

Science B J640

Gateway Science Suite

General Certificate of Secondary Education

Mark Scheme for the Units

January 2009

J640/MS/R/09

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

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Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

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GCSE Gateway Science B (J640)

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Mark Scheme Guidance

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

 = underlined words must be present in answer to score a mark

ecf = error carried forward

AW = alternative wording

ora = or reverse argument

B621/01 Unit 1: Modules B1, C1 and P1 Foundation Tier

Question		Expected Answers	Marks	Additional Guidance								
1	(a)	36.5 to 37.5 (°C) (1)	1									
	(b)	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;">gains heat</td> <td style="width: 50%; border: none;">loses heat</td> </tr> <tr> <td style="border: none;">respiration</td> <td style="border: none;">sweating (1)</td> </tr> <tr> <td style="border: none;">shivering</td> <td></td> </tr> <tr> <td style="border: none;">exercise (1)</td> <td></td> </tr> </table>	gains heat	loses heat	respiration	sweating (1)	shivering		exercise (1)		2	lose 1 mark for each incorrect answer
gains heat	loses heat											
respiration	sweating (1)											
shivering												
exercise (1)												
	(c) (i)	cholera (1)	1	if no box ticked allow correct answer clearly indicated.								
	(ii)	ingests / destroy / engulfs (bacteria / pathogens) (1) (make / produce) antibodies (1)	2	not kill / eats / swallow / attacks / fights / gets rid of / surrounds incorrect reference to antibodies scores (0) e.g. white blood cells kill antibodies								
		Total	6									

Question		Expected Answers	Marks	Additional Guidance
2	(a)	correct bars drawn (2)	2	all correct = 2 marks 2 or 3 correct = 1 mark margin of error allow $\pm \frac{1}{2}$ square, but tin of peaches must not be zero ignore width of bars
	(b) (i)	60 (1)	1	no need to show working
	(ii)	amino acids (1)	1	allow peptides not polypeptides be tolerant of spelling ignore just "aminos"
	(c)	oxygen(1) carbon dioxide (1)	2	allow O ₂ and O allow CO ₂ penalise incorrect subscript or CO or Co if answer line is blank credit correctly labelled answer in list.
		Total	6	

Question		Expected Answers	Marks	Additional Guidance
3	(a)	DNA (1)	1	allow deoxyribose nucleic acid
	(b)	(i) 19 (1)	1	
		(ii) idea that black is dominant / white is recessive (1) idea of (black gene) inherited / passed on / passed down from father (1)	2	allow black fur / black cat / dad is dominant not references to chromosomes e.g. "black chromosome is dominant" scores 0 ignore black overpowers white or black is stronger than white or dad's DNA is stronger e.g. the black gene from the father is dominant scores 2 allow father was homozygous (for black) / father is BB ignore references to the kittens being heterozygous
		(iii) any correctly named environmental factor / age/ gender/ different genes or DNA (1)	1	allow "the environment" / diet / illness allow higher level answers e.g. "lack of oxygen during pregnancy" ignore any other references to parents or growth rates
		Total	5	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	<p>any two from</p> <p>impaired judgement / loss of concentration (1)</p> <p>poor balance / dizziness (1)</p> <p>poor muscle control / coordination (1)</p> <p>blurred vision (1)</p> <p>vasodilation / heat loss (1)</p> <p>makes you sleepy / tired (1)</p> <p>reaction (time) affected / slows down nervous system/AW (1)</p> <p>slurred speech (1)</p> <p>idea of memory loss (1)</p> <p>lowers inhibitions e.g. more confidence (1)</p> <p>depression (1)</p>	2	<p>ignore feels drunk / causes nausea</p> <p>allow lowers awareness</p> <p>allow no control</p> <p>ignore bad sight</p>
	(b)	<u>cirrhosis</u>	1	<p>ignore liver damage / liver disease / liver cancer</p> <p>allow phonetically correct spellings e.g. seroses (1)</p> <p>not sclerosis</p>
		Total	3	

Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	eggs (1)	1	if answer line blank, allow correctly indicated answer on pictures multiple answers score 0
		(ii)	potatoes (1)	1	if answer line blank, allow correctly indicated answer on pictures multiple answers score 0
	(b)		potatoes / eggs / (any suitable) meat / (any suitable) vegetable / fish / turkey / rice / pasta (1)	1	ignore chicken allow any food usually cooked
	(c)		new substance formed / difficult to reverse (1)	1	allow energy change takes place / colour change ignore shape / appearance / texture / references to change of state
			Total	4	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	perfume (particles) can (easily) reach the nose (1)	1	allow so you can smell it allow so it can spread out / to spread the smell (AW) allow idea of drying e.g. "so it dries" or "so it does not run" ignore for the scent to come out but spread out into the air scores 1
	(b)	any two from non-toxic (1) does not react with water (1) does not irritate skin (1) insoluble in water (1) does not stain clothes (1) must have a (nice) smell /scent (1)	2	ignore references to 'safe to use' allow waterproof / does not wash off easily
	(c)	ensure that they are safe (to use) / to see side effects / if they irritate or harm or damage (skin) (1)	1	not to see if they are ok to use /could kill humans ignore cause reaction (to humans) allow cause bad reaction (to humans)
		Total	4	

