AQA

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Secondary Education

Science: Double Award 3462/3H
Specification B

Mark Scheme

2006 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 (Co-ordinated)
Higher Tier 3462/3H

3462/3H   Q1

question	answers	extra information	mark
(a)	0.05 (A)	ignore incorrect units if given accept 'the same' / 'the same as K' / 'the same as the other ammeter' do **not** accept 'same as the other meter'	1
(b)(i)	any **two** from: • two cells are joined + to + • some of the cells potential difference is across the diode / ammeters / wires **or** the pd of the cells is shared by all components • the other components have a resistance • cells not fully charged **or** cells partially run down • cells have an internal resistance	answers in terms of current gain no marks accept one cell in the wrong way accept two cells are joined back-to-back accept two cells are joined – to – accept battery for cell do **not** accept answers in terms of all the cells or in terms of energy only accept voltage for pd do **not** accept using up pd accept a named component / components / wire has a resistance do **not** accept voltage of cells is less than 1.5 unless explained do **not** accept cells are not as powerful unless explained	2
(ii)	the diode has a (very) <u>high</u> resistance (in the reverse direction)		1
	a diode only conducts / allows current to flow in one direction	accept little / no current flows do **not** accept blocks / cuts flow	1

Continued

3462/3H   Q1

question	answers	extra information	mark
(c)	**QoWC** for the use of the word resistance	annotate Q✓ Q✗ accept resistant	1
	accept increase / change / decrease throughout question but a contradiction loses **one** mark with change as neutral		
	as the pd / current increases / changes	accept voltage for pd must be correctly linked to at least one of the following points accept	1
	the temperature of the filament increases / changes	lamp / bulb for filament accept filament becomes hotter	1
	increasing / changing the **resistance** of the lamp		1
		accept for **1** mark only the filament lamp does not obey Ohm's law	
total			9
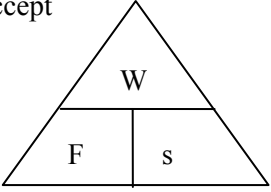
3462/3H   Q2

question	answers	extra information	mark
(a)	0.5		1
	hertz	accept Hz but **not** HZ / hz / hZ	1
		accept (waves) per second **or** / sec **or** / s **or** s^{-1} **or** sec^{-1}	
(b)	any **one** from: • any named part of the electromagnetic spectrum • S – waves / secondary waves • wave on a rope	 do **not** accept seismic waves / earthquake do **not** accept slinky unless clearly described	1
(c)	transverse – disturbance / vibration is perpendicular to the direction of energy transfer / wave travel	accept a correctly labelled diagram	1
	longitudinal – disturbance / vibration is parallel to the direction of energy transfer / wave travel	accept a correctly labelled diagram part explanation of the difference between transverse **and** longitudinal gains **1** mark	1
(d)(i)	TIR shown	needs to stay inside water jet ignore number of reflections **or** arrow heads lines straight by eye	1
(ii)	bigger than	any indication of correct answer	1
total			7

3462/3H Q3

question	answers	extra information	mark
(a)	W		1
	has only two states **or** is either on or off	accept discrete values only do **not** credit answer purely in terms of shape	1
(b)	any **one** from: • higher quality • increased carrying capacity • errors can be rectified	accept clearer do **not** accept easier to read ignore faster accept <u>less</u> distortion **or** <u>less</u> weakening of signal strength do **not** accept no distortion / weakening on its own accept more information can be sent **or** more channels	1
total			3

