



# GCSE

## Science B

General Certificate of Secondary Education

Unit **B621/02**: Unit 1 Modules B1, C1, P1 (Higher Tier)

## Mark Scheme for January 2011

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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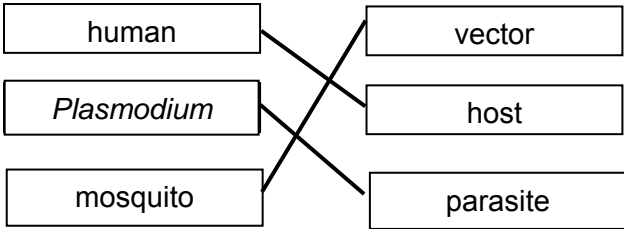
- 1 Abbreviations, annotations and conventions used in the detailed Mark Scheme.

/	= alternative and acceptable answers for the same marking point
(1)	= separates marking points
not	= answers which are not worthy of credit
reject	= answers which are not worthy of credit
ignore	= statements which are irrelevant
allow	= answers that can be accepted
( )	= words which are not essential to gain credit
<u>    </u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW	= alternative wording
ora	= or reverse argument

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Question			Expected Answers	Marks	Additional Guidance
1	(a)	(i)		2	all three correct = (2) marks one or two correct = (1) mark
		(ii)	sucks <b>blood</b> or <b>parasite</b> and passes on to next human it feeds on (1)	1	key is the <b>transfer of (infected) blood or parasite</b> <b>allow</b> suck up the blood from one person and then bite another <b>allow</b> sucks Plasmodium and passes on to next human <b>by biting</b> <b>ignore</b> bacteria <b>ignore</b> just feeding on one person and then another <b>ignore</b> transfer of disease or illness
	(b)		heat stroke / dehydration / lose too much water or fluid /  (high temperatures) kills cells (1)	1	<b>allow</b> (high temperatures) reduces enzyme activity / enzyme denatures / enzyme changes shape (1) <b>ignore</b> excess sweating <b>not</b> kills enzymes <b>ignore</b> strokes / heart attack / heart beats faster / increased blood pressure / overheating / organ failure
	(c)	(i)	<b>four</b> (1)	1	<b>allow</b> A, T, C, G in any order / adenine, thymine, guanine, cytosine in any order (1)

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Question			Expected Answers	Marks	Additional Guidance
		(ii)	<b>any two from:</b> <ul style="list-style-type: none"> <li>• Use nets (to screen body) (1)</li> <li>• Use insect repellents (1)</li> <li>• Spray insecticides or pesticides (1)</li> <li>• Use (UV light/chemical) traps (1)</li> <li>• Drain or remove stagnant water areas (1)</li> <li>• Spray water with oil (1)</li> <li>• Spray water with detergent (1)</li> <li>• Wear long sleeved tops / long trousers / cover bare skin (1)</li> </ul>	<b>2</b>	<b>ignore</b> use quinine / anti-malarial tablets / vaccination <b>ignore</b> bug spray or mosquito spray unless qualified  <b>allow</b> cover water (so mosquitoes can't get to it) (1)  <b>allow</b> introduce fish to eat mosquito larvae or eggs (1) <b>but ignore</b> introduce fish to eat mosquitoes
			<b>Total</b>	<b>7</b>	

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Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	contain (all) <b>essential</b> amino acids / contain <b>amino acids</b> the body cannot make (1)	1	<b>ignore</b> contains all the important amino acids <b>ignore</b> references to growth or repair <b>ignore</b> first class proteins can't be made by the body
		(ii)	12 / twelve (g) (1)	1	
	(b)		change to or a fault with <ul style="list-style-type: none"> <li>• a gene</li> <li>• chromosome</li> <li>• DNA</li> <li>• genetic code</li> <li>• base (sequence) (1)</li> </ul>	1	<b>ignore</b> harmful gene <b>ignore</b> cells mutate <b>ignore</b> changes to physical characteristics e.g. has 6 toes on each foot  <b>allow</b> the bases don't match up
			<b>Total</b>	<b>3</b>	