Question		Expected Answers	Marks	Additional Guidance								
7	(a)	fizzy pop bottles (1) won't shatter or break (when dropped) / resists attack by water or acids (1)	2	if answer line is blank, allow fizzy bottles ticked, underlined or circled or if indicated in explanation the second mark is conditional on correctly identifying fizzy pop bottles allow low density ignore properties not on the list any reference to low melting point or flexible loses 2 nd mark								
	(b)	does not decay / does not decompose / idea that it takes a long time to break down (1)	1	allow does not rot / does not break down ignore waste away ignore does not break up ignore does not disintegrate / does not deteriorate / does not degrade								
	(c)	any two from: <table border="0"> <tr> <td><u>method</u></td> <td><u>problem caused</u></td> </tr> <tr> <td>use of landfill sites / bury underground (1)</td> <td>because it takes up valuable space (1)</td> </tr> <tr> <td>burning/incineration</td> <td>but makes (toxic) gases / adds to greenhouse gases or effect or global warming / wastes a valuable resource (1)</td> </tr> <tr> <td>recycling (1)</td> <td>but expensive to achieve / sorting plastics is difficult / saves valuable resources (1)</td> </tr> </table>	<u>method</u>	<u>problem caused</u>	use of landfill sites / bury underground (1)	because it takes up valuable space (1)	burning/incineration	but makes (toxic) gases / adds to greenhouse gases or effect or global warming / wastes a valuable resource (1)	recycling (1)	but expensive to achieve / sorting plastics is difficult / saves valuable resources (1)	2	look for two methods, if only one method give credit for correct problem caused allow use a tip (1) ignore simple references to pollution ignore melting ignore references to reusing
<u>method</u>	<u>problem caused</u>											
use of landfill sites / bury underground (1)	because it takes up valuable space (1)											
burning/incineration	but makes (toxic) gases / adds to greenhouse gases or effect or global warming / wastes a valuable resource (1)											
recycling (1)	but expensive to achieve / sorting plastics is difficult / saves valuable resources (1)											
		Total	5									

Question			Expected Answers	Marks	Additional Guidance
8	(a)	(i)	heat (1)	1	allow if answer line is blank credit correctly indicated answers in list
		(ii)	sound (1)	1	allow if answer line is blank credit correctly indicated answers in list
	(b)		<u>exothermic</u> (1)	1	not burning or neutralisation
	(c)		(spirit / fuel / liquid / named fuel) <u>burner</u> (1)	1	not Bunsen burner ignore lamp
	(d)		carbon - 2 (1) hydrogen - 6 (1)	2	
	(e)		oxygen (1)	1	allow O ₂ not O
			Total	7	

Question			Expected Answers	Marks	Additional Guidance
9	(a)	(i)	idea of reflection (of microwaves) (1)	1	<p>allow reflection of heat allow not absorbing microwaves allow to stop microwaves escaping / to keep microwaves in allow because microwaves cannot travel through metal</p> <p>ignore references to microwaves bouncing (off walls) ignore prevents heat escaping ignore references to conduction</p>
		(ii)	microwaves or radiation or energy go through or refract through glass (1)	1	<p>allow (microwaves) not reflected or absorbed by glass allow glass is not heated by microwaves</p> <p>ignore references to melting not to allow heat /heat (energy) to go through</p>
		(iii)	water absorbs microwaves / water heated (by microwaves) / (water) particles gain energy or move faster or vibrate more (1)	1	<p>allow microwaves / "they" go into the water allow water heated faster allow it gets hot or hotter ignore water absorbs heat ignore references to speed of cooking</p>
	(b)		C (1) wavelength (1)	2	
			Total	5	

Question			Expected Answers	Marks	Additional Guidance
10	(a)	(i)	100 (1)	1	allow 200 / 2 if answer line is blank, credit correct answer in table or diagram
		(ii)	20 (1)	1	allow 5000 / 250 if answer line is blank, credit correct answer in table or diagram
		(iii)	air is trapped / AW (1) air is an insulator or poor conductor (1) idea of less / reduced / little convection (1)	2	not heat trapped allow warm air trapped
		(iv)	carpets / underlay / curtains / draught proofing / draught excluders / (cavity) wall insulation (1)	1	allow put on extra clothing not loft / roof insulation or double / triple glazing ignore use of reflective / silver / shiny foil / reference to turning down the heating not just floor insulation but under floor insulation scores (1)
	(b)		(degrees) Celsius / centigrade / °C (1) joules or J (1)	2	allow Kelvin / K (1) Fahrenheit / °F (1) not merely degrees (°) allow kJ or MJ or kWh or kilowatt hour(s) (1) if word is correct ignore symbols
			Total	7	

Question		Expected Answers	Marks	Additional Guidance
11	(a)	cause skin cancer / eye damage / skin damage (1)	1	not merely cancer / damage / suntan allow (sun)burn allow skin ageing
	(b)	any two from: (Rico's skin / dark skin) contains (more) melanin or pigment (1) (darker skins) absorb more UV or radiation (1) less or no UV or radiation reaches (inner) tissues / AW (1)	2	allow RA in terms of light skin allow "more melanin (which) absorbs UV or radiation" scores 2 allow stops UV reaching the (inner) tissues (1) ignore references to filtering out the UV
	(c)	any two from reduces damage or risk (1) allows longer exposure (without damage) / can stay in sun longer (1) less UV / radiation gets through (1)	2	allow idea of increased / more / better protection (1) ignore references to cream lasting longer
		Total	5	