3462/3H   Q4

question	answers	extra information	mark
(a)(i)	all points plotted accurately	accept **1** mark for 5 correct plots	2
		± ½ small square on stopping distance	
	line of best fit must be continuous	accept attempt at a reasonable curve	1
		does not need to go through 0 0	
		do **not** accept a straight line do **not** accept dot-to-dot	
(ii)	4 to 6 (metres)	accept ecf from (a)(i)	2
		accept **1** mark for value taken correctly from graph at 25mph **or** correct method shown	
(b)(i)	0.7 (s)	incorrect unit = 0 marks	1
(ii)	constant speed / velocity	accept (continued as) 30mph accept did not change / stayed the same accept no acceleration	1
(iii)	3.3(s)	penalise incorrect unit once only	1
(iv)	reaction time <u>increases</u> / is <u>longer</u> **or** thinking distance <u>increases</u>	do **not** accept reaction time slower **or** reactions are slower	1
	stopping distance / it <u>increases</u>	do **not** accept travels at constant speed for longer	1
(c)(i)	work done = force (applied) × distance (moved)	accept W = F × s or W = F × d accept provided subsequent method is correct	1
(ii)	2100	accept 2.1 kilo accept **1** mark for using 7000 N	2
(iii)	2100 (joules)	accept their (c)(ii)	1
total			14
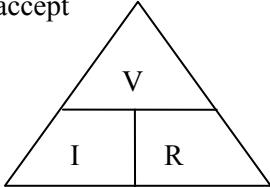
3462/3H Q5

question	answers	extra information	mark
(a)(i)	refraction		1
(ii)	it changes speed **or** change in density	accept it speeds up do **not** accept it slows down do **not** accept air is more dense than glass	1
(b)(i)	sound / waves <u>diffract</u>	do **not** accept reflection	1
	through the gap (in the wall) **or** over the wall **or** because the gate is open	this only scores if first marking point is given accept for **1** mark only sound / waves go through the gap and <u>spread out</u> **or** diagram showing wave fronts spreading out from open gates if diagram is labelled as diffraction both marks can be scored	1
(ii)	less diffraction	accept no diffraction accept gates <u>absorb</u> sound / noise / waves accept gates <u>reflect</u> sound / noise / waves do **not** accept rebounds / stops / blocks out	1
total			5

3462/3H   Q6

question	answers	extra information	mark
(a)	fusion	accept fussion do **not** accept any misspelling which could be interpreted as fission	1
(b)	describing forces involved	accept radiation pressure for force	1
	forces are equal / balanced		1
(c)(i)	(galaxies) moving away (from Earth) (quickly) **or** space (between Earth and the galaxies) is expanding (rapidly)	ignore wavelength do **not** accept planets moving away	1
(ii)	(the further the galaxy) the <u>faster</u> it is moving away from us	accept the further the galaxy the <u>faster</u> we are moving away from it	1
(d)(i)	(living) organisms produce changes to an atmosphere **or** atmosphere similar to earth **or** presence of water indicates possibility of life	accept specific changes e.g. there is more oxygen accept presence of oxygen	1
	not caused / unlikely to be caused by other (chemical or geological) processes **or** atmosphere different to how it would have been with only chemical / geological changes **or** accounted for by photosynthesis	dependent on previous mark	1
(ii)	using radio telescopes	do **not** accept telescopes	1
	to find meaningful / recognisable signals from space	accept pulses do **not** accept noise	1
total			9

3462/3H Q7

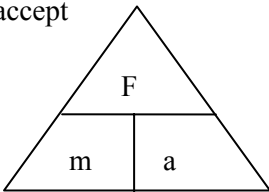| question	answers	extra information	mark
(a)(i)	potential difference = current × resistance	accept pd / voltage for potential difference accept $V = I \times R$ accept provided subsequent method is correct	1
(ii)	375	an answer of 0.375 gains **2** marks accept **1** mark for correct transformation accept **1** mark for use of 0.004 A	3
(b)	straight line drawn below given line	must go through origin	1
total			5

3462/3H   Q8

question	answers	extra information	mark
(a)(i)	(high energy) electron	accept $_{0}^{-1}e$	1
(ii)	one less neutron one more proton	**both** required accept it is <u>more</u> stable	1
(iii)	becomes charged / ionised	do **not** credit becomes negatively charged only	1
(b)	will not pass through the skull / bone	do **not** accept answers in terms of air, paper or metal unless qualified	1
(c)(i)	12.5		1
(ii)	increased exposure to radiation <u>from space</u> **or** atmosphere absorbs less of the radiation (from space)	accept <u>cosmic rays</u> for radiation from space	1
	(increased risk of) cancer	accept indication of mutating cells	1
total			7

