

Science B

General Certificate of Secondary Education

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

Mark Scheme for January 2012

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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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
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Annotations

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt not given
	error carried forward
	information omitted
	ignore
	reject
	contradiction

Subject-specific Marking Instructions

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

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

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Question			Expected Answers	Marks	Additional Guidance
1	(a)		Gazza (1)	1	
	(b)	(i)	calculation: she needs 60g (1)	1	
		(ii)	answer (yes) because she is eating 62g (1)	1	allow ecf from b(i) check the answer is consistent with b(i) first allow she is eating more than RDA / 60g ignore she is eating enough
	(c)		emulsifying fat (droplets) / increasing the surface area of fat (droplets) / breaking down fat droplets (1) lymph / lacteals (1)	2	not fats / fat molecules allow neutralises acids / provides correct pH for lipase allow lymphatic system / lymph capillaries not lymph glands
			Total	5	

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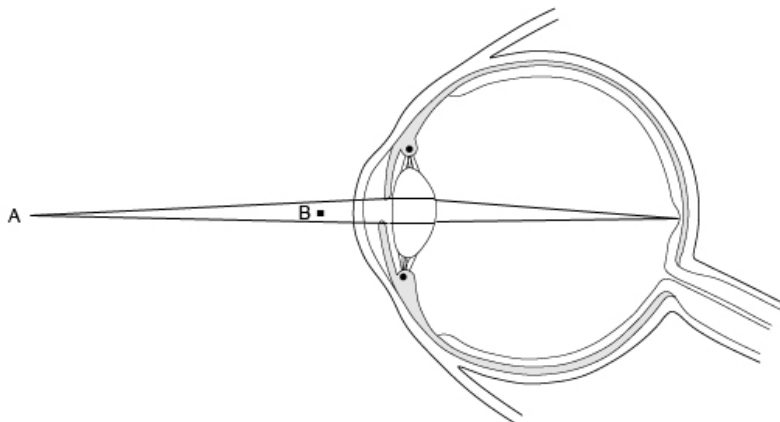
Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	alternative form of a gene (1)	1	ignore a type of gene allow a different type of one gene ignore gene unless qualified
		(ii)	protein (1)	1	
		(iii)	less stress / less fat / cholesterol in diet / less alcohol / (more) exercise / less smoking (1)	1	allow relaxed lifestyle allow less salt in diet ignore eating less sugar in diet / healthy diet / losing weight
	(b)		zero (1) dominant (allele) so neither parent can have the syndrome (1)	2	can only score this mark if probability is correct
			Total	5	

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Question			Expected Answers	Marks	Additional Guidance
3	(a)		O ₂ and CO ₂ (1) correct balancing (1)	2	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
	(b)		lactic acid levels do not get as high / lactic acid levels start to increase later in the race (1) lactic acid causes pain / fatigue / cramp (in muscles) (1)	2	allow lactic acid is produced more slowly ignore lactic acid is not made lactic acid is not produced so quickly so less pain in muscles = 2 marks
	(c)		anabolic steroids (1)	1	
			Total	5	

Question			Expected Answers	Marks	Additional Guidance
4	(a)	(i)		1	bending must coincide with the lens double lines drawn and not clear which is answer = zero lines must meet very close to retina and must meet in fovea (dip in retina) allow if lines are not drawn in lens
		(ii)	any two from: contraction of <u>ciliary</u> muscles (1) slackening of suspensory ligaments (1) lens becomes round(ed) / fat(ter) / wide(r) / thick(er) (1)	2	ignore ligaments relax
	(b)		long sight: eye or lens wrong shape (1) red-green colour blindness: lack of certain cells / receptors in the <u>retina</u> / lack of cones (1)	2	allow lens too thin / not powerful enough eye too short / small (eye) muscles too weak allow specific / certain cells in the retina not working any mention of rods negates this mark
			Total	5	

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Question			Expected Answers	Marks	Additional Guidance
5	(a)		takes a (much) longer time to be formed than it does to use (1)	1	not it cannot be used again it is a fossil fuel is not sufficient ignore it cannot be made again allow it takes a long time to form / was made a long time ago
	(b)	(i)	any two from: boiling point increases as molecular size increases / ora (1) boiling point increases as strength of intermolecular force increases / ora (1) strength of intermolecular force increases as molecular size increases / ora (1)	2	 allow boiling point increases as there are more intermolecular forces allow more intermolecular forces as molecules get bigger allow the use of the term force between the molecules rather than intermolecular force not reference to bonds unless it is clear that it is bonds between molecules
		(ii)	C ₈ H ₁₈ (1)	1	allow H ₁₈ C ₈ / C ₂ H ₆ / C ₅ H ₁₂ subscripts must be correct but allow different order of atoms
	(c)		paraffin (1)	1	
			Total	5	

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Question			Expected Answers	Marks	Additional Guidance										
6	(a)		dodecane + oxygen (1) → carbon dioxide + water (1)	2	allow formulae instead of words allow unbalanced symbol equation allow C ₁₂ H ₂₆ + O ₂ (1) → CO ₂ + H ₂ O (1) + energy = max of 1 mark										
	(b)		any two from: availability (1) physical state / solid, liquid or gas (1) is it toxic (1) will it pollute (the atmosphere) (1) flash point / flammability / ease of burning (1) ease of use (1) storage (1) density (1) will the engine run on the fuel / cost to convert the engine to run on the fuel (1) sustainability / renewable (1)	2	allow amount of named pollutant ignore weight of fuel / cost of fuel / safety unless qualified										
	(c)		The energy released when making bonds is smaller than the energy absorbed when breaking bonds. (1) (tick in third box)	1	<table><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td>The energy released when making bonds is smaller than the energy absorbed when breaking bonds.</td><td>✓</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>					The energy released when making bonds is smaller than the energy absorbed when breaking bonds.	✓				
The energy released when making bonds is smaller than the energy absorbed when breaking bonds.	✓														
	(d)		10 920 (2) but correct substitution of mass and temperature change in equation (1)	2	unit not needed mass must be 100 and temperature change is 26 allow 218.4 or 19740 for one mark										
			Total	7											

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Question			Expected Answers	Marks	Additional Guidance
7	(a)		19 (1)	1	
	(b)	(i)	salad cream / salad dressing / egg / tomato ketchup / sauce / biscuits / breakfast cereals / cakes / desserts / mousses / soft drinks / toffee / chewing gum / ice cream / dried potato / chocolate (coatings) / bread / margarine / low fat spreads / coffee whiteners / topping powders / peanut butter / caramels / cheese / cream / milk (drinks) / yoghurts / frankfurters / sausages / mortadella / luncheon meat / pate / butter (1)	1	ignore mayonnaise
		(ii)	head is hydrophilic and tail is hydrophobic / correct labels on diagram of hydrophilic (head) and hydrophobic (tail) (1) head / hydrophilic end bonds with water molecules / attracts water molecules / join to / sticks to (1) tail / hydrophobic end bonds with oil molecules / attracts oil molecules / join to / sticks to (1)	3	all marks can be awarded from a correctly labelled diagram(s) or a full and clear description allow hydrophilic end of molecule surrounded by water molecules / head surrounded by water molecules (1) allow hydrophobic end of molecule surrounded by oil molecules / tail surrounded by oil molecules (1) ignore water / fat loving
	(c)		any one from: does not react with food / does not react with oil / does not react with water (1) does not dissolve in water / does not dissolve in oil / waterproof / nonporous (1) flexible / squeezable (1) non-toxic (1) cheap (1) easily moulded (1) lightweight / low density (1)	1	ignore transparent / light
			Total	6	

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Question			Expected Answers	Marks	Additional Guidance
8	(a)		lime water (1)	1	allow other ways of indicating answer e.g. ringing or ticking the answer answer on answer line takes precedence
	(b)		$2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$ (1)	1	all formulae must be correct in terms of case and subscript
			Total	2	

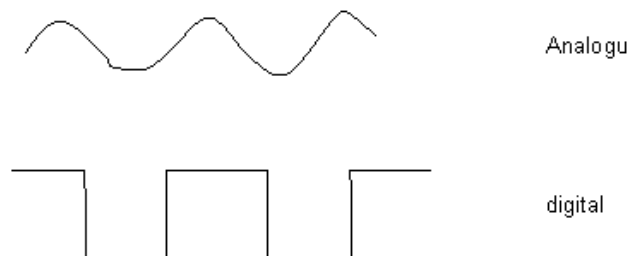
Question			Expected Answers	Marks	Additional Guidance
9	(a)	(i)	reference to trend for temperatures to be very high in recent years (1)	1	allow correct use of figures from graph e.g. average temperature in 2000 is higher than in 1880 (1) allow correct average line drawn on the graph (1) allow temperature is getting higher / increasing / is now the highest it has been (1) ignore it / the trend is increasing, unless qualified not the temperature is increasing every year
		(ii)	any one from: reference to temperatures being random year by year / large amount of variation (1) the scale of 100 years on the time scale is not significantly long (1) the temperature only increases by approximately 1.5°C so not a significant increase (1)	1	allow correct use of figures from graph (1) not it / graph fluctuates or drops allow some years the temperature drops allow only includes one stations recordings
	(b)	(i)	reduced / causes cooling (1)	1	
		(ii)	<u>reflects</u> radiation (from town) back to Earth (1)	1	ignore traps heat / radiation allow heat / infra red
			Total	4	

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Question			Expected Answers	Marks	Additional Guidance
10	(a)	(i)	no medium required (to transfer energy) / does not require particles (to transfer energy)/ conduction and convection require particles(1)	1	ignore can travel through space ignore does not need air or a specific medium
		(ii)	(shiny) foil behind radiators (1)	1	allow put foil in cavity wall of house / in loft / under carpets (1) allow use reflective glass in windows (1) allow reduce area / size of window glass (1) allow reduce room temperature (1)
	(b)	(i)	(warm air is) less <u>dense</u> (1)	1	allow reverse argument (1) ignore hot air rises not heat rises
		(ii)	(£) 125 (1)	1	
			Total	4	

Question			Expected Answers	Marks	Additional Guidance
11	(a)		angle of incidence is greater than critical angle / greater than (angle in range $40 - 42^\circ$) (1)	1	not angle that it hits the surface (1)
	(b)	(i)	analogue – any value / continuously variable (1) digital – on and off / 1 and 0 / only two values (1)	2	<p>allow correct diagrams</p>  <p>Analogue</p> <p>digital</p> <p>allow reference to range of values of wavelength / frequency / amplitude not just values vary</p>
		(ii)	many separate signals sent together / sent at the same time (1)	1	
		(iii)	interference / noise can be removed easily (1)	1	<p>allow less interference / noise in the output (signal) / AW (1) allow explanation involving noise not recognised and amplified (1) ignore good quality / less noise / less interference</p>
			Total	5	

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Question			Expected Answers	Marks	Additional Guidance
12	(a)		299 700 000 / 2.997×10^8 (1)	1	allow 300 000 000 / 3×10^8 (1)
	(b)		line of sight (1) lack of / limited diffraction (1)	2	allow no buildings in way of transmission / so not reflected by buildings (1) allow will not bend around buildings
	(c)		two from it / mobiles frequencies are lower (1) low frequencies have low energy (1) it / mobiles microwaves have lower energy / power (1) mass being heated in a microwave is significantly less than the mass of a human (1)	2	allow converse answers if referring to cookers allow not the correct frequency to vibrate water molecules (1) allow mobiles have longer wavelength (1) allow long wavelengths have low energy (1) not strength allow mass of a human is too large to be heated by a phone
			Total	5	

Question			Expected Answers	Marks	Additional Guidance
13			heat (1) temperature (1)	2	
			Total	2	