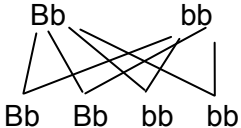
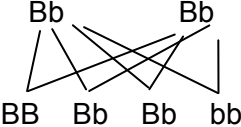
Question	Expected Answers	Marks	Additional Guidance
12	analogue (1) burglar alarms (1) reflection (1)	3	correct order required must clearly be reflection and not refraction
	Total	3	
	Overall Total	60	

B621/02 Unit 1: Modules B1, C1 and P1 Higher Tier

Question			Expected Answers	Marks	Additional Guidance
1	(a)	(i)	dehydration (1)	1	if answer line is blank, allow dehydration circled, underlined or ticked in list above
		(ii)	homeostasis (1)	1	allow negative feedback
	(b)	(i)	any one from take malaria tablets (1) use insect repellent or insecticide (1) description of way to prevent being bitten (1)	1	allow named anti-malarial drugs e.g. larium, quinine ignore reference to injections / vaccination / immunisation / inoculation e.g. cover up / use mosquito net / avoid areas or times where there are mosquitoes / wear protective clothing
		(ii)	mosquito (1)	1	allow <i>anopheles</i> allow mosquito bite
			Total	4	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	60 (1)	1	no need to show working
		(ii)	amino acids (1)	1	allow peptides not polypeptides be tolerant of spelling ignore just "aminos"
	(b)		contains (all) the essential amino acids / have amino acids the body can't make (1)	1	ignore references to essential proteins allow no essential amino acids missing
	(c)		any one from burst blood vessels (1) damage to brain / kidney / eye (1) stroke (1) heart disease / heart attack (1)	1	allow angina not fainting
			Total	4	

Question		Expected Answers	Marks	Additional Guidance
3	(a)	A T C G (1)	1	any order allow all 4 correct words instead of symbols adenine, thymine, cytosine, guanine (1) allow combination of words and letters
	(b)	(i) 19 (1)	1	
		(ii) idea that black is dominant / white is recessive (1) idea of (black gene) inherited / passed on / passed down from father (1)	2	USE TICKS IN THIS QUESTION allow black fur / black cat / dad is dominant not references to chromosomes e.g. "black chromosome is dominant" scores 0 ignore black overpowers white or black is stronger than white or dad's DNA is stronger allow father was homozygous (for black) / father is BB ignore references to the kittens being heterozygous e.g. the black gene from the father is dominant scores 2

Question	Expected Answers	Marks	Additional Guidance																		
(c)	<p>correct genotype for both parents Bb and bb / correct gametes B and b and b and b (1)</p> <p>genotype of offspring Bb and bb correctly shown(1)</p> <p>phenotype of offspring / clear identification of which phenotype gives white cats and black cats (1)</p>	3	<p>USE TICKS IN THIS QUESTION</p> <p>correct Punnett squares or spaghetti diagram without labels scores (2)</p> <div style="text-align: center;"> <table border="1"> <tr> <td></td> <td>b</td> <td>b</td> </tr> <tr> <td>B</td> <td>Bb</td> <td>Bb</td> </tr> <tr> <td>b</td> <td>bb</td> <td>bb</td> </tr> </table>  </div> <p>If, in addition bb is white and Bb is black then scores 3rd mark BUT</p> <div style="text-align: center;"> <table border="1"> <tr> <td></td> <td>B</td> <td>b</td> </tr> <tr> <td>B</td> <td>BB</td> <td>Bb</td> </tr> <tr> <td>b</td> <td>Bb</td> <td>bb</td> </tr> </table>  </div> <p>this loses first mark as parents genotype is incorrect, but ECF on identifying offspring based on these parents</p>		b	b	B	Bb	Bb	b	bb	bb		B	b	B	BB	Bb	b	Bb	bb
	b	b																			
B	Bb	Bb																			
b	bb	bb																			
	B	b																			
B	BB	Bb																			
b	Bb	bb																			
	Total	7																			

Question		Expected Answers	Marks	Additional Guidance
4	(a)	depressant (1)	1	if more than one boxed ticked, scores 0
	(b)	(i) synapse (1)	1	allow synaptic gap / synaptic cleft ignore just gap / cleft
		(ii) any two from idea of (neuro)transmitter or chemical (1) (chemical) diffuses (1) (binds with) receptors (1)	2	USE TICKS IN THIS QUESTION allow acetylcholine (ACh) (1) allow just diffusion for one mark ignore idea of impulse diffusing across the gap eg “it diffuses” for the second mark
	(c)	<u>cirrhosis</u>	1	ignore liver damage / liver disease / liver cancer allow phonetically correct spellings eg seroses not sclerosis
Total			5	

Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	eggs (1)	1	if answer line blank, allow correctly indicated answer on pictures multiple answers score 0
		(ii)	potatoes (1)	1	if answer line blank, allow correctly indicated answer on pictures multiple answers score 0
	(b)		kill microbes or bacteria / improve the texture / improve the taste / make it easier to digest (1)	1	ignore kill germs allow kills named microbes e.g. bacteria, fungi, protozoa, salmonella, parasites ignore kills virus ignore references to removing poisons allow prevent food poisoning allow denatures proteins
	(c)		any two from shape (of protein molecule) changes (1) process is irreversible / (protein is) permanently changed (1) (process is called) denaturing / protein is denatured (1)	2	USE TICKS IN THIS QUESTION allow protein (molecule) breaks down / breaks up allow protein (molecule) unfurls ignore protein molecule expands / shrinks / changes state e.g. molecule changes shape (1) and stays like that (1) allow denaturisation ignore proteins die
Total				5	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	perfume (particles) can (easily) reach the nose (1)	1	<p>allow so you can smell it (1)</p> <p>allow so it can spread out / to spread the smell / AW (1)</p> <p>allow idea of drying e.g. "so it dries" or "so it does not run"</p> <p>ignore for the scent to come out but spread out into the air scores 1</p>
	(b)	<p>(high energy) particles escape from liquid (1)</p> <p>forces or attractions between the particles in the liquid overcome or weakened or broken (1)</p>	2	<p>USE TICKS IN THIS QUESTION</p> <p>allow idea of particles become more spread out or separated (1)</p> <p>ignore references to diffusion</p> <p>allow bonds instead of forces</p>
	(c)	<p>any one from:</p> <p>cruel (to animals) / ethical objection (1)</p> <p>may work differently in different species / animals are not the same as humans (1)</p>	1	<p>allow it could hurt / harm / kill animals / inhumane</p> <p>allow references to animal rights</p> <p>e.g. animal can't speak for itself</p> <p>e.g. some people think animals have the same rights as humans</p> <p>e.g. animals have no control over what happens to them</p> <p>e.g. it might not hurt the animal but could harm the human</p> <p>allow may give unreliable or inaccurate results</p>
		Total	4	

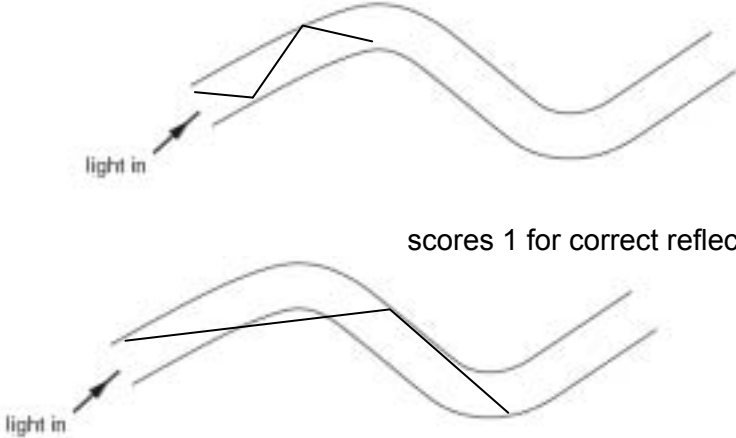
Question		Expected Answers	Marks	Additional Guidance
7	(a)	fizzy pop bottles (1) won't shatter or break (when dropped) / resists attack by water or acids (1)	2	if answer line is blank, allow fizzy bottles ticked, underlined or circled or if indicated in explanation the second mark is conditional on correctly identifying fizzy pop bottles allow low density (1) ignore properties not on the list any reference to low melting point or flexible loses 2 nd mark
	(b) (i)	(forces or bonds between polymer chains) are weak (1)	1	allow polymer chains are not connected together allow it has no cross-linking allow no bonds between polymer chains any reference to bonds within the molecule are weak scores 0
	(ii)	cross links or bonds between chains prevent movement of chains (past each other) (1)	1	allow strong intermolecular bonds ignore strong intermolecular forces between molecules ignore polymer has strong bonds – must have idea of bonds between polymer molecules
Total			4	



Question	Expected Answers	Marks	Additional Guidance
8 (a)	paraffin(1) idea of least (mass of) fuel to produce same energy change (1)	2	allow 0.5 explanation mark is dependent on identifying correct fuel
(b)	<u>exothermic</u> (1)	1	not burning or neutralisation
(c)	100 x 4.2 x 20 (1) but 8400 (J) scores 2	2	allow 67.2 (J) or 0.8 x 4.2 x 20 (1) if candidate continues calculation to calculate energy per gram, allow 10,500 (J/g) scores 2
(d)	ethanol + oxygen → carbon dioxide + water (1)	1	allow correct formulae or mixture of words and formulae eg C ₂ H ₅ OH + O ₂ → CO ₂ + H ₂ O (1) eg ethanol + O ₂ → carbon dioxide + H ₂ O (1) allow = instead of → not ethanol + O → carbon dioxide + H ₂ O not + energy must use ethanol not just fuel ignore balancing if "and" used in the equation, scores 0
(e)	$ \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array} + 2 \text{O}=\text{O} \longrightarrow \begin{array}{c} \text{O} \\ \\ \text{C} \\ \\ \text{O} \end{array} + 2 \begin{array}{c} \text{H} & \text{O} \\ & / \ \backslash \\ & \text{H} \ \ \ \ \text{H} \end{array} $ <p style="text-align: center;">OR</p> $ \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array} + \begin{array}{c} \text{O}=\text{O} \\ \text{O}=\text{O} \end{array} \longrightarrow \begin{array}{c} \text{O} \\ \\ \text{C} \\ \\ \text{O} \end{array} + \begin{array}{c} \text{H} & \text{O} \\ & / \ \backslash \\ & \text{H} \ \ \ \ \text{H} \end{array} $	1	allow CH ₄ + 2O ₂ → CO ₂ + 2H ₂ O or mix of molecular formulae and displayed formulae allow = instead of → allow correct multiples watch for balancing on existing equations
	Total	7	