3462/3H   Q9

question	answers	extra information	mark
(a)	ions / (free) electrons gain (kinetic) energy	accept atom / particles / molecules for ion accept ions vibrate faster accept ions vibrate with a bigger amplitude accept ions vibrate more do **not** accept ions start to move do **not** credit move more	1
	(free) electrons transfer energy by collision with ions **or** energy transferred by collisions between vibrating ions	idea of passage from ion to ion accept atom / particles / molecules for ion	1
(b)	hot water tank jacket		1

	correct calculation shown
	or
	result of all four calculations
	
	or
	answers in terms of payback time with clear reference to 5 years
		$20 \times 5 - 30 = 70$
		or
		   70
		   25
		   25
		   50
		
		accept for **1** mark finding saving over 5 years
		   100
		    75
		   100
		   400
		
		or answers in terms of payback time only
			2

total			5

3462/3H   Q10

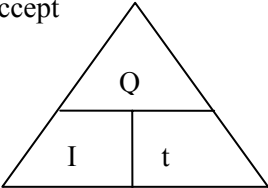| question	answers	extra information	mark
(a)(i)	force = mass × acceleration	accept F = m × a accept (triangle diagram: F on top, m and a below) provided subsequent method is correct accept correct transformation do **not** accept an equation in units	1
(ii)	5.6	accept **1** mark for correct transformation	2
(b)	forces acting against forward motion <u>increase</u> (as the athlete gets faster)	accept drag / air resistance / frictional forces as opposing forces	1
	(until) forces balance (acceleration is zero) **or** (until) force backwards = 364 N (acceleration is zero)	ignore reference to terminal velocity	1
total			5

3462/3H   Q11

question	answers	extra information	mark
(a)	any **two** from: • do not produce pollutant gases • can produce electricity at any time • small amount of fuel gives a large amount of energy • conserves fossil fuels	ignore answers in terms of cost accept carbon dioxide or sulphur dioxide for pollutant gases accept are reliable accept concentrated fuel	2
(b)	(high cost) of building / decommissioning	accept reference to safety / security accept high cost of waste disposal	1
(c)(i)	suitable wind strength for generation only 24% / some of the time	accept only windy 24% / some of the time accept it is not always windy	1
(ii)	any **two** from: • wind is a dilute energy source • hi<u>gh</u>er capital / land cost • many wind farms are needed • wind farms are inefficient	accept wind turbines for wind farm	2
total			6

3462/3H   Q12

question	answers	extra information	mark
(a)(i)	(change in) gravitational potential energy = weight × (change in) vertical height	accept gpe = w × h accept E for gpe accept gpe = mgh do **not** accept gravity for g	1
(ii)	35 200	allow 35.2 kilo allow **1** mark for correct substitution allow **1** mark for an answer of 3520	2
(b)(i)	$\text{kinetic energy} = \frac{1}{2}\text{mass} \times \text{speed}^2$	accept velocity for speed accept $\frac{1}{2}mv^2$ do **not** accept $\frac{1}{2}ms^2$	1
(ii)	24	accept **1** mark for correct substitution accept **1** mark for correct transformation	3
(c)	gravitational (potential) energy **and** kinetic / movement energy	must be sum of the two accept gpe and ke	1
	(transferred) as elastic (potential / strain energy		1
	QoWC for linking of gravitational / kinetic / movement energy to elastic energy	annotate Q✓ Q✗	1
total			10

3462/3H   Q13

question	answers	extra information	mark
(a)(i)	ions are free to move	accept ions carry the current	1
(ii)	electrolysis		1
(b)(i)	charge = current × time	accept $Q = I \times t$ do **not** accept A for I do **not** accept C for Q accept *(triangle with Q on top, I and t on bottom)* provided subsequent method is correct	1
(ii)	4 (g)	accept **1** mark for correct substitution into $Q = I \times t$, with t = 2400 accept **1** mark for an answer of 0.067 or 0.07	2
total			5