Rewarding Learning

General Certificate of Secondary Education
2015–2016

Science: Single Award

Unit 3 (Physics)

Higher Tier

[GSS32]

FRIDAY 26 FEBRUARY 2016, 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	(a)	Dead plants and animals [1] compressed/high temperature [1] over millions of years [1]	[3]	
	(b) (i)	A – boiler [1] B – turbine [1]	[2]	
	(ii)	Magnet and coil [1] implied movement of magnet/coil [1]	[2]	
	(c) (i)	Answer between 20–22%	[1]	
	(ii)	To reduce the use of fossil fuels/reduce global warming	[1]	
	(d)	Heating oil [1] cheapest per kWh [1]	[2]	11
2	(a)	The time [1] it takes the radioactivity to fall by half [1]	[2]	
	(b)	260	[1]	
	(c) (i)	$^1/_4$	[1]	
	(ii)	radium-224 – (passes through air and) stopped by paper [1] radium-226 – passes through aluminium and stopped by lead [1] radium-228 – (passes through paper and) stopped by aluminium [1]	[3]	7

AVAILABLE MARKS

3 Indicative content

- ammeter measures current
- voltmeter measures voltage
- voltmeter wired in parallel
- ammeter wired in series
- keep type of wire the same/width
- change the length
- use formula V=IR
- the longer the wire the higher the resistance

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully, in a logical sequence, how to measure the resistance of different lengths of resistance wire (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 to measure the resistance of different lengths of resistance wire (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 to measure the resistance of different lengths of resistance wire (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

4 (a) A – cornea [1]
B – retina [1] [2]

(b) C [1]

3

			AVAILABLE MARKS
5	**(a)**	Amplitude doubles [1] ± 1 square tolerance wavelength stays the same [1] [2]	
	(b)	A sound wave which has a frequency [1] greater than 20 000 Hz [1] [2]	
	(c)	0.01/2 [1] 0.005 × 330 [1] 1.65 m [3] [3]	
	(d)	Glass fibre tiles [1] reduce echoes [1] they reduce the reflection most at all frequencies [1] [3]	10
6	**(a)**	Friction is overcome by gravity [1] unbalanced force/resultant force of 0.001 [1] marble accelerates/increase (velocity, speed) [1] [3]	
	(b)	0 N [1] steady speed [1] [2]	
	(c)	$0.009/1.5/9 \times 10^{-3}/1.5$ [1] $0.006/6 \times 10^{-3}$ [2] [2]	
	(d)	Average speed is measured over a given distance [1] instantaneous speed is measured at a specific point [1] [2]	9
7	**(a)**	**(i)** all points plotted correctly [2] 3 points plotted correctly [1] line [1] [3]	
		(ii) Correct value from candidate's graph (36 to 39 km [$\times 10^3$]) [1]	
	(b)	**(i)** As the distance from Earth increases the speed away from Earth increases [1]	
		(ii) Galaxy E has a greater red-shift [1]	
	(c)	Singularity/single point [1] large expansion/explosion [1] gravity pulled matter together [1] [3]	
	(d)	Steady State [1]	10

	AVAILABLE MARKS

8 **(a)** Microwaves penetrate the food [1]
microwaves cause water molecules to oscillate/vibrate [1]
faster vibration causes increase in temperature [1] [3]

(b) 2.44×10^9 Hz (it has the highest frequency) [1]
the higher the frequency the more energy [1] [2]

(c) **Indicative content:**
- find power rating on the label/power is 1200 W
- convert power into kW
- find out how long the appliance is used for
- convert time into hours
- multiply power by time/to find the number of units used
- need to find cost per unit.

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully, in a logical sequence, how to calculate the electrical cost of using the appliance (using at least **five** 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 to calculate the electrical cost of using the appliance (using **three or four** 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 calculate the electrical cost of using the appliance (using **one or two** 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] 11

9 **(a)**

Circuit	V_1/V	V_2/V	A_1/A	A_2/A
A				2 [1]
B		3 [1]		1 [1]

[3]

(b) Electrons are negative [1]
actual flow is a flow of electrons [1]
from the negative to positive terminal/conventional from positive to negative [1] [3]

(c) To increase the voltage + decrease current [1]
reduce energy loss [1] [2] 8

Total **75**