AQA GCSE Physics | 8463

SPECIFICATION POINT 4.5.6.1.3

Velocity

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**4**
Available paper years	**2005–2015**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.5.6.1.3 Velocity

Answer 01 · Mark scheme

June 2005 | 3451 | Original Q15 | Legacy

The full source mark scheme begins on page 8. Follow original question 15 in that document.

4.5.6.1.3 Velocity

Answer 02 · Mark scheme

Question 8

question	answers	extra information	mark
8(a)(i)	4.5	allow **1** mark for correct substitution i.e. 9 ÷ 2	2
8(a)(ii)	m/s^2	accept answer given in (a)(i) if not contradicted here	1
8(a)(iii)	speed		1
8(a)(iv)	straight line from the origin passing through (2s, 9 m/s)	allow **1** mark for straight line from the origin passing through to t = 2 seconds allow **1** mark for an attempt to draw a straight line from the origin passing through (2,9) allow **1** mark for a minimum of 3 points plotted with no line provided if joined up would give correct answer. Points must include(0,0) and (2,9)	2
8(b)(i)	**B** smallest (impact) force on all/ every/ any surfaces	if **A** or **C** given scores **0** marks in total these marks are awarded for comparative answers	1 1 1

Question 8 continues on the next page

4.5.6.1.3 Velocity

PHY2F

Question 8 continued

8(b)(ii)	(conditions) can be repeated **or** difficult to measure forces with human athletes	accept answers in terms of variations in human athletes e.g. athletes may have different weights area / size of feet may be different difficult to measure forces athletes run at different speeds accept any answer that states or implies that with humans the conditions needed to repeat tests may not be constant e.g. athletes unable to maintain constant speed during tests (or during repeat tests) do **not** accept the robots are more accurate removes human error is insufficient fair test is insufficient	1
Total			**10**

4.5.6.1.3 Velocity

Answer 03 · Mark scheme

8(a)(i)	friction		1	AO1 2.1.3a

8(a)(ii)	air resistance	accept drag friction is insufficient	1	AO1 2.1.3a

8(a)(iii)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best-fit' approach to the marking.		**Mark** **6**	**AO spec ref**
0 marks	**Level 1 (1–2 marks)**	**Level 2 (3–4 marks)**	**Level 3 (5–6 marks)**	AO2 AO3 2.1.4c
No relevant content.	There is an attempt to explain in terms of forces A and B why the velocity of the cyclist changes between any two points **or** a description of how the velocity changes between any two points.	There is an explanation in terms of forces A and B of how the velocity changes between X and Y and between Y and Z **or** a complete description of how the velocity changes from X to Z. **or** an explanation and description of velocity change for either X to Y or Y to Z	There is a clear explanation in terms of forces A and B of how the velocity changes between X and Z **and** a description of the change in velocity between X and Z.	

4.5.6.1.3 Velocity

Answer 03 · Mark scheme

examples of the points made in the response	extra information
X to Y • at X force A is greater than force B • cyclist accelerates • and velocity increases • as cyclist moves toward Y, force B (air resistance) increases (with increasing velocity) • resultant force decreases • cyclist continues to accelerate but at a smaller value • so velocity continues to increase but at a lower rate **Y to Z** • from Y to Z force B (air resistance) increases • acceleration decreases • force B becomes equal to force A • resultant force is now zero • acceleration becomes zero • velocity increases until… • cyclist travels at constant / terminal velocity	accept speed for velocity throughout

Question	Answers	Extra information	Mark	AO spec ref
8(b)(i)	3360	allow **1** mark for correct substitution, ie 140 × 24 provided no subsequent step accept 3400 for **2** marks if correct substitution is shown	2	AO1 AO2 2.2.1b
	joule / J	do **not** accept j do **not** accept Nm	1	
8(b)(ii)	decreases	accept an alternative word / description for decrease do not accept slows down	1	AO1 2.1.3e
	temperature	accept thermal energy accept heat	1	
Total			**13**	

4.5.6.1.3 Velocity

Answer 04 · Mark scheme

June 2015 | PH2FP | Original Q5 | Legacy

The full source mark scheme begins on page 26. Follow original question 5 in that document.

