Rewarding Learning

General Certificate of Secondary Education
2015–2016

Science: Single Award

Unit 3 (Physics)

Higher Tier

[GSS32]

FRIDAY 13 NOVEMBER 2015, 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)	Neutrons [1] protons [1]	[2]	
	(b) (i)	300 cpm	[1]	
	(ii)	80 cpm	[1]	
	(c) (i)	Gamma	[1]	
	(ii)	Stop radiation escaping [1] prevent cancer/tumour [1]	[2]	
	(iii)	Kills bacteria [1] keeps food fresh longer/prevents fruit rotting/longer sell-by date [1] more profit/less waste [1]	[3]	10
2	(a) (i)	Any **two** from: • same driver • same speed • same road (conditions) • same car • same fuel type	[2]	
	(ii)	More mpg = more efficiency	[1]	
	(iii)	Lighter cars	[1]	
	(b)	Remains of plants/animals [1] compressed/pressure [1] millions of years [1]	[3]	7

AVAILABLE MARKS

3 (a) Indicative content

- Bulbs connected in branches in parallel
- Bulbs connected side by side in series
- If one bulb goes out, the rest stay lit in parallel/all go out in series/ easier to find broken bulb in parallel
- Bulbs are brighter in a parallel circuit
- More bulbs connected, same brightness in parallel/dimmer in series
- Same current all around a series circuit/every bulb gets a constant voltage in a series circuit
- Current is split among the branches in parallel/voltage is shared in a parallel circuit
- More wiring/more expensive

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe fully the differences between parallel and series circuits (using **6 or more** of the above points) to explain why a parallel circuit should be chosen in a logical sequence. 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 the differences between parallel and series circuits (using **3 to 5** of the above points) to explain why a parallel circuit should be chosen in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe the differences between parallel and series circuits (using **1 or 2** of the above points) to explain why a parallel circuit should be chosen. 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) 722 units [1]
10830/£108.30 [2] [2]

8

					AVAILABLE MARKS
4	(a)	(i)	D is dearer than C but has a higher SAR rating [1] higher SAR = more radiation = more danger [1]	[2]	
		(ii)	Tumour/cancer	[1]	
		(iii)	Any **two** from: • increase distance between phone + body/implied • reduce time of phone calls • text rather than talk	[2]	
	(b)		Any **three** from: • messages sent using microwaves • message sent to nearest mast • mast to mast relay/masts act as repeaters • area around a mast is called a cell	[3]	8
5	(a)		Correct reference to frequency [1] over 20 kHz/humans don't hear as high as dogs/dogs hear higher [1]	[2]	
	(b)	(i)	Distance from car to person [1] time between lights and sound [1]	[2]	
		(ii)	Different wind speed/weather	[1]	
	(c)	(i)	As depth decreases, wavelength decreases/amplitude increases/ speed decreases	[1]	
		(ii)	Height [1] from midpoint [1]	[2]	
		(iii)	$284/23 \times 10^3$ [1] 0.012 [2]	[2]	10
6	(a)	(i)	5–5.5 $\times$ 10^8 km from Sun	[1]	
		(ii)	Any figure between –170 and –190 (–180)	[1]	
		(iii)	Time taken for a planet to go round the Sun	[1]	
		(iv)	Any figure between 0.5 and 0.8 (0.62)	[1]	
	(b)	(i)	Distance from Sun changes during an orbit/not circular orbits	[1]	
		(ii)	Heliocentric	[1]	
		(iii)	Earth was in centre (of geocentric) [1] fewer planets (in geocentric) [1]	[2]	8

AVAILABLE MARKS

7 **(a)** Any 2 correct values [1]
7 [2] [2]

(b) Straight line through (0,0) [1]
completely below current line [1] [2]

(c) **(i)** Momentum will be transferred from A to B [1]
producing a force [1]
gives B velocity [1] [3]

(ii) They absorb energy [1]

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8 **(a)** **Indicative content**

- chemical energy is changed into heat energy
- this occurs in the burner
- heat energy is used to turn water into steam
- this occurs in the boiler
- heat energy changed into kinetic energy (in steam)
- kinetic energy of steam drives the turbine
- kinetic energy is changed into electrical energy
- this occurs in the generator
- generator consists of a magnet and coil of wire

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to explain fully, in a logical sequence, how electricity is made inside this power station (using **7 or more** 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, in a logical sequence, how electricity is made inside this power station (using between **4 and 6** 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 electricity is made inside this power station (using up 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) Step up transformer [1]
increases voltage/decreases current [1]
saves energy/less heat loss in wires [1] [3]

9

				AVAILABLE MARKS
9	**(a)**	B = decrease/decelerate C = none/constant speed D = increase/accelerate 1 or 2 correct [1] All 3 correct [2]	[2]	
	(b)	Hybrid consists of a diesel/petrol engine + battery/electrical [1] regenerative system recharges the battery [1] buses braking converts kinetic energy into electricity [1]	[3]	
	(c)	Two surfaces rub together [1] increased friction [1]	[2]	7
			Total	**75**