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Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	24.7 scores (2) 89 / (1.9) <sup>2</sup> or 89/3.61 scores (1)	2	<b>allow</b> 24.65 to 24.72 (2) 24.6 scores 1 25 scores 2 <b>but</b> 25.0 scores 1
		(ii)	<b>underweight</b> (1)	1	<b>ignore</b> not heavy enough or below average weight <b>ignore</b> abnormal / not normal <b>ignore</b> anorexic <b>ignore</b> skinny
	(b)		<b>any two from:</b>  code (1)  for (the production of) proteins or enzymes (1) enzymes control reactions in cells (1)	2	<b>Use ticks in this question</b>  <b>allow</b> template or pattern or base sequence for code (1)  proteins or enzymes on its own scores 0  <b>allow</b> DNA sequence codes for protein (synthesis) (2) <b>but</b> DNA sequence codes for protein bases scores (1) only for 'code'
			<b>Total</b>	<b>5</b>	

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Question		Expected Answers	Marks	Additional Guidance
4	(a)	<p>any two from:  vasodilation / idea that arterioles or capillaries or blood vessels <b>near skin surface</b> dilate (1)</p> <p>bringing more <b>blood</b> to <b>surface</b> of skin or top of the blood vessel (1)</p> <p>idea of heat lost (1)</p>	2	<p><b>Use ticks in this question</b></p> <p><b>allow</b> capillaries or arterioles or blood vessels <b>near skin surface</b> dilate / get wider / get bigger / expand (1)  <b>ignore</b> veins and arteries near skin surface</p> <p><b>allow</b> blood travels through the capillary loop (1)  <b>allow</b> blood travels nearer to the <b>surface</b> (1)</p> <p><b>allow</b> heat from blood used to evaporate sweat (1)  <b>allow</b> higher level responses relating to latent heat</p>
	(b)	(optimum) temperature for enzymes (1)	1	<p><b>allow</b> enzymes work best at 37°C (1)  <b>allow</b> so enzymes can work properly or (most) effectively (1)  <b>allow</b> references to enzymes work more slowly below 37°C or enzymes are denatured above 37°C (1)  <b>ignore</b> reactions work best at 37°C unless linked to enzymes  <b>not</b> kills enzymes</p>
	(c)	<b>blood</b> temperature monitored (by the brain) / (thermo/heat) receptors detect <b>blood</b> temperature (1)	1	<p><b>allow</b> (hypothalamus) monitors blood temperature (1)  <b>allow</b> blood gets warmer (1)</p>
	(d)	idea that as a change (from the normal) is <b>detected</b> the body responds to reverse the change (1)	1	<p>e.g. when the body <b>detects</b> that we get too hot our body sweats and we cool down  e.g. when the body <b>detects</b> that blood sugar rises insulin is produced to lower blood sugar levels</p> <p><b>idea of detection and the body's response are required</b></p>
		<b>Total</b>	<b>5</b>	



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Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	sodium hydrogencarbonate → sodium carbonate + carbon dioxide + water (1)	1	<b>not</b> '+ heat' in the equation <b>allow</b> '+ heat' above arrow <b>not</b> & or and instead of '+' <b>allow</b> = instead of → <b>not</b> sodium hydrocarbonate <b>allow</b> mix of correct formulae and words, but equation does not need to be balanced e.g. $2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O}$
		(ii)	limewater (1) turns cloudy / milky (1)	2	<b>second marking point is dependent on first</b> , but both marks can be awarded on the same line <b>allow</b> white precipitate / misty / turns white / chalky / foggy
	(b)		intelligent (packaging) (1)	1	<b>ignore</b> smart (packaging) <b>not</b> active (packaging)
			<b>Total</b>	<b>4</b>	