Version 1.0: *27092005*

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Physics 3451/F
Specification B

Mark Scheme

2005 examination – June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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Physics (Specification B)
Foundation Tier 3451/F

3451/F Q1

question	answers	extra information	mark
(a)(i)	less than	accept any correct indication	1
(ii)	more than	accept any correct indication	1
(b)	any **two** from: stays above the same place above the equator one orbit takes 24 hours	 do **not** accept stays in the same place do **not** accept goes around equator unless qualified do **not** accept orbit at same speed as Earth do **not** accept orbit at a constant speed accept has same angular speed / velocity as Earth	2
total			4

3451/F Q2

question	answers	extra information	mark
(a)	comet		1
(b)	large group / number / collection of stars	ignore reference to planets accept millions of stars do **not** accept thousands of stars do **not** accept loads of stars	1
(c)	giant supernova neutron		1 1 1
total			5

4.5.6.1.3 Velocity

3451/F Q3

question	answers	extra information	mark
(a)(i)	radio		1
(ii)	gamma	accept microwave accept infrared	1
(iii)	ultra violet		1
(iv)	microwaves		1
(b)	the same as		1
(c)	X-rays do not go through lead	references to gamma rays are incorrect accept lead protects them from the X-rays accept not exposed to X-rays	1
	lead stops / reduces risk of X-rays harming / damaging / killing (persons) <u>cells</u>	accept X-rays (may) cause cancer accept organs for cell do **not** accept references to electric shock do **not** accept stops bones of people showing on X-ray answers involving the horse wearing an apron are incorrect	1
	Quality of written communication	award for a sensible sequence of **two** points	1
total			8

4.5.6.1.3 Velocity

3451/F Q4

question	answers	extra information	mark
(a)	light electrical		1 1
(b)	15% **or** 0.15	correct substitution gains **1** mark only an answer of 15 with no unit **or** an incorrect unit gains **1** mark an answer of 0.15 given with a unit gains **1** mark	2
(c)	the ticket machine is a long way from other electricity supplies		1
(d)	any figure between 5 and 10 inclusive	unit not required but if given must match numerical answer	1
total			6

3451/F Q5

question	answers	extra information	mark
(a)(i)	radon (gas)	do **not** accept gas	1
(ii)	background		1
(b)	bigger	accept any word which means bigger	1
(c)	**Z** alpha will not pass through aluminium or lead	if Z is not given, the reason does not score accept alpha cannot go through metals / dense material accept there is nothing to stop the radiation accept alpha will not pass through aluminium do **not** accept alpha will not pass through lead do **not** accept alpha stopped by air	1 1
total			5

4.5.6.1.3 Velocity

3451/F Q6

question	answers	extra information	mark
(a)	loses negative charge / electrons	do **not** accept positive charge transfers to the comb do **not** accept friction	1
(b)	**A** attract		1
	B repel		1
	C attract		1
(c)	**F A D E**	allow **2** marks for 2 letters in the correct place allow **1** mark for 1 letter in the correct place	3
total			7

4.5.6.1.3 Velocity

Physics B – AQA GCSE Mark Scheme, 2005 June series

3451/F Q7

question	answers	extra information	mark
(a)	all points correctly plotted	tolerance ± $\frac{1}{2}$ square on y axis only allow **1** mark for 3 correctly plotted points	2
	attempt made to draw a smooth curve	do **not** accept dot-to-dot line	1
(b)(i)	3 days ± 0.2 **or** any value correctly obtained using their graph line	if no line drawn in (a), answer must be exactly 3	1
(ii)	3 days or their (b)(i)		1
(c)	radon-222	accept radon **or** 222 accept alpha or 3.8 correct isotope required for reason to score	1
	has the shortest half-life	accept the others have longer half-lives	1
total			7

4.5.6.1.3 Velocity

3451/F Q8

question	answers	extra information	mark
(a)	fossils of Cynognathus are found in Africa and South America		1
	the shapes ……. almost fit together	only two boxes should be ticked deduct **1** mark for each additional box to a minimum mark of **0**	1
(b)	continental		1
	crust		1
	tectonic		1
total			5

