

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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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

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

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

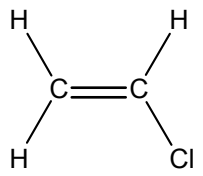
Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	contain (all) essential amino acids / contain amino acids the body cannot make (1)	1	ignore contains all the important amino acids ignore references to growth or repair ignore first class proteins can't be made by the body
		(ii)	12 / twelve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

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

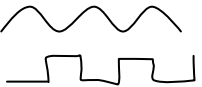


Question		Expected Answers	Marks	Additional Guidance
4	(a)	<p>any two from: vasodilation / idea that arterioles or capillaries or blood vessels near skin surface dilate (1)</p> <p>bringing more blood to surface of skin or top of the blood vessel (1)</p> <p>idea of heat lost (1)</p>	2	<p>Use ticks in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

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

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

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

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	second mark is dependent on the first mark being awarded allow 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 allow correct multiples eg $2\text{CH}_4 + 4\text{O}_2 \rightarrow 2\text{CO}_2 + 4\text{H}_2\text{O}$ (1) allow = instead of \rightarrow not 'and' or '&' for + allow 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 $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}^2 + 2\text{H}^2\text{O}$
		Total	4	

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

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>any one from: short distance between transmitters (1)</p> <p>high positioning of transmitters (1)</p>	1	<p>allow masts / aerials / antennae / dishes for transmitters allow bigger dish or larger area of dish ignore poles or satellites allow more transmitters (1)</p> <p>allow frequent amplification of signal (1) allow positioning of transmitters to avoid obstacles (1)</p>
		Total	3	

Question			Expected Answers	Marks	Additional Guidance
11	(a)	(i)	idea that fibreglass contains (trapped) air (1) idea that air is (good) insulator or a poor conductor (1)	2	allow air pockets for idea of trapped air reject the idea that the air moves and is then trapped by or in the fibreglass allow fibreglass is a (good) insulator or poor conductor if no other mark scored (1) ignore traps heat any mention of heat particles negates second marking point
		(ii)	5 (1)	1	
	(b)		any two from: 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	Use ticks in this question not particles expand ignore particles move faster not warm air is lighter not heat rises not particles more or less dense less dense warm(er) air rises (2) allow correct marking points clearly shown in a labelled diagram e.g. <div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: right; padding-right: 10px;"> warm air expands so warm air rises </div> <div style="text-align: center;"> </div> <div style="text-align: left; padding-left: 10px;"> Colder air falls </div> </div> <p style="text-align: right; margin-right: 50px;">heat source</p>
		Total		5	

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 ₃ (1)	1	
		(ii)	protect from ultraviolet (radiation) / absorb ultraviolet (radiation) (1)	1	allow blocks or filters ultraviolet (radiation) ignore reflects ultraviolet (radiation) ignore weakens ultraviolet (radiation)
		(iii)	cfcs / chlorofluorocarbons (1)	1	allow oxides of nitrogen / NO _x (1) ignore unqualified pollution allow reference to fridges to aerosols only if cfcs are mentioned not greenhouse gases
			Total	5	

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	allow . . . and _ _ _ (1) allow blinks allow flickers on and off but ignore just flickers allow . . . _ _ _ . . . = SOS (2) ignore messages (stem of question)	
	(b)	(i)	(pattern of) pits or indents or dips (on surface) (1)	1	mark (b)(i) and (b)(ii) together and look to credit reference to pits or indents in part (ii) for (b)(i) ignore surface contains digital information or 0s and 1s ignore holes or ridges or grooves
		(ii)	reflection (of light from unpitted surface) (1)	1	
		Total		4	

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