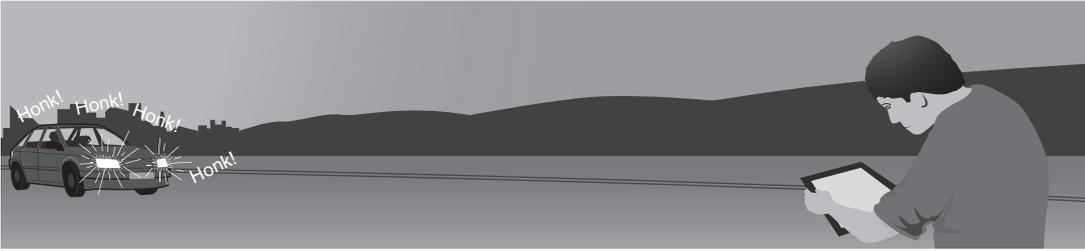
\_\_\_\_\_ [2]

Examiner Only

Marks

Remark

- 7 (a) The picture below shows two pupils using the flash-bang method to find the speed of sound in air.



© GCSE Single Award Science for CCEA by T Laverty, J Napier & R White, page 213, published by Hodder Murray, 2006. ISBN 978 0340 926000. 'Reproduced by permission of Hodder Education'

- (i) Describe a method the pupils could use to find the speed of sound.

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[3]

- (ii) When the experiment was repeated in the opposite direction, the results were found to be different.

Suggest a reason for the difference.

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[1]

- (b) The speed of sound can also be found using the echo method.

- (i) What is an echo?

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[1]

- (ii) In concert halls echoes can distort the sound.

Explain fully how this problem can be overcome.

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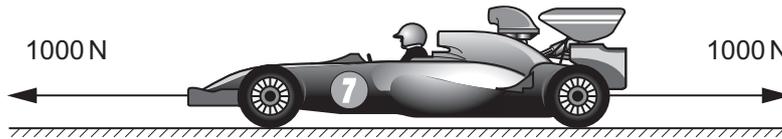


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[2]

Examiner Only	
Marks	Remark

- 8 The diagram below shows the forces acting on a moving racing car.



- (a) (i) Explain fully, in terms of forces, the movement of this racing car.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

- (ii) Describe fully, in terms of the resultant force, the effect of increasing the forward force to 1500 N.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

- (b) State **two** safety features designed to absorb energy and reduce injury in a crash.

1. \_\_\_\_\_

2. \_\_\_\_\_ [2]

- (c) Car speeds can be measured using instantaneous or average speed cameras.

- (i) Explain the difference between instantaneous and average speed.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

- (ii) Suggest a reason why there are fewer accidents when average speed cameras are used.

\_\_\_\_\_

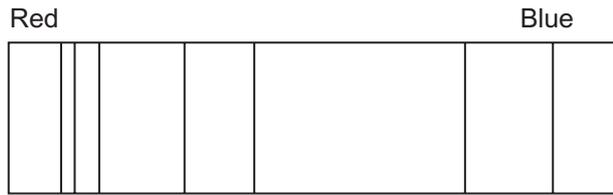
\_\_\_\_\_ [1]

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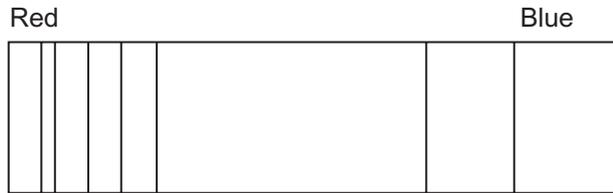
Marks Remark



(b) The diagrams below provide further evidence for the Big Bang theory.



Light from a star that is stationary relative to Earth



Light from a star that is moving away from Earth

Name and explain the phenomenon shown in these diagrams.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

**THIS IS THE END OF THE QUESTION PAPER**

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Marks	Remark





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