4.5.6.1.3 Velocity

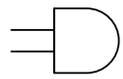
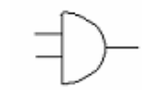
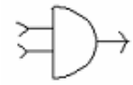
3451/F Q9

question	answers	extra information	mark
(a)	capacitor LDR relay (normally open)	accept condenser **or** light dependent resistor accept 'ldr', 'Ldr' etc. do **not** accept 'relay normally closed'	1 1 1
(b)(i)	battery	accept '(battery of) cells' do **not** accept 'battery / cell'	1
(ii)	LED	**or** light emitting diode accept 'led' or 'Led' do **not** accept just 'diode'	1
(iii)	B will light (but C will not)	accept '(only) B will work' accept 'one is on the other is off' do **not** accept 'C is on and B is off'	1
(iv)	any **one** from: B is connected the right way round (and C is not) a (light emitting) diode only allows (a significant) current to flow in one direction B's anode is connected to the positive side of the supply B's cathode is connected to the negative terminal	N.B. the candidate's answer to part (b)(iii) may include this mark but do **not** credit if the response to part (b)(iii) is incorrect or there is any other contradiction if (iv) is completely consistent with (iii) which is wrong, allow **1** mark	1
(c)(i)	first input / second input / output 0 / 0 / **0** 1 / 0 / **0** 0 / 1 / **0** 1 / 1 / **1**	**all** correct allow: OFF NO OFF NO OFF NO ON YES	1
(ii)	truth (table)		1

cont…

4.5.6.1.3 Velocity

3451/F Q9 cont…

(iii)		a Roman upper case D in any orientation without contacts is acceptable but if contacts are shown do **not** give the mark if there is any ambiguity or contradiction allow  	1
(d)	light sensor	**or** light dependent resistor **or** LDR accept 'ldr', Ldr' etc allow solar cell, photo cell	1
	NOT gate	accept 'Not gate' **or** 'not gate' if both correct but in the wrong order credit with **1** mark	1
total			12

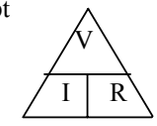
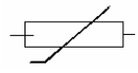
4.5.6.1.3 Velocity

3451/F Q10

question	answers	extra information	mark
(a)(i)	rays continued to meet on the right hand side of the lens and beyond	must be straight lines from the right hand side of the lens ignore details through the lens allow if no arrows	1
	meet exactly on the axis	negate mark if contradictory arrow(s) added do not need to go beyond the focus for this mark	1
(ii)	(principal) focus	**or** focal (point)	1
(iii)	converging	**or** convex	1
(b)(i)	**A**		1
(ii)	rays seem to come from this point	**or** words to this effect **or** shows this on the diagram	1
(iii)	diverging	**or** concave	1
(c)	film	accept any unambiguous method of showing the correct response	1
	smaller than		1
	further away from		1
(d)	any **three** from: • real image can be put on a screen • virtual image cannot be put on a screen / film • virtual image is imaginary • real image is formed where (real) rays cross / converge • virtual image is where virtual / imaginary rays (seem to) come from • virtual image formed where virtual rays intersect / cross	allow film allow real image has light travelling through it **or** virtual image is where rays seem to come from	3
total			13

4.5.6.1.3 Velocity

3451/F Q11

question	answers	extra information	mark
(a)(i)	$A_1 = 0.5$	ignore any units	1
	$A_4 = 0.5$	allow **1** mark for $A_1 = A_4 \neq 0.5$	1
(ii)	the resistance of **P** is more than 20 Ω		1
	a smaller current goes through P / A_2 (than 20 Ω)	dependent on getting 1st mark correct accept converse	1
(b)(i)	potential difference = current × resistance	accept pd / voltage for potential difference accept V = I × R, correct symbols and correct case only accept volts = amps × ohms accept  provided subsequent method is correct allow combination of physical quantities and named units allow voltage = I × R	1
(ii)	6	allow **1** mark for correct substitution	2
(iii)	6	accept their (b)(ii)	1
(c)	thermistor or 	accept correct circuit symbol allow phonetic spelling	1
	resistance goes down (as temperature of thermistor goes up)	do **not** accept changes for goes down do **not** accept an answer in terms of current only answers in terms of other components are incorrect	1
total			10