Question			Expected Answers	Marks	Additional Guidance
9	(a)	(i)	Idea of reflection (of microwaves) (1)	1	<p>allow reflection of heat allow not absorbing microwaves allow to stop microwaves escaping / to keep microwaves in allow because microwaves cannot travel through metal</p> <p>ignore references to microwaves bouncing (off walls) ignore prevents heat escaping ignore references to conduction</p>
		(ii)	microwaves or radiation or energy go through or refract through glass (1)	1	<p>allow (microwaves) not reflected or absorbed by glass allow glass is not heated by microwaves</p> <p>ignore references to melting not to allow heat /heat (energy) to go through</p>
	(b)	(i)	water particles vibrate more or move more quickly / water molecules gain (kinetic) energy (1)	1	<p>ignore 'move around more' ignore heating of particles eg it heats them up</p>
		(ii)	conduction or convection (heats the rest of the food) (1)	1	<p>allow higher level answers e.g. the vibrations in water molecules passed on (to other particles) allow (heat) energy is passed on (to other particles) ignore heat passed on allow idea of movement of warm water molecules ignore radiation</p>
	(c)		<p>cooking oil has a lower (specific) heat capacity</p> <p>OR</p> <p>oil contains less heat or energy (1)</p>	1	<p>ignore oil hotter / water colder</p> <p>allow correct reverse argument</p> <p>allow it takes less energy to heat it</p> <p>assume "it" refers to cooking oil unless stated e.g. it has a lower shc (1)</p>
Total				5	

Question		Expected Answers	Marks	Additional Guidance
10	(a)	<p>any three from</p> <p>idea of transfer of energy from warm air to glass (1)</p> <p>idea of increased vibration of (glass) particles (1)</p> <p>idea of collisions or transfer of energy between (glass) particles (1)</p> <p>idea of collisions or transfer of energy (from glass) to (cool) air particles (1)</p>	3	<p>USE TICKS IN THIS QUESTION</p> <p>allow reference to molecules instead of particles</p> <p>any references to heat particles scores 0</p>
	(b) (i)	100 (1)	1	<p>allow 200 / 2 (1)</p> <p>if answer line is blank, credit correct answer in table or diagram</p>
	(ii)	20 (1)	1	<p>allow 5000 / 250 (1)</p> <p>if answer line is blank, credit correct answer in table or diagram</p>
	(c)	<p>4000 (2)</p> <p>BUT $\frac{3000}{0.75}$ or $\frac{3000 \times 100}{75}$ or $\frac{3000}{75\%}$ or $\frac{3000 \times 4}{3}$</p> <p>scores 1</p>	2	only look for the working out mark if the final answer is incorrect
		Total	7	

Question		Expected Answers	Marks	Additional Guidance
11	(a)	12 (1)	1	if answer line is blank allow 12 underlined, ticked or circled
	(b)	<p>any two from:</p> <p>(Rico's skin / dark skin) contains (more) melanin or pigment (1)</p> <p>(darker skins) absorb more UV or radiation (1)</p> <p>less or no UV or radiation reaches (inner) tissues / AW (1)</p>	2	<p>USE TICKS IN THIS QUESTION</p> <p>allow ora in terms of light skin</p> <p>allow "more melanin which absorbs UV or radiation" scores 2</p> <p>allow stops UV reaching the (inner) tissues</p> <p>ignore references to filtering out the UV</p>
		Total	3	

Question	Expected Answers	Marks	Additional Guidance
12 (a) (i)	reflection in text or shown once correctly on diagram scores (1) BUT total internal reflection in text or from correctly labelled diagram scores (2)	2	<p>Ignore bouncing Ignore references to refract</p> <p>mark text first</p> <p>on diagram, reflections must be at surface of fibre. Angles of reflection do not have to be accurate. Ignore entry and exit rays</p>  <p>scores 1 for correct reflection idea</p> <p>scores 0 as ray is not contained within fibre</p>

		(ii)	analogue continuously variable or has many values OR digital in steps / digital is either on or off or 1 and 0 (1)	1	for digital allow in steps or high and low (1) allow correct diagram e.g. digital is  analogue is 
	(b)	(i)	multiplexing or many signals can be interleaved / AW (1)	1	not ideas about different frequencies allow multiple signals can be sent on a single channel ignore can send multiple signals
		(ii)	noise is not recognised (1)	1	allow noise or interference is not amplified allow receiver can tell the difference between 1s and 0s even with noise or interference allow digital can reject noise or interference ORA allow digital signals can be corrected
			Total	5	
			Overall Total	60	

B622/01 Unit 2: Modules B2, C2 and P2 Foundation Tier

Question		Expected Answers	Marks	Additional Guidance
1	(a)	ants – pooter beetles – pit-fall trap butterflies – net all correct (2) one or two correct (1)	2	
	(b) (i)	any two from size / length / width (1) different (pattern) / (different) markings / (different number of) spots (1) (different) antennae (1) (different) legs (1) (different) eyes (1) (different) mouth parts (1) (different) wing covers (1) (different) shape (1)	2	allow (different) colour (1) ignore all have spots not number of antennae not number of legs allow different shells
	(ii)	B and E (1) look similar / look same / same number of spots / same characteristics (1)	2	second mark is dependent on B and E being stated allow same size (1) ignore similar spots
	(c)	fossils (1)	1	allow specific examples, e.g. in amber / impressions in rocks allow beetles turned into rock
		Total	7	

