



Ce	ntre Number
71	

Candidate Number

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)**.

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

7706

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1 The diagram below shows some sea wave		The	diagram	below	shows	some	sea	wave	s.
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THE C	nagrani below shows some sea waves.	Marks	Remark
	5 m 24 m		
(a) L	Ise the information in the diagram to answer the following questions.		
<b>(</b> i	i) What is the amplitude of these waves?		
	Answer m [1]		
<b>(</b> i	ii) What is the wavelength of these waves?		
	Answer m [1]		
<b>(b)</b> A	student notes that <b>four</b> complete waves pass him in <b>two</b> seconds.		
V	Vhat is the frequency of these waves?		
	Answer Hz [1]		
(c) (i	<ul> <li>Sea waves are transverse waves. Describe the motion of the particles in a transverse wave.</li> </ul>		
	[2]		
<b>(</b> i	ii) Name another example of a transverse wave.		
	[1]		

. . .

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

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

Examiner Only Marks Remar

(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.



[1]

Examiner Only Marks Re 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. В 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. 

5

# (iii) Suggest how the thinking distances shown in the table opposite


**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.

[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.

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

The table below gives details of some isotopes.

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

Examiner Only changes with wavelength. Marks Remark frequency/kHz wavelength/km (a) State the conclusion that can be drawn from this graph. [1]

(b)	(i)	Use the graph to find the wavelength of an electromagnetic wave with a frequency of 7.5 kHz.	Examine Marks	er Only Remark
		Answer km [1]		
	(ii)	Use your answer to part (i) and the equation:		
		wave speed = frequency $ imes$ wavelength		
		to calculate the speed of this wave in metres per second (m/s). (Show your working out.)		
		Answer m/s [2]		
(c)	Sta	te <b>two</b> features of electromagnetic waves.		
		[2]		
(d)	Nar phc	me <b>two</b> types of electromagnetic wave that can be used in mobile one communications.		
		[2]		

The dia consum	gram below shows how electricity gets from power stations to lers.	Examiner Marks I
powe	er step-up on transformer transformer	
(a) (i)	Complete the following energy change diagram for a fossil fuel power station.	
	Heat Electrical	2]
(ii)	Why is electrical the most useful type of energy?	11
(b) Ele trar	ctricity from the power station is passed through a step-up nsformer.	
(i)	<ul><li>What change, if any, does the step-up transformer make to the:</li><li>1. current?</li></ul>	
	[ 2. voltage?	1]
(ii)	[	1]
(11)	transformer.	
	[	1]

<ul><li>(i) Draw an conventi</li><li>(ii) The tabl</li></ul>	arrow on the diagram to ional current flow. e below shows the result	show the direction of	[1] cuit when
the varia	able resistor is adjusted.	Current/A	
	2	0.10	
		0.10	
	3	0.15	
	3	0.15	
	3 5 7	0.15 0.25 0.30	
State the	3 5 7 e trend shown by these r	0.15 0.25 0.30	[1]
State the	3 5 7 e trend shown by these r	0.15 0.25 0.30 esults.	[1] [1]
State the	3 5 7 e trend shown by these r	0.15 0.25 0.30 results.	[1] e home. [1]

11

(a)	The diagrams compact fluore	below show a filament lamp, a halogen lamp and a escent lamp (CFL).	Examin Marks	er Only Remark
	filament la (wire insi	Amp halogen lamp (filled with argon)		
	The graph belowith power inp	ow shows how the light output for each type changes ut.		
	light output/ arbitrary units			
	(i) At 25 watt produces	s calculate how much more light a halogen lamp compared with a filament lamp. arbitrary units [1]		

(a) The diagrams below show a filament lamp, a halogen lamp and a 6

	(ii)	State two trends that the graph shows.	Examiner Only Marks Reman	rk
		2		
		[2]		
(b)	The of fi exp	e government is promoting the use of CFL bulbs and the production lament bulbs is about to stop. Use the information provided to lain why this is the best course of action.		
		[3]		
(c)	Sta	te the law of 'conservation of energy'.		
		[2]		

finc	I the speed of sound in air.	N	Varks	R
N <sup>L</sup> FIOPKL A	the management of the second sec			
SE Single / ISBN 978	Award Science for CCEA by T Laverty, J Napier & R White, page 213, published by Hodder N 0340 926000. 'Reproduced by permission of Hodder Education'	Aurray,		
(i)	Describe a method the pupils could use to find the speed of sound.			
		_ [3]		
(ii)	When the experiment was repeated in the opposite direction, results were found to be different.	, the		
	Suggest a reason for the difference.			
		_ [1]		
( <b>b)</b> The	e speed of sound can also be found using the echo method.			
(i)	What is an echo?			
		[1]		
(ii)	In concert halls echoes can distort the sound.			
	Explain fully how this problem can be overcome.			
		_ [2]		

Examiner Only

	1000 N		
a) (i)	Explain fully, in terms of forces, the movement of this racing ca	ar.	
		_ [2]	
(ii)	Describe fully, in terms of the resultant force, the effect of increasing the forward force to 1500 N.		
		_ [2]	
<b>o)</b> Sta inju 1	te <b>two</b> safety features designed to absorb energy and reduce ry in a crash.	_ [2]	
<b>b)</b> Sta inju 1 2	te <b>two</b> safety features designed to absorb energy and reduce ry in a crash.	_ [2] [2]	
<ul> <li>5) Sta inju</li> <li>1</li> <li>2</li> <li>Ca car</li> </ul>	te <b>two</b> safety features designed to absorb energy and reduce ry in a crash.	_ [2] _ [2] ed	
5) Sta inju 1 2 2. (i)	te <b>two</b> safety features designed to absorb energy and reduce ry in a crash. - speeds can be measured using instantaneous or average spea neras. Explain the difference between instantaneous and average spea	_ [2] _ [2] ed eed.	
<ul> <li>5) Stainju</li> <li>1</li> <li>2</li> <li>2</li> <li>(i) Car</li> <li>(i)</li> </ul>	te <b>two</b> safety features designed to absorb energy and reduce ry in a crash. speeds can be measured using instantaneous or average speeneras. Explain the difference between instantaneous and average speeneras.	_ [2] _ [2] ed eed. _ [2]	
<ul> <li>5) Stainju</li> <li>1</li> <li>2</li> <li>Carcar</li> <li>(ii)</li> </ul>	te <b>two</b> safety features designed to absorb energy and reduce ry in a crash. speeds can be measured using instantaneous or average speeneras. Explain the difference between instantaneous and average speeneras. Suggest a reason why there are fewer accidents when average speed cameras are used.	_ [2] _ [2] ed eed. _ [2] _ [2]	

**9** (a) The table below gives the speed of galaxies in the Universe at different distances from Earth.

Galaxy	Distance from Earth/ tens of millions of light years	Speed away from Earth/ thousands of km/s
Virgo	5	1
Ursa Major	65	15
Corona	95	22
Bootes	170	39
Hydra	260	61

Examiner Only Marks Remark

(i) Describe fully the Big Bang theory and explain how the information in the table supports this theory.

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

			[6]
i)	Based on the Big Bang theory how old is the Universe?		
	Answer	vears	[1]
	////3//01	ycars	[']
ii)	Explain fully the term 'light year'.		
			[1]
			r.1

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



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