4.5.6.1.3 Velocity

3451/F Q12

question	answers	extra information	mark
(a)(i)	larger the distance, greater the time	accept 'they are proportional' accept converse	1
(ii)	any value between 6 and 9 years inclusive		1
(b)(i)	carbon dioxide		1
(ii)	(Venus) has high**er** temperature (than Mercury)	accept has the high**est** temperature accept Venus is hotter / hottest do **not** accept has a high / very high temperature	1
	(Venus) further from the Sun than Mercury	accept 'Venus is not the closest planet to the Sun' answer in terms of greenhouse effect only, scores **0** marks	1
total			5

4.5.6.1.3 Velocity

3451/F Q13

question	answers	extra information	mark
(a)(i)	20		1
(ii)	convection		1
(iii)	fit draughtproof strips	accept lay carpet accept fit curtains accept close doors / windows / curtains accept any reasonable suggestion for reducing a draught 'double glazing' alone is insufficient	1
(b)	air is (a good) insulator **or** air is a poor conductor	accept air cavity / 'it' for air	1
	reducing heat transfer by <u>conduction</u>	accept stops for reduces ignore convection do **not** accept radiation do **not** accept answers in terms of heat being trapped	1
(c)(i)	most cost effective	accept it is cheaper or low<u>est</u> cost accept shortest payback time accept in terms of reducing heat loss by the largest amount do **not** accept it is easier ignore most heat is lost through the roof	1
(ii)	4		1
total			7

4.5.6.1.3 Velocity

3451/F Q14

question	answers	extra information	mark
(a)(i)	constant speed	do **not** accept normal speed do **not** accept it is stopped / stationary	1
	in a straight line	accept any appropriate reference to a direction constant velocity gains **2** marks 'not accelerating' gains **2** marks terminal velocity alone gets **1** mark	1
(ii)	goes down owtte	accept motorbike (it) slows down	1
(b)(i)	20 (m/s)	ignore incorrect units	1
(ii)	acceleration = change in velocity / time (taken)	do **not** accept velocity for change in velocity accept change in speed accept $a = \frac{v-u}{t}$ **or** $a = \frac{v_1 - v_2}{t}$ **or** $a = \frac{\Delta v}{t}$ do **not** accept $a = \frac{v}{t}$	1
(iii)	4 **or** their (b)(i) ÷ 5	allow **1** mark for correct substitution	2
	m/s^2	m/s/s **or** ms^{-2} **or** metres per second squared **or** metres per second per second	1
(c)	vehicle may skid / slide	loss of control / brakes lock / wheels lock accept greater stopping distance **or** difficult to stop	1
	due to reduced friction (between tyre(s) and road)	accept due to less grip do **not** accept no friction	1

cont…

3451/F Q14 cont…

(d)	any **three** from: • increased speed • reduced braking force • slower (driver) reactions • poor vehicle maintenance • increased mass / weight of vehicle • poor road surface • more streamlined	do **not** accept night time / poor vision N.B. specific answers may **each** gain credit eg tiredness (1), drinking alcohol (1), using drugs (1), driver distracted (1) etc specific examples may **each** gain credit eg worn brakes or worn tyres etc accept large mass / weight of vehicle if candidates give three answers that affect stopping distance but not specific to increase award **1** mark only	3
total			13

4.5.6.1.3 Velocity

3451/F Q15

question	answers	extra information	mark
(a)(i)	arrow from centre of the ball **and** at right angles to the string **and** in the correct direction	arrow should point to the student's belt accept free-hand 'straight' line do **not** accept curved line	1
(ii)	increase increase increase	accept 'be stronger / bigger' accept 'be stronger / bigger' accept 'be stronger / bigger'	1 1 1
(b)	speed velocity direction	all **three** correct any two correct for **1** mark otherwise **0** marks	2
(c)(i)	centripetal	accept 'centripedal' and other minor misspellings do **not** accept anything which could be 'centrifugal'	1
(ii)	gravity	accept 'weight' accept 'force of attraction due to mass(es) (of the Moon and the Earth)'	1
(iii)	electron(s)		1
(iv)	electrostatic	accept 'electrical' do **not** accept just 'centripetal'	1
total			10