Question		Expected Answers	Marks	Additional Guidance
2	(a)	bird (1) predator (1)	2	allow either order allow other ways of showing answers such as ringing or underlining words answers on answer line takes precedence
	(b)	any four from large claws / sharp claws / long claws / strong claws (1) to hold fish / to grip fish / to kill fish / to carry fish / AW (1) sharp beak / strong beak / pointed beak / hooked beak (1) to tear fish / kill fish / AW (1) powerful wings / large wings / strong wings / big wings (1) to chase (fish) / carry away fish / glide over water / AW (1) eyes at front of head (1) to judge distance (1) good eyesight / sharp eyesight (1) spot prey from distance (1)	4	maximum of 3 marks if only features are written maximum of 3 marks if only reasons are given four marks must have at least one feature and one reason beware of giving marks for catching or hunting fish (given in stem) ignore long beak ignore to eat fish allow large wingspan allow to fly faster ignore eyes on side of head
	(c)	(in danger of) becoming extinct / dying out (1)	1	allow not many left / population very low not population has been wiped out but allow population likely to be wiped out not it is extinct ignore population decreasing
		Total	7	

Question		Expected Answers	Marks	Additional Guidance
3	(a)	water (1) oxygen (1)	2	must be in correct order allow H ₂ O allow O ₂ if both word and formulae given ignore incorrect formula not O
	(b)	reduce carbon dioxide (in air) / trees take in carbon dioxide / carbon dioxide used in photosynthesis / AW (1)	1	allow remove carbon dioxide not plants breathe in carbon dioxide ignore plants breathe out oxygen
	(c)	tall trees get more light / small trees get less light (1)	1	allow not enough light (for small trees) / small trees shaded from the light ignore competition for nutrients / water not tall trees absorb light / tall trees absorb all the light / small trees get no light not tall trees block out the light but allow block out some of the light
	(d)	(make it from) glucose (1)	1	ignore photosynthesis allow carbon dioxide and water / carbon, hydrogen and oxygen / starch / sugar (1) not glucose and an incorrect substance e.g. glucose + amino acid
	(e)	living organism that lives on another living organism that cause it harm / AW (1)	1	living organism can be a plant or an animal answer must imply harm e.g. animal that lives off another in a win lose situation
		Total	6	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	molten rock cools down / magma cools down / lava cools down / liquid rock cools down (1)	1	allow molten rock crystallises / magma crystallises / lava crystallises allow molten rock solidifies / magma solidifies / lava solidifies / liquid rock solidifies allow molten rock hardens / magma hardens / lava hardens / liquid rock hardens not liquid rock dries out etc.
	(b)	molten rock (that erupts from a volcano) (1)	1	allow liquid rock / melted rock allow magma that erupts from a volcano but not just magma not liquid rock under the Earth's surface / magma under the Earth's surface / liquid rock cools down / hot rock ignore liquid substance - must state rock or imply rock e.g. lava or magma
	(c)	any two from predict future eruptions / warn people when volcano will erupt / AW (1) to see if the volcano is active or dormant / find out why eruptions happen / find out how eruptions happen / research the structure of volcano / AW (1) gain information on the Earth's structure / study plate tectonics / study rocks under the Earth's surface / AW (1)	2	allow to find out about volcanoes (1)
		Total	4	

Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	amalgam- mercury brass- copper and zinc solder- lead and tin all three correct (2) one or two correct (1)	2	
		(ii)	amalgam - filling teeth solder - joining electrical components steel - making car bodies all three correct (2) one or two correct (1)	2	
	(b)		electrolysis (1)	1	allow other ways of indicating correct answer such as ringing answer, underling answer or ticking answer answer on answer line takes precedence
Total				5	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	density - low density (1) corrosion - rusts / corrodes (1) elec conductor - good electrical conductor (1)	3	allow lower density / less dense (1) allow yes (1) allow conducts / yes / good (1)
	(b)	saves (natural) resources / reduces disposal problems (1)	1	allow saves money / saves energy / less mining / both are finite resources / reduces pollution / less greenhouse gases made / reduces greenhouse effect / reduces global warming / reduces waste / reduces use of land-fill sites / reduces amount of scrap metal / less harmful emissions ignore so it can be used again
		Total	4	

Question		Expected Answers	Marks	Additional Guidance
7	(a)	zinc / hydrochloric acid (1)	1	allow zinc and hydrochloric acid allow Zn / HCl
	(b)	(i) 6 (minutes) (1)	1	
		(ii) acid runs out / AW (1)	1	allow no more acid / no more HCl / one of the reactants has run out ignore no more gas is made not zinc has run out
		(iii) any two from increase temperature / heating (1) use more concentrated acid / AW (1) use powdered zinc / break zinc into smaller pieces (1) use a catalyst (1) stir / shake (1)	2	allow use a stronger acid / use a more pure acid (1) allow explanations of methods given e.g. increase temperature (1) because particles have more energy (1) and more collisions (1) increase concentration (1) because particles are more crowded (1) and more collisions (1) powdered zinc (1) has more surface area (1) so more collisions (1)
	(c)	$\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$ formulae (1) balancing (1)	2	allow = instead of an arrow allow any correct multiple not and or & instead of + balancing mark is dependent on correct formulae symbols must have correct upper and lower cases e.g. ZN, CL, ZN are incorrect. With C it is difficult to tell if it is upper or lower case so more latitude will have to be given
Total			7	

Question		Expected Answers	Marks	Additional Guidance
8	(a)	light (1) electricity (1) direct (1)	3	led is a useful way to remember the answer
	(b)	any one from low maintenance (1) no power cables / use in remote areas / no wires (1) long life (1) renewable energy source / sunlight does not run out (1) no polluting waste (1) rugged (1) no need for fuel / energy resource is free / uses free energy (1)	1	ignore always available ignore sun does not run out allow no pollution / no waste / no greenhouse gases / no global warming effect ignore better for the environment ignore cheaper / electricity is free
	(c)	any one from biomass / wood / straw / manure (1) wind (1) water / waves / tide / hydroelectric power (1) geothermal (1)	1	allow suitable named plants e.g. tree, rape, sugar beet, sugar cane ignore plants on its own allow biofuels / bioethanol / biodiesel (1)
		Total	5	

Question		Expected Answers	Marks	Additional Guidance
9	(a)	telescope / binoculars (1)	1	allow radio telescope / scanning from satellite
	(b)	ice and dust / ice and rock (1)	1	both needed for 1 mark
	(c)	elliptical (1)	1	allow egg shaped, oval allow correct answers in terms of distance from Sun at different points of orbit allow an oval diagram not eclipse / ecliptic i.e. words with a 'c' as the second letter
	(d)	any two from crater / (big) holes in ground (1) explosion at point of impact / hot rocks ejected / AW (1) death and destruction (1) sunlight blocked (by dust) (1) climate change / ice-age (1) flooding (1)	2	ignore fires (given in stem) allow people killed / cities or buildings destroyed / animals killed / plants killed / extinction of organisms (1) ignore destruction of planet allow earthquakes / tsunami
	(e)	any two from unusual elements found / unusual rocks found / unusual minerals found (1) craters / (big) holes in ground (1) (sudden) change in fossil numbers (1) (sudden) change in type of fossil numbers (1)	2	allow rocks from space / rock from the asteroid / parts of asteroids found / AW (1) ignore fire and animal extinction fossils on its own is not enough
		Total	7	

Question		Expected Answers	Marks	Additional Guidance
10	(a)	alpha (1) gamma (1)	2	allow answers ticked or underlined if one incorrect answer max 1 if two incorrect answers 0
	(b)	reduces / gets less / gets smaller (1)	1	not slows down
	(c)	any two from protective clothing / gloves / goggles / laboratory coat (1) keep distance (from class) / teacher as far as possible away from source (1) short exposure time (1) tongs / do not handle (1) shielded storage / lead box for storage (1) safety screen (1) no students to handle (1)	2	ignore masks
		Total	5	

Question		Expected Answers	Marks	Additional Guidance
11	(a)	fridge used for longer / fridge used all the time / fridge used for more (1)	1	allow ora e.g. kettle used for less time / kettle not used as much allow calculation of kW-hours to show they are the same
	(b)	104 (1)	1	allow 52 x 2 allow £1.04 allow 1.04 if there is evidence of a correct calculation to get 104 e.g. 52 x 2
	(c)	watt(s) / kilowatt(s) (1)	1	not what not W / kW
		Total	3	

		Overall Total	60	
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B622/02 Unit 2: Modules B2, C2 and P2 Higher Tier

Question		Expected Answers	Marks	Additional Guidance
1	(a)	water (1) oxygen (1)	2	must be in correct order allow H ₂ O allow O ₂ not O if words and formula given ignore incorrect formula
	(b)	reduce carbon dioxide (in air) / trees take in carbon dioxide / carbon dioxide used in photosynthesis / AW (1)	1	allow remove carbon dioxide not plants breathe in carbon dioxide ignore plants breathe out oxygen
	(c)	tall trees get more light / small trees get less light (1)	1	allow not enough light (for small trees) / small trees shaded from the light ignore competition for nutrients / water not tall trees absorb light / tall trees absorb all the light not tall trees block out light but allow block out some of the light
	(d)	(make it from) glucose (1)	1	ignore photosynthesis allow carbon dioxide and water / carbon, hydrogen and oxygen / starch / sugar (1) not glucose and an incorrect substance e.g. glucose + amino acid
	(e)	living organism that lives on another living organism that cause it harm / AW (1)	1	living organism can be a plant or an animal answer must imply harm e.g. animal that lives off another in a win lose situation
		Total	6	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	when lynx (predator) increase, hares (prey) decrease (1) when lynx decrease, hares increase (1)	2	allow idea of time delay (1) allow reference to size of peaks and troughs (1) allow inverse relationship (2)
		(ii)	foxes eat other things / rabbits have other predators / AW (1)	1	allow human influences e.g. hunting / myxomatosis allow foxes have other predators
	(b)		idea of limited hunting / set quotas / only kill a few at a time / AW (1)	1	Only kill as many as are born / enough left to breed / allow give time to breed. ignore reference to breeding in captivity
	(c)		spread load / spread weight / less pressure (1)	1	allow don't sink into snow not just increased surface area
	(d)		insects (1) colourful / bright / scented petals / flowers (1)	2	allow named examples of insects (1) allow produce nectar / smell / sticky pollen / shape = landing platform (1) read both parts and mark them together if wind mentioned in pollination max 1 for correct insect answer to second part. eg wind pollination X – bees attracted to petals collect pollen (1) ignore reference to other animals
			Total	7	