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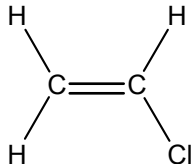
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Question			Expected Answers	Marks	Additional Guidance
6	(a)		petrol (1)  least fuel (1) and same temperature rise (1)	3	mark independently  <b>allow</b> all heated up by same amount / all release the same amount of energy (1) <b>allow</b> same temperature rise indicated in table (1)  calculation of temperature rise / g in each fuel (2)
	(b)		14000(J/g) (1)	1	<b>allow</b> 14kJ/g (1)
	(c)		idea that bond breaking is endothermic (1)  idea that bond formation is exothermic (1)  more energy given out (in bond formation) than is taken in (in bond breaking) (1)	3	<b>Use ticks in this question</b>  <b>allow</b> bond breaking absorbs energy (1)  <b>allow</b> bond making releases energy (1)  <b>allow</b> more energy released than absorbed (1)  <b>but</b> references to different numbers of bonds, e.g. more bonds made than broken, loses 3 <sup>rd</sup> mark  <b>reject</b> references to intermolecular bonds  <b>allow</b> exothermic reactions give out energy or heat (1) if no other mark scored
			<b>Total</b>	<b>7</b>	

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Question			Expected Answers	Marks	Additional Guidance
7	(a)	(i)	contains a (carbon to carbon) double bond (1)	1	<b>ignore</b> doesn't contain the maximum amount of hydrogen <b>ignore</b> alkene <b>allow</b> contains a (carbon to carbon) triple bond (1)
		(ii)	(bromine water) turns colourless / loses its colour / orange to colourless / decolourises (1)	1	<b>ignore</b> 'goes clear' <b>ignore</b> changes colour
	(b)	(i)	high pressure (1) (named) catalyst (1)	2	<b>allow</b> any pressure above 1 atmosphere (1) <b>not</b> just pressure <b>ignore</b> high temperature
		(ii)	 <p style="text-align: right;">(1)</p>	1	Cl can be attached in any one of the four positions  <b>allow</b> CL <b>allow</b> bracketed formula with n before or after the brackets
			<b>Total</b>	<b>5</b>	

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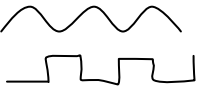


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Question			Expected Answers	Marks	Additional Guidance
8	(a)		A (1)  it is a liquid / same cost but higher energy value / good availability / ora (1)	2	<b>second mark is dependent on the first mark being awarded</b>  <b>allow</b> one mark for D and a correct reason eg D because good availability / D because it is a gas (1)  B or C scores 0
	(b)		$\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$ correct formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae <b>allow</b> correct multiples eg $2\text{CH}_4 + 4\text{O}_2 \rightarrow 2\text{CO}_2 + 4\text{H}_2\text{O}$ (1) <b>allow</b> = instead of $\rightarrow$ <b>not</b> 'and' or '&' for + <b>allow</b> one mark for correct balanced equation with incorrect use of upper and lower case formulas eg $\text{Ch}_4 + 2\text{O}_2 \rightarrow \text{Co}_2 + 2\text{H}_2\text{O}$ eg $\text{CH4} + 2\text{O2} \rightarrow \text{CO}^2 + 2\text{H}^2\text{O}$
			<b>Total</b>	<b>4</b>	

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Question	Expected Answers	Marks	Additional Guidance
9 (a)	<p>correct diagrams showing:</p> <p>analogue - continuously variable (1)</p> <p>digital - on and off or 1 and 0 (1)</p>	2	<p>marks can be awarded for labels on diagrams e.g. 'continuously variable' and 'on and off'</p> <p>minimum half wavelength diagrams required</p>  <p><b>allow</b></p>  <p><b>ignore</b> any horizontal lines</p> <p><b>reject</b> an analogue diagram that is pulsed or has vertical sections or looks like a digital signal with noise, e.g.</p>  <p><b>allow</b> 1 mark for analogue and digital diagrams interchanged</p>
(b)	(lots of) digital signals interleaved (on same data line) (1)	1	<p><b>allow</b> multiplexing (1)</p> <p><b>ignore</b> references to interference or quality of signal</p> <p><b>ignore</b> you can send more than one signal at the same time <b>but allow</b> you can send more than one signal at the same time <b>down the same line</b></p>
	<b>Total</b>	<b>3</b>	