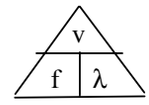
4.5.6.1.3 Velocity

3451/F Q16

question	answers	extra information	mark
(a)(i)	**X** at the centre of the lifebelt	measuring from the centre of **X**, allow 2 mm tolerance in any direction	1
(ii)	any **two** from: below the point of suspension at the centre (of the lifebelt) (because) the lifebelt / it is symmetrical	if X is on vertical line below the hanger (but not at centre) can gain the first point only accept '(vertically) below **Y**' accept 'in the middle' **or** (because) the mass / weight is evenly distributed	2
(b)	Nm **or** newton metre(s) 750	accept Newton metre(s) do **not** accept any ambiguity in the symbol ie NM, nM or nm (moment) = force × (perpendicular) distance (between line of action and pivot) **or** (moment) = 500 × 1.5 gains **1** mark	1 2
(c)	**Quality of written communication**: any **three** connected points from: low(er) <u>centre of mass / gravity</u> (more) <u>stable</u> less likely to fall over the <u>turning effect / moment</u> (of the weight of case) is less so the pull on her arm is less	for **2** of the underlined terms used in the correct context **or** <u>centre of mass / gravity</u> will be close(r) to the wheels / axle / ground **or** less <u>unstable</u> accept 'less likely to overturn' do **not** accept 'will not fall over' **or** so less effort is needed to hold the case ignore references to pulling the case	1 3
total			10

4.5.6.1.3 Velocity

3451/F Q17

question	answers	extra information	mark
(a)	any **two** from: • **amplitude** decreasing • **wavelength** increasing • **frequency** decreasing **Quality of written communication**	accept siren / sound getting quieter do **not** accept sound decreases accept pitch decreasing ignore reference to transverse wave ignore reference to speed contradictory statements within each point lose the mark all emboldened terms in candidate's answer used correctly	2 1
(b)(i)	ultrasound **or** ultrasonic		1
(ii)	wave speed = frequency × wavelength	accept speed / velocity for wave speed accept $v = f \times \lambda$ do **not** accept w for λ do **not** accept s for v accept  provided subsequent calculation shows a correct method	1
(iii)	339.2 **or** 340 **or** 339	allow **1** mark for using 212 000 allow **1** mark for correct substitution an answer of 0.3392 **or** 0.34 **or** 0.339 gains **1** mark only award full credit for a correct numerical answer with the unit changed to km/s	3
total			8

4.5.6.1.3 Velocity

GCSE

Additional Science / Physics

PH2FP

Mark scheme

4408/4403
June 2015

Version/Stage: 1.0: Final

4.5.6.1.3 Velocity

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Further copies of this mark scheme are available from aqa.org.uk

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PMT

Mark Scheme

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of errors / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

4.5.6.1.3 Velocity

Example 1: What is the pH of an acidic solution? (1 mark)

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Accept / allow

Accept is used to indicate an equivalent answer to that given on the left-hand side of the mark scheme. Allow is used to denote lower-level responses that just gain credit.

3.9 Ignore / Insufficient / Do not allow

Ignore of insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

4. Quality of Communication and levels marking

In Question **8c** students are required to produce extended written material in English, and will be assessed on the quality of their communication as well as the standard of the scientific response.

