



General Certificate of Secondary Education

Science: Double Award 3462/3H *Specification B (Co-ordinated)*

Mark Scheme


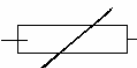
2005 examination - June series

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.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Double Award Higher Tier 3462/3H

3462/3H Q1

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 20Ω		1
	a smaller current goes through P / A_2 (than 20Ω)	dependent on getting 1 st mark correct accept converse	1
(b)(i)	potential difference = current \times resistance	accept pd / voltage for potential difference accept $V = I \times R$, correct symbols and correct case only accept volts = amps \times ohms accept  provided subsequent method is correct allow combination of physical quantities and named units allow voltage = $I \times R$	1
(ii)	6	allow 1 mark for correct substitution	2
(iii)	6	accept their (b)(ii)	1
(c)	<u>thermistor</u> or 	accept correct circuit symbol allow phonetic spelling	1
	<u>resistance</u> 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

3462/3H Q2

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 <u>higher</u> temperature (than Mercury)	accept has the <u>highest</u> temperature accept Venus is <u>hotter</u> / <u>hottest</u> 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

3462/3H Q3

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 <u>lowest</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

3462/3H Q4

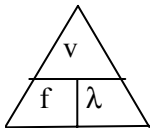
question	answers	extra information	mark
(a)(i)	<u>constant</u> speed	do not accept normal speed do not accept it is stopped / stationary	1
	in a straight line	accept any appropriate reference to a direction constant velocity gains 2 marks 'not accelerating' gains 2 marks terminal velocity alone gets 1 mark	1
(ii)	goes down owtte	accept motorbike (it) slows down	1
(b)(i)	20 (m/s)	ignore incorrect units	1
(ii)	acceleration = $\frac{\text{change in velocity}}{\text{time (taken)}}$	do not accept velocity for change in velocity accept change in speed accept $a = \frac{v_1 - v_2}{t}$ or $a = \frac{v - u}{t}$ or $a = \frac{\Delta v}{t}$ do not accept $a = \frac{v}{t}$	1
(iii)	4 or their (b)(i) \div 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 <u>no</u> friction	1

cont...

3462/3H Q4 cont...

<p>(d)</p>	<p>any three from:</p> <ul style="list-style-type: none"> • <u>increased</u> speed • <u>reduced</u> braking force • <u>slower</u> (driver) reactions • <u>poor</u> vehicle maintenance • <u>increased</u> mass / weight of vehicle • <u>poor</u> road surface • <u>more</u> streamlined 	<p>do not accept night time / poor vision</p> <p>NB specific answers may each gain credit eg tiredness (1), drinking alcohol (1), using drugs (1), driver distracted (1) etc</p> <p>specific examples may each gain credit eg worn brakes or worn tyres etc</p> <p>accept large mass / weight of vehicle</p> <p>if candidates give three answers that affect stopping distance but not specific to <u>increase</u> award 1 mark only</p>	<p>3</p>
<p>total</p>			<p>13</p>

3462/3H Q5

question	answers	extra information	mark
(a)	<p>Quality of written communication</p> <p>any two from:</p> <ul style="list-style-type: none"> • amplitude decreasing • wavelength increasing • frequency decreasing 	<p>all emboldened terms in candidate's answer used correctly</p> <p>accept siren / sound getting quieter do not accept sound decreases</p> <p>accept pitch decreasing ignore reference to transverse wave ignore reference to speed</p> <p>contradictory statements within each point lose the mark</p>	<p>1</p> <p>2</p>
(b)(i)	ultrasound or ultrasonic		1
(ii)	wave speed = frequency \times wavelength	<p>accept speed / velocity for wave speed</p> <p>accept $v = f \times \lambda$ do not accept w for λ do not accept s for v</p> <p>accept </p> <p>provided subsequent calculation shows a correct method</p>	1
(iii)	339.2 or 340 or 339	<p>allow 1 mark for using 212 000 allow 1 mark for correct substitution</p> <p>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</p>	3
total			8

3462/3H Q6

question	answers	extra information	mark
(a)	converted into helium	accept helium created accept converted into heavier elements accept used up in nuclear fusion / to produce energy do not accept any reference to burning	1
(b)	Quality of written communication	correct points must be in sequence	1
	turns / expands into a <u>red giant</u>	contradictions negate mark	1
	contracts and explodes or becomes a supernova		1
	may form a (dense) <u>neutron star</u> or (if enough mass shrinks to) form a <u>black hole</u>	accept forms a neutron star and (then) a black hole	1
(c)(i)	supernova or remains of an earlier star	ignore super nebula	1
(ii)	younger or not formed at the time of the Big Bang		1
total			7

3462/3H Q7

question	answers	extra information	mark
(a)(i)	both lose <u>2</u> protons and (<u>2</u>) neutrons	accept changes by 2 protons and 2 neutrons	1
(ii)	different number of protons (in the nucleus)	accept different atomic number do not accept different number of protons and neutrons or different mass number ignore electrons	1
(iii)	gamma involves no change in the number of protons (in the nucleus) or gamma is a wave (not a particle)	do not accept number of neutrons and / or protons ignore electrons	1
(b)(i)	water because for all energy values the thickness of water needed to absorb (90% of) the radiation is more than the other materials	both material and reason required accept thickness of water required is always more than the other materials	1
(ii)	6	allow 1 mark for obtaining both correct values 72 and 12 from graph allow 1 mark for incorrect values 71 and / or 11 from graph evaluated correctly	2

cont...

