



Rewarding Learning

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

Science: Single Award

Unit 3 (Physics)

Higher Tier

[GSS32]

FRIDAY 11 NOVEMBER 2016, AFTERNOON

**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) (i) A sound with a frequency [1] above 20 kHz [1]	[2]	7
	(ii) Dolphin	[1]	
	(iii) Porpoise	[1]	
	(b) 1500 × 0.04 [1] 1500 × 0.02 [1] 30 m [1]	[3]	
2	(a) Alpha and gamma [1]		10
	Any two from:		
	• paper reduces the count so alpha radiation is present		
	• aluminium has no effect on the count so beta radiation is absent		
	• lead reduces the count so gamma radiation is present [2]	[3]	
(b) (i) The time it takes [1] for the radioactivity to fall by half [1]	[2]		
(ii) Iodine-131 [1] It produces gamma rays [1] shortest half-life [1]	[3]		
(iii) The combination of protons and neutrons [1] is unstable [1]	[2]		

3 (a) Indicative content

- water flows to turn the turbine
- coil of wire and magnet (in generator)
- relative movement
- water is a renewable resource/coal is non-renewable
- it produces no carbon dioxide/air pollution
- saves fossil fuels/fossil fuels last longer/cheaper to run
- expensive to build
- floods habitats/uses land where people live

**AVAILABLE
MARKS**

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully, in a logical sequence, how the hydroelectric power station works (using at least six 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, in a logical sequence, how the hydroelectric power station works (using four or five 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 the hydroelectric power station works (using one to three 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) Graph has a lower maximum [1]

Starts later than 5 am and finishes before 9 pm [1]

[2]

8

4 (a) How good the bulb is at transferring the total energy [1]
into useful energy [1]

[2]

(b) CFL bulb [1]

it only costs £7.40 to use [1]

[2]

4

- 5 (a) (i) 0.25 m [1]
0.6 m [1] [2]
- (ii) Frequency decreases [1]
- (b) (i) Any **three** from:
- Place car and pupil a large (known) distance apart [1]
 - car flashes lights and beeps horn **at the same time** [1]
 - pupil starts the watch when he sees the lights, pupil stops the clock when he hears the horn. [1]
 - use formula speed = distance ÷ time [3]
- (ii) 330 m/s [1]
- (iii) The wind [1]

AVAILABLE
MARKS

8

6 **Indicative content:**

- travels 15 000 m in 10 minutes
- at a steady speed
- stops once for 40 minutes
- then moves 15 000 m in 10 minutes
- the bus makes two stops/only stops for 10 mins
- both travel 30 000 m (in 60 minutes)
- at the same average speed
- any other valid comparison

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully, in a logical sequence, the motion of the bus and car (using at least six 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, in a logical sequence, the motion of the bus and car (using four or five 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 the motion of the bus and car (using one to three 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]

6

			AVAILABLE MARKS	
7	(a)	Any two from: <ul style="list-style-type: none"> • bulb gets dimmer/cooler • voltage decreases • current decreases • resistance increases 	[2]	8
	(b)	Dimmer switch/volume control	[1]	
	(c)	All points correctly plotted [2] 4 points correctly plotted [1] line of best fit [1]	[3]	
	(d)	Transformer increases the voltage/step-up transformer decreases current [1] less energy losses [1]	[2]	
8	(a)	They increase the time taken to stop [1] this reduces the force on the driver [1]	[2]	7
	(b) (i)	1300 × 13 [1] 16 900 [1]	[2]	
	(ii)	kgm/s / Ns	[1]	
	(iii)	0 kgm/s [1] its velocity is zero/stationary/stopped [1]	[2]	
9	(a) (i)	Friction is overcome by gravity [1] unbalanced force [1] trolley accelerates [1]	[3]	9
	(ii)	0.4 ÷ 2 [1] 0.2 [1]	[2]	
	(iii)	The speed would increase.	[1]	
	(b)	B	[1]	
	(c)	Car travel within speed limit over a greater distance/time [1] reduces chance of a serious accident over a greater distance [1]	[2]	

- 10 (a) (i) The greater the height, the longer it takes to orbit [1]
- (ii) There is no correlation between the masses of the satellites and their orbit times [1]

- (b) Hydrogen [1]
by nuclear fusion [1] [2]

(c)

Element	Wavelength/nm	Element present
Helium	447, 502	
Sodium	590	✓
Hydrogen	410, 434, 486, 656	✓
Iron	431, 467, 496	

- (d) It is moving faster [1]
it is further away [1] [2]

Total

**AVAILABLE
MARKS**

8

75