Students will be required to:
- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: basic
- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: clear
- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: detailed
- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

4.5.6.1.3 Velocity

Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
1(a)	increases	accept reaches highest value do **not** accept increases and decreases	1	AO2 2.3.2	**E**
1(b)(i)	increases		1	AO1 2.3.2m	**A**
1(b)(ii)	increases		1	AO1 2.3.2m	**A**
1(c)	18 watt	allow **1** mark for correct substitution i.e. 12 x 1.5 provided no subsequent step accept W answer may be indicated in the list	2 1	AO2 2.4.2c AO1 2.4.2c	**E**
Total			**6**		

4.5.6.1.3 Velocity

Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
2(a)	inside the Sun		1	AO1 2.6.2b	A
2(b)	fusion		1	AO1 2.6.2a	G
2(c)	energy		1	AO1 2.6.2f	A
Total			3		

4.5.6.1.3 Velocity

Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
3(a)	3 (.0)	allow **1** mark for correct substitution i.e. 25 x 0.12 provided no subsequent step	2	AO2 2.1.5d	**E**
3(b)(i)	elastic potential kinetic	correct order only	1 1	AO1 2.1.5c 2.2	**G**
3(b)(ii)	increases to 80(mm) (or more)	accept any number greater than 75 an answer 'it (more than) doubles' gains both marks	1 1	AO3 2.1.5a	**E**
3(c)(i)	weight		1	AO1 2.1	**A**
3(c)(ii)	Downward speed increases		1	AO1 2.1.1e	**A**
Total			**8**		

4.5.6.1.3 Velocity

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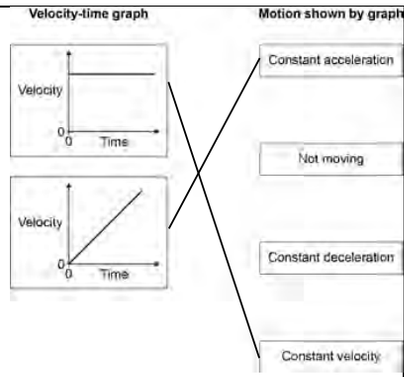
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Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
4(a)(i)	(3-pin) plug	do **not** accept plug socket	1	AO1 2.4.1d	**E**
4(a)(ii)	live and neutral		1	AO1 2.4.1e	**A**
4(a)(iii)	double		1	AO1 2.4.1j	**G**
4(b)	Direct current (d.c.) only		1	AO1 2.4.1a	**A**
4(c)(i)	live		1	AO1 2.4.1g	**G**
4(c)(ii)	too great a current flows	accept a surge of current accept too great a power accept an electrical fault do **not** accept voltage / energy / electricity too high	1	AO1 2.4.1g	**E**
4(c)(iii)	can be reset (disconnects circuit) faster	accept does not need replacing cheaper is insufficient does not melt is insufficient quicker to fix / replace is insufficient	1 1	AO2 2.4	**E**
Total			**8**		

4.5.6.1.3 Velocity

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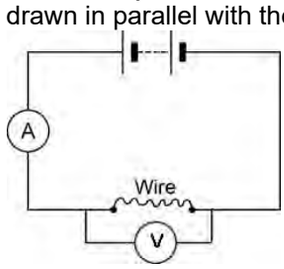
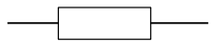
Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
5(a)		if more than one line is drawn from a graph then all those lines are wrong allow **1** mark for 1 correct line	2	AO1 2.1.2f	**G**
5(b)	speed		1	AO1 2.1.2d	**G**
5(c)(i)	2.25	allow **1** mark for correct substitution i.e. $a = \frac{9-0}{4}$ or $a = \frac{9}{4}$ provided no subsequent step	2	AO2 2.1.2e	**E**
5(c)(ii)	The air resistance increases		1	AO1 2.1.4a	**A**
5(d)	2000 J mass is half **or** kinetic energy depends on mass	 do **not** accept weight for mass	1 1	AO2 2.2.1g	**E**
Total			**8**		