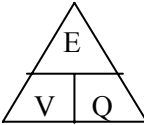
3462/3H Q7 cont...

<p>(c)</p>	<p>any three from:</p> <ul style="list-style-type: none"> • <u>most</u> (alpha) particles passed <u>undeflected / straight through</u> the gold • suggesting most of the atom is empty (space) • a <u>few</u> (alpha) particles <u>scattered / deflected</u> through (very) <u>large</u> angles • suggesting a concentrated / small nucleus • nucleus is positive because it <u>repels</u> the positive (alpha) particles <p>may be scored on annotated diagram provided not negated elsewhere</p> <p>accept repelled do not accept reflected / rebound / bounce back</p> <p>no reference to experiment, maximum 1 mark</p>	<p>3</p>
<p>total</p>		<p>9</p>

3462/3H Q8

question	answers	extra information	mark
(a)(i)	infra red or ir		1
(ii)	a series of <u>on and off</u> pulses or a signal having only two values	accept a diagram accept starts and stops like 1 0	1
(b)	signals pick up <u>noise</u> / <u>interference</u> which is also <u>amplified</u>	must be clear noise or interference amplified	1
	different frequencies weaken different amounts	accept distorts signal	1
	more amplification increases the difference in amplitude between different frequencies	accept answers in terms of the more amplifications, the less like the original signal	1
(c)	<u>absorbed</u> by water / fat / oil molecules (in cells)	accept causes <u>increase</u> in vibrations of oil / fat / water molecules / particles	1
	cells damaged by the <u>heat</u> released	accept cell killed by the heat released or (enzymes denatured by heat released) accept for 1 mark ‘heats up water (in cells)’ ignore reference to cancer	1
total			7

3462/3H Q9

question	answers	extra information	mark
(a)	electrons / negative charges are <u>repelled</u>	do not accept converse implied movement of 'positive charges' negates the mark	1
(b)(i)	energy (transferred) = potential difference \times charge	accept pd or voltage for potential difference accept $E = V \times Q$ accept $W = V \times Q$ accept  provided subsequent method correct	1
(ii)	21 600 000 000 or 2.16×10^{10}	accept 21 600 000 <u>kilojoules</u> for both marks allow 1 mark for an answer of 21 600 000 joules	2
(c)	copper is a <u>good</u> (electrical) conductor or copper has a low resistance	accept allows electrons / electricity to flow easily ignore heat	1
	provides path for electrons / electricity / lightning <u>to</u> earth / ground / metal plate	do not accept in terms of heat / energy do not accept attracts lightning unless explained	1
total			6

3462/3H Q10

question	answers	extra information	mark
(a)(i)	$\text{gpe} = \text{weight} \times \text{height}$	accept $E_p = mgh$ accept $pe = mgh$	1
(ii)	1200	accept values using 9.8 (1) allow 1 mark for correct substitution	2
(b)(i)	120	accept $\frac{\text{their (a)(ii)} \times 6}{60}$	1
(ii)	300	allow $b(i) \div 0.4$ for both marks allow 1 mark for correct transformation	2
total			6

3462/3H Q11

question	answers	extra information	mark
(a)	<ul style="list-style-type: none"> heat released from (natural) radioactive decay 		1
	<ul style="list-style-type: none"> causes <u>convection</u> (currents) in the mantle / underneath the crust 	do not accept in the magma	1
(b)	<ul style="list-style-type: none"> (oceanic plate) pushed down 	must be clear which plates are referred to	1
	<ul style="list-style-type: none"> or (oceanic plate) subducted 	accept 'moves under' if supported by correct reference to density	
	<ul style="list-style-type: none"> (oceanic plate) (partially) melts 		1
	<ul style="list-style-type: none"> magma rises through the (continental) crust / plate / part of Ecuador 	do not accept answers in terms of fold mountains etc	1
(c)(i)	earthquakes / tremors / mining / p(rietary) waves / s(econdary) waves / tectonic plate movement	accept sensible alternatives for underground activity	1
(ii)	any two from: <ul style="list-style-type: none"> difficult to get inside volcano crater safely changes in ground level difficult to see / measure changes to sulphur dioxide levels difficult to measure limited research seismic activity (may be) limited before eruption 	accept difficult to get near to volcano safely accept changes may be sudden accept any sensible suggestion related to the difficulty or safety of obtaining relevant measurements	2
(d)(i)	kinetic energy = $\frac{1}{2} \times \text{mass} \times \text{speed}^2$	accept velocity for speed accept $\text{KE} = \frac{1}{2} mv^2$	1
(ii)	32 000	accept 32 kJ	1
(e)(i)	$\frac{1}{4}$	accept 0.25 or 25%	1
(ii)	2600	if answer to (e)(i) is $\frac{1}{2}$ then accept 1300	1
total			12