



*Rewarding Learning*

General Certificate of Secondary Education  
2014–2015

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**Science: Single Award**

Unit 3 (Physics)

Higher Tier

[GSS32]

WEDNESDAY 20 MAY 2015, AFTERNOON

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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.

- 1 (a) (i) Any **one** from:
- same thickness/type of aluminium sheet
  - beta source same distance from aluminium sheets each time
  - counter same distance from aluminium sheets each time
  - same beta source each time/same amount of beta

[1]

- (ii) Any **two** from:
- the thicker the aluminium the less radiation passes through
  - greater decrease in radiation count at lower thicknesses
  - above 10 (9 or 10) sheets the count is constant/remains at 100 cpm

[2]

(iii) Background radiation is present

[1]

(b) Horizontal line starting at 4000

[1]

(c)

Position	Types of Radiation
A	alpha, beta, gamma [1]
B	beta, gamma [1]
C	none [1]

[3]

8

- 2 (a) (i) Average speed cameras allow drivers to slow down/there are more instantaneous cameras

[1]

- (ii) Number of people speeding increases with age/number of people speeding decreased [1]  
up to aged 40–54/5639 and then decreases [1]

[2]

(b) 03:00–05:59 [1]

there are fewer cars on the road/fewer people on road [1]

[2]

5

- 3 (a) Refraction at lens [1]  
rays meet at retina [1]

[2]

- (b) lens too weak/eyeball too short/lens too thin [1]  
rays brought to focus behind the retina [1]  
close objects **blurry**/not clear/can't read close up/distant objects clear [1] [3]

- (c) The older you get the greater the minimum distance your eyes can focus [1]

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**4 Indicative content**

- friction is a force
- which opposes motion/stops movement/holds things back/slows down
- change height/angle of slope
- until block moves
- change the type of surface
- the greater the height the greater the friction
- use the same mass/weight of block/same block (must relate)
- repeat the experiment 3 times/average the results for height (reliability/ validity to correct response)

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe and explain fully (using <b>seven to eight</b> of the above points) how friction can be measured. They use good spelling, punctuation and grammar and form and style are of a high standard.	[5–6]
B	Candidates use some appropriate specialist terms to describe and explain how friction can be measured (using <b>four to six</b> of the above points) 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/explain how friction can be measured using <b>one to three</b> of the above points. 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]

- 5 (a)** Will not run out [1]
- (b)** A magnet and coil [1]  
relative movement/spins/turns [1] [2]
- (c)** Area behind the dam is flooded [1]  
this will destroy habitats [1]  
unsightly = neutral [2]

AVAILABLE  
MARKS

6

5

		AVAILABLE MARKS
6	(a) Any <b>two</b> from: <ul style="list-style-type: none"> <li>• case/outside made of plastic/no exposed metal parts</li> <li>• all metal parts cased in plastic/insulator</li> <li>• user cannot contact live part</li> </ul>	[2]
	(b) Too much <b>current</b> could flow through the appliance [1] causing damage to the appliance/user [1]	[2]
	(c) 0.06 kW/0.75 h [1] <b>either conversion</b> 0.06 kW $\times$ 0.75 h [2] 0.045 kWh [3]	[3]
7	(a) The longer the wire, the higher the resistance [1] the higher the resistance, the lower the current [1]	[2]
	(b) (i) All points drawn correctly [1] smooth curve [1]	[2]
	(ii) 1.4–1.6 A	[1]
	(c) 1.5/4.5 [1] $0.33/\frac{1}{3}$ [2]	[2]
	(d) Resistance stays the same	[1]
8	(a) (i) Cosmic radiation/intensity rises up to a maximum at a wavelength of $2 \times 10^{-3}$ m [1] then decreases (still need reference to intensity/wavelength) [1]	[2]
	(ii) $3 \times 10^8/2 \times 10^{-3}$ [1] $1.5 \times 10^{11}$ [2]	[2]
	(b) <b>Universe</b> /everything started as a single point (singularity) [1] Universe was created from a large explosion/expansion [1] (after millions of years) gravity <b>pulled this matter</b> together to (eventually form stars and galaxies) [1]	[3]
	(c) Galaxy <b>B</b> is further away [1] galaxy <b>B</b> is moving faster [1]	[2]
	(d) Heliocentric model	[1]
		7
		8
		10

- 9 (a) (i) As mass increases the acceleration decreases/converse [1]
- (ii) Same force used each time/1 N [1]
- (b) (i) 0.95 N [1]
- (ii) Accelerating/speeding up [1]  
Unbalanced force [1] [2]
- (c) Instantaneous speed is the speed of a car at any **instant**/moment in time [1]  
the average speed of a car is the speed over a **given distance**/time [1] [2]

AVAILABLE  
MARKS

7

10 (a) **Indicative content**

- transformer A is a step-up transformer – after power station
- increases voltage
- decreases current
- (smaller current) in wire produces less heat/less waste/less energy
- (smaller current) means transmission lines with a smaller diameter can be used
- thinner wires are cheaper
- step-down transformer (either named transformer [1] mark only) – before houses
- decrease voltage

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe and explain fully (using <b>seven or eight</b> of the above points) how transformers work. They use good spelling, punctuation and grammar and form and style are of a high standard.	[5–6]
B	Candidates use some appropriate specialist terms to describe and explain how these transformers work (using <b>four to six</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/explain using <b>one to three</b> of the above points how transformers work. 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) Underground cables produce the **highest** magnetic field at **close distances** [1]  
overhead cables produce **higher magnetic** fields than **underground** cables as the distance **increases** [1] [2]

8

- 11 (a) Fossil fuels are running out/methanol renewable [1]  
these will reduce the reliance on fossil fuels [1]
- (b) Extenders are **added** to (fossil) fuels [1]  
substitutes are used **instead**/in place of fossil fuels [1]
- (c) A car which uses **electricity** and **petrol/diesel**

	AVAILABLE MARKS
[2]	
[2]	
[1]	5
<b>Total</b>	<b>75</b>