



**General Certificate of Secondary Education
2017–2018**

Science: Single Award

Unit 3 (Physics)

Higher Tier

[GSS32]

FRIDAY 9 NOVEMBER 2018, MORNING

**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	<p>(a) From 6 am to 1 pm output increases [1] output stays the same from 1 pm to 5 pm [1]</p> <p>(b) Any two from:</p> <ul style="list-style-type: none"> • less output overall [1] • output would start to increase after 7 am [1] • output would decrease earlier [1] <p>(c) Light from moon/stars/street lights</p> <p>(d) (i) Will not run out</p> <p style="padding-left: 20px;">(ii) Wind/geothermal/biomass/wave/tidal/hydroelectric</p>	<p>[2]</p> <p>[2]</p> <p>[1]</p> <p>[1]</p> <p>[1]</p>	7
2	<p>(a) As speed increases thinking and braking distance increase [1] speed has a bigger effect on braking distance [1]</p> <p>(b) (i) 65 m</p> <p style="padding-left: 20px;">(ii) As speed increases stopping distance increases</p> <p>(c) (i) Friction is a force [1] that acts in the opposite direction to movement [1]</p> <p style="padding-left: 20px;">(ii) Rain reduces friction [1] increasing braking distance [1]</p>	<p>[2]</p> <p>[1]</p> <p>[1]</p> <p>[2]</p> <p>[2]</p>	8

3 (a) Indicative content

- number of vibrations per second
- no effect on lower frequency
- lowest frequency heard is 20 Hz
- highest frequency heard is 20 kHz
- as we get older highest frequency that can be heard decreases/audible range decreases with age
- after 40 there is a bigger decrease
- loud sounds also cause hearing loss

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe sound waves, human hearing, how it is damaged and protected (using at least 6 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 sound waves, human hearing, how it is damaged and protected (using 4 to 5 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 sound waves, human hearing, how it is damaged and protected (using 1 to 3 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) A sound with a frequency greater than 20 kHz. [1]

(ii) 1500 × 4 [1]
 6000/2 or 4/2 [2]
 3000 m [3] [3]

(iii) Signal will come back quicker [1]

AVAILABLE
MARKS

11

			AVAILABLE MARKS			
4	(a)	(i) Neutral	[1]	8		
		(ii) Green and yellow	[1]			
	(b)	(i) 800/230 [1] 3.48/3.5	[2]			
		(ii) Fuse size = 5 A	[1]			
	(c)	(i) Earth wire	[1]			
		(ii) No live/metal parts exposed to user completely cased in insulator/plastic	[2]			
5	(a)	(i) Refraction is bending of light	[1]	5		
		(ii) Lens and cornea both refract light [1] cornea refracts more than lens [1]	[2]			
	(b)	(i) Lens is too strong	[1]			
		(ii) Concave lens	[1]			
	6	(a)	Plot all points correctly [2]		[3]	11
			6 points plotted correctly [1]			
line of best fit [1]						
(b)		Any faster than 4500 rpm doesn't produce any more output	[1]			
(c)		More turns on coil/stronger magnet	[1]			
(d)		Remains of plants and animals [1] over millions of years [1] under high temperature and pressure [1]	[3]			
		(e)	(i) Extender – alcohol [1] substitute – hydrogen/biodiesel [1]	[2]		
(ii) Less reliance on fossil fuels	[1]					

			AVAILABLE MARKS
7	(a) U [1]		
	Any two from:		
	• beta radiation is necessary to go through thin aluminium		
	• gamma radiation would go through easily		
	• alpha would not penetrate aluminium		
	• long half-life so doesn't need replaced often [2]	[3]	
	(b) Nucleus is unstable/will disintegrate [1] it has too many protons or neutrons [1]	[2]	
	(c) (i) 14 cpm	[1]	
	(ii) 2 days	[1]	
	(iii) 4 days = 2 × half-life [1] 80 × 2 × 2 = 320 cpm [2]	[2]	9
8	(a) Forces are unbalanced [1] A > B + C [1] resultant force [1]	[3]	
	(b) Friction	[1]	
	(c) (i) 3 × 75 [1] 225 [2]	[2]	
	(ii) kgm/s	[1]	7

9 (a) Indicative content

- A = big bang theory
- B = steady state theory
- steady state always the same size
- big bang started with a singularity
- explosion/inflation
- 14 billion years ago \pm 0.2
- Universe continues to expand

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to compare the steady state and big bang theories (using at least 6 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 compare the steady state and big bang theories (using 4 to 5 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 compare the steady state and big bang theories (using 1 to 3 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) Red shift [1]

(ii) Galaxy C is further away [1]
Galaxy C is moving faster than B [1] [2]

9

Total

75

**AVAILABLE
MARKS**