



*Rewarding Learning*

**General Certificate of Secondary Education  
2016–2017**

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**Science: Single Award**

Unit 3 (Physics)

Higher Tier

**[GSS32]**

**FRIDAY 24 FEBRUARY 2017, MORNING**

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**MARK  
SCHEME**

## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

			AVAILABLE MARKS	
1	(a)	From June to November the lamp stays lit for less time [1] as there is less light [1] battery less charged/less electricity produced [1]	[3]	7
	(b)	(i) Will not run out	[1]	
		(ii) Doesn't produce carbon dioxide/not polluting air	[1]	
		(iii) Unsightly/noisy	[1]	
		(iv) Geothermal/tidal/HEP/biomass/wave	[1]	
2	(a)	(i) Area A is darker = higher level of radon [1] higher radon level = more risk of <b>lung</b> cancer [1]	[2]	7
		(ii) Below this level, risk is zero/almost zero	[1]	
	(b)	(i) Radiation that is all around us, all the time	[1]	
		(ii) $11.5 + 0.2 + 0.3 + 14 + 50 = 86$ [1] $100 - 86 = 14$ [1]	[2]	
		(iii) X-rays/radiotherapy	[1]	
3	(a)	Constant speed for first 10 mins/6000 m [1] stopped from 10 mins/after 6000 m [1]	[2]	6
	(b)	(i) All points plotted correctly [2] 6 points plotted correctly [1] correct lines drawn [1]	[3]	
		(ii) First bike line is steeper/travels further in same time	[1]	

## 4 (a) Indicative content

- coal, oil and gas
- remains of animals/plants
- millions of years ago
- pressure
- fossil fuels burned to produce heat
- (heat turns) **water** into steam
- steam drives a turbine
- turbine drives generator to make electricity
- generator operation to make electricity

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to explain fully how fossil fuels are used to provide heat, transport and electricity (using <b>at least 7</b> of the above points). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to partially explain how fossil fuels are used to provide heat, transport and electricity (using <b>4 to 6</b> of the above points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates explain how fossil fuels are used to provide heat, transport and electricity (using <b>1 to 3</b> of the above points). However these are not in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

## (b) Fuse [1]

stops too much current flowing [1]

melts/breaks the wire [1]

[3]

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AVAILABLE  
MARKS

			AVAILABLE MARKS	
5	(a)	(i) As speed increases, time decreases [1] and so does efficiency [1]	[2]	12
		(ii) Any <b>three</b> from: average speed is over the whole lap [1] instantaneous would be at 1 point in lap [1] instantaneous will change around the lap [1] (instantaneous will be) slower in the corners [1]	[3]	
		(iii) Not enough fuel [1] will be 20 miles short/105 millilitres/0.5 gallons short [1]	[2]	
	(b)	(i) Subs given number in equation [1] subs converted number in equation [1] correct answer in units [1]	[3]	
		(ii) Useful: kinetic + heat [1] Waste: sound [1]	[2]	
6	(a)	(i) Cell	[1]	10
		(ii) Relay/passing on [1] signals to next <b>closest</b> mast [1]	[2]	
	(b)	Highest frequency [1] more energy [1] more cancer/time/further waves travel [1]	[3]	
		(c) (i) Radio/infrared/visible light [1] TV + radio signals/optic fibres use must relate to wave given [1]	[2]	
		(ii) Any <b>two</b> from: • all travel at same speed/speed of light • can travel through a vacuum • carry energy • are transverse	[2]	
	7	(a)	(i) As speed increases both thinking + braking distance increase [1] speed has a greater effect on braking distance [1]	
(ii) 17 + 48 [1] 65 [1]			[2]	
(b) Alcohol slows down the brain/reactions [1] increases thinking distance [1] has no effect on braking distance [1]		[3]		
			7	

## 8 (a) Indicative content

- car + timer 1 km apart
- driver sounds horn and flashes lights at same time
- start stopwatch when lights seen
- stop stopwatch when sound heard
- speed = distance/time
- change positions of car + timer
- to eliminate the effect of the wind
- repeat and average results

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe how to use the flash-bang method to measure the speed of sound (using <b>at least 7</b> of the above points). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to partially describe how to use the flash-bang method to measure the speed of sound (using <b>4 to 6</b> of the above points). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe how to use the flash-bang method to measure the speed of sound (using <b>1 to 3</b> of the above points). However these are not in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

- (b) (i) Sound with a frequency [1]  
greater than 20 kHz/too high for human hearing [1] [2]
- (ii) As distance to obstacle decreases, the number of bleeps per second increases and these bleeps get louder/volume increases [1]
- (iii) Scanning/fish finding/submarines/ocean depth [1]

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AVAILABLE  
MARKS

9	(a) (i) Forces are unbalanced [1] accelerating (to the right) [1]	[2]	<b>AVAILABLE MARKS</b>
	(ii) Resultant = 0 N [1] stopped [1] steady speed up/down [1]	[3]	
	(b) Longer time for crash [1] seatbelts/airbags/crumple zone [1]	[2]	
			7
	<b>Total</b>		<b>75</b>