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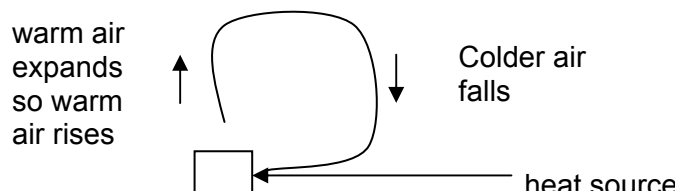
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Question		Expected Answers	Marks	Additional Guidance
10	(a)	<p>Microwaves do not pass through glass and plastic. <input type="checkbox"/></p> <p>Microwaves are reflected by glass and plastic surfaces. <input type="checkbox"/></p> <p>Microwaves are reflected by metal surfaces. <input checked="" type="checkbox"/></p> <p>Microwaves cook from the centre of the food. <input type="checkbox"/></p> <p>Microwaves penetrate about one centimetre into the food. <input checked="" type="checkbox"/></p> <p>third box ticked (1) fifth box ticked (1)</p>	2	reduce by one mark for every additional tick down to 0
	(b)	<p><b>any one from:</b> short distance between transmitters (1)</p> <p>high positioning of transmitters (1)</p>	1	<p><b>allow</b> masts / aerials / antennae / dishes for transmitters  <b>allow</b> bigger dish or larger area of dish  <b>ignore</b> poles or satellites  <b>allow</b> more transmitters (1)</p> <p><b>allow</b> frequent amplification of signal (1)  <b>allow</b> positioning of transmitters to avoid obstacles (1)</p>
		<b>Total</b>	<b>3</b>	

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Question			Expected Answers	Marks	Additional Guidance
11	(a)	(i)	idea that fibreglass <b>contains</b> (trapped) air (1)  idea that air is (good) insulator or a poor conductor (1)	2	<b>allow</b> air pockets for idea of trapped air  <b>reject</b> the idea that the air moves and is then trapped by or in the fibreglass  <b>allow</b> fibreglass is a (good) insulator or poor conductor if no other mark scored (1)  <b>ignore</b> traps heat  any mention of heat particles negates second marking point
		(ii)	5 (1)	1	
	(b)		<b>any two from:</b> warm(er) air expands / particles move further apart (1)  warm(er) air less dense / cold(er) air more dense (1)  warm(er) air rises / cold(er) air falls (1)	2	<b>Use ticks in this question</b>  <b>not</b> particles expand <b>ignore</b> particles move faster  <b>not</b> warm air is lighter <b>not</b> heat rises <b>not</b> particles more or less dense  less dense warm(er) air rises (2)  <b>allow</b> correct marking points clearly shown in a labelled diagram e.g.  
			<b>Total</b>	<b>5</b>	

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Question			Expected Answers	Marks	Additional Guidance
12	(a)	(i)	300 (1)	1	
		(ii)	more UV absorbed / less UV gets through / less (UV) damage to cells or tissues / more melanin in dark skin (1)	1	allow ora ignore references to light / sunshine / suns rays
	(b)	(i)	ozone / O <sub>3</sub> (1)	1	
		(ii)	protect from <b>ultraviolet</b> (radiation) / absorb <b>ultraviolet</b> (radiation) (1)	1	allow blocks or filters <b>ultraviolet</b> (radiation) ignore reflects <b>ultraviolet</b> (radiation) ignore weakens <b>ultraviolet</b> (radiation)
		(iii)	cfcs / chlorofluorocarbons (1)	1	allow oxides of nitrogen / NO <sub>x</sub> (1) ignore unqualified pollution allow reference to fridges to aerosols <b>only</b> if cfcs are mentioned <b>not</b> greenhouse gases
			<b>Total</b>	<b>5</b>	



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Question			Expected Answers	Marks	Additional Guidance
13	(a)		(long and short) flashes or . _ or on and off (1)  represent letters or numbers or words or information (1)	2	<b>allow</b> . . . and _ _ _ (1) <b>allow</b> blinks <b>allow</b> flickers on and off but <b>ignore</b> just flickers  <b>allow</b> . . . _ _ _ . . . = SOS (2) <b>ignore</b> messages (stem of question)
	(b)	(i)	(pattern of) pits or indents or dips (on surface) (1)	1	<b>mark (b)(i) and (b)(ii) together and look to credit reference to pits or indents in part (ii) for (b)(i)</b> <b>ignore</b> surface contains digital information or 0s and 1s <b>ignore</b> holes or ridges or grooves
		(ii)	reflection (of light from unpitted surface) (1)	1	
			<b>Total</b>	<b>4</b>	

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