4.5.6.1.3 Velocity

Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
6(a)	cell damage *or* cancer	accept kills/mutates cells radiation poisoning is insufficient ionising is insufficient	1	AO3 2.5.2g	**E**
6(b)(i)	any **one** from: • use tongs to pick up source • wear gloves • use (lead) shielding • minimise time (of exposure) • maximise distance (between source and teacher)	accept any other sensible and practical suggestion ignore reference to increasing / decreasing the number / thickness of lead sheets	1	AO3 2.5	**E**
6(b)(ii)	background		1	AO1 2.5.2b	**E**
6(c)(i)	curve drawn *from point 2,160*	do **not** accept straight lines drawn from dot to dot	1	AO2 2.5	**E**
6(c)(ii)	(also) increases	less radiation passes through is insufficient	1	AO3 2.5	**E**
6(c)(iii)	50	accept any value from 40 to 56 inclusive	1	AO3 2.5	**E**
6(d)	gamma only gamma (radiation) can pass through lead	 accept alpha **and** beta cannot pass through lead a general property of gamma radiation is insufficient	1 1	AO2 2.5.2e	**E**
Total			**8**		

4.5.6.1.3 Velocity

Question	Answers	Extra information	Mark	AO / Spec. ref.	ID
7(a)(i)	p.d. is (directly) proportional to current **or** gradient/slope is constant ***or*** the lines show constant resistance	accept lines are straight / diagonal	1	AO2 2.3.2d/e/g	**E**
7(a)(ii)	C for the same p.d. the current is the smallest	reason only scores if C is chosen accept lowest gradient **and** the gradient = 1/R	1 1	AO2 2.3.2i	**E**
7(b)(i) clip with table 1	ohm	accept correct symbol Ω accept an answer written in Table 1 if not given in answer space	1	AO1 2.3.2h	**E**
7(b)(ii)	K and L only length varies	reason only scores if both K and L are chosen accept type of metal and the diameter are the same	1 1	AO3 2.3.2	**E**
7(b)(iii)	measure the resistance of more wires made from different metals	accept test more (types of) metals measure the resistance of more wires is insufficient they only use two metals is insufficient	1	AO3 2.3.2	**E**

7(c)(i)	voltmeter symbol correct and drawn in parallel with the wire 	accept voltmeter symbol correct and drawn in parallel with the battery	1	AO1 2.3.2c/f	**E**
7(c)(ii)	correct symbol drawn 	symbol must be rectangular	1	AO1 2.3.2c	**E**
Total			**9**		

Question	**Answers**	**Extra information**	**Mark**	**AO / Spec. ref.**	**ID**
8(a)	(an equal amount of) positive charge	do **not** accept charge on the atom / nucleus is positive	1	AO3 2.5.1	**E**
8(b)(i)	a (significant) number of alpha particles were scattered by more than 4° **or** alpha particles deflected backwards measurements / results could not be explained by 'plum pudding' model **or** measurements / results did not support predictions	accept (some) measurements / results were unexpected can be explained by the nuclear model is insufficient accept measurements / results did not support hypothesis	1 1	AO1 2.5 AO1	**E**
8(b)(ii)	many/(over)100 000 measurements / results taken	accept Rutherford(and Marsden) were respected scientists **or** scientists were respected accept measurements / results taken over several months the experiment was repeated many times is insufficient	1	AO3 2.5	**E**

4.5.6.1.3 Velocity

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Question 8 continues on the next page . . .

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
8(c)			6	AO1 2.5.1a/b/c	**E**

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
no relevant content	A brief description is given with some particles correctly named	A description is given with all three particles named **plus either** the polarity of charge associated with the three particles **or** the relative mass of the three particles **or** the relative mass for one particle and the relative charge for one particle given	A more detailed description is given, naming the particles and polarity of charge **and either** the relative mass is given for at least two particles **or** the relative charge is given for at least two particles

examples of the points made in the response	extra information		
brief description contains protons, neutrons and electrons protons are positive electrons are negative neutrons are uncharged has a nucleus **relative charge** proton +1 electron – 1 neutron 0 **relative mass** proton 1 neutron 1 electron (about) 1/2000 **more detailed description** protons and neutrons make up the nucleus electrons orbit the nucleus electrons are in shells most of the atom is empty space nucleus occupies a very small fraction of the volume of the atom electrons orbit at a relatively large distance from the nucleus most of the mass of the atom is contained in the nucleus the nucleus as a whole is positively charged total number of protons in the nucleus equals the total number of electrons orbiting it in an atom	accept protons and neutrons have the same mass accept electrons have tiny / negligible mass zero mass is neutral		

Total		**10**