Question		Expected Answers	Marks	Additional Guidance
3	(a) (i)	fossils not formed / fossils not found / fossils have been destroyed / fossilisation is a rare event (1)	1	allow fossils may be under the sea / in an inaccessible place
	(ii)	any three from idea of variation / mutations (1) idea of competition for limited resources (1) idea of survival of the fittest (1) idea of inheritance of successful characteristics (1)	3	allow Adapted to environment / had different characteristics eg fins / dolphins have flippers (1) allow adaptations were advantageous to living in water / idea that adaptations helped them to survive (1) allow characteristics / adaptations passed on (through breeding) (1) best adapted breed = (2)
	(b) (i)	mammals have lungs / fish have gills / mammal have fur / fish have (wet) scales / mammals produce milk / ora (1) mammals are warm blooded (1)	1	allow mammals have live young / fish lay eggs assume unqualified answers refer to mammals
	(ii)	live in similar / same environment / have similar / same way of life / they both live in the sea / need to swim (1)	1	allow convergent evolution / evolution of analogous organs
	(c)	ecosystem (1)	1	allow correct answer underlined, circled or ticked in list if answer line is blank
		Total	7	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	<p>any two from predict future eruptions / warn people when volcano will erupt / AW (1)</p> <p>to see if the volcano is active or dormant / find out why eruptions happen / find out how eruptions happen / research the structure of volcano (1)</p> <p>gain information on the Earth's structure / study plate tectonics / study rocks under the Earth's surface / AW (1)</p>	2	allow to find out about volcanoes
	(b)	slow cooling gives large crystals / fast cooling gives small crystals (1)	1	allow because rate of cooling is different / have different cooling times
	(c)	subduction (1)	1	
		Total	4	

Question		Expected Answers	Marks	Additional Guidance
5	(a)	amalgam- mercury brass- copper and zinc solder- lead and tin all three correct (2) one or two correct (1)	2	
	(b)	copper sulfate solution impure copper anode pure copper cathode	2	3 correct scores 2 1 or 2 correct scores 1
		Total	4	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	<p>any two from transparent / can see through it (1) resistant to impact / does not break easily / can withstand collisions / shatterproof (1) can be toughened (1) easy to shape (1) waterproof /does not dissolve / react in water (1)</p>	2	<p>ignore strong or references to cleaning /scratchproof / hardwearing</p> <p>allow inert / un-reactive (1) ignore just weatherproof</p>
	(b) (i)	gives better fuel economy / cheaper to run / AW (1)	1	<p>allow car will be lighter / weigh less / less mass can accelerate quicker/ travel faster</p> <p>not aluminium will be lighter</p>
	(ii)	<p>aluminium will have a longer lifetime / AW (1)</p> <p>because aluminium corrodes less than steel / steel rusts but aluminium does not does not corrode (1)</p>	2	<p>mark as one answer</p> <p>not does not rust as an explanation for does not corrode ignore does not need painting</p> <p>allow aluminium forms a protective coat /protective aluminium oxide / protective layer / protective film (1)</p> <p>if no marks scored in part (i) and no marks scored in (ii) allow 1 mark for the answer to part (i) in part (ii)</p>
		Total	5	

Question		Expected Answers	Marks	Additional Guidance
7	(a)	10.5 - 12 (minutes) (1)	1	
	(b)	substance which speeds up a reaction (1)	1	allow remains unchanged / changes rate of reaction
	(c)	greater surface area / more frequent collisions / collisions more often / more chance of collision (1)	1	allow more exposed particles per unit surface area not just more collisions
	(d)	any two from particles move faster / particles have more energy (1) more frequent collisions / AW (1) more energetic / successful / effective collisions (1)	2	ignore vibrations allow more chance of collisions (1) allow collisions are harder / more powerful / with more force (1) allow more collisions scores 1 if no other marks awarded
	(e)	$\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$ formulae (1) balancing (1)	2	allow = instead of an arrow allow any correct multiple not and or & instead of + balancing mark is dependent on correct formulae symbols must have correct upper and lower cases e.g. ZN, CL, ZN are incorrect. With C it is difficult to tell if it is upper or lower case so more latitude will have to be given
		Total	7	

Question		Expected Answers	Marks	Additional Guidance
8	(a)	<p>any one from low maintenance (1) no power cables / use in remote areas / no wires (1) long life (1) renewable energy source / sunlight does not run out (1) no polluting waste (1)</p> <p>rugged (1) no need for fuel / energy resource is free / uses free energy (1)</p>	1	<p>ignore always available</p> <p>ignore sun does not run out</p> <p>allow no pollution / no waste / no greenhouse gases / no global warming effect (1) ignore better for the environment</p> <p>ignore cheaper / electricity is free</p>
	(b)	<p>less light falling on photocell / effective photocell area reduced (1)</p>	1	<p>not no light ignore shaded</p>
	(c)	<p>(light) energy / photons absorbed by photocell (1)</p> <p>idea of electrons knocked loose from silicon / atoms / particles in photocell (1)</p> <p>electrons flow / idea of current if linked to electrons (1)</p>	3	<p>ignore sun or sunlight allow higher level answers hole / positive movement in p-type (1) electron / negative movement in n-type (1)</p> <p>allow electrons leave / become free from atom / particle / silicon (1)</p>
		Total	5	

Question		Expected Answers	Marks	Additional Guidance
9	(a)	ice and dust / ice and rock (1)	1	both needed for 1 mark
	(b)	elliptical (1)	1	allow egg shaped, oval allow correct answers in terms of distance from Sun at different points of orbit allow an oval diagram not eclipse / ecliptic i.e. words with a 'c' as the second letter
	(c)	any two from unusual elements found / unusual rocks found / unusual minerals found (1) craters / (big) holes in ground (1) (sudden) change in fossil numbers (1) (sudden) change in type of fossil numbers (1)	2	allow rocks from space / rock from the asteroid / parts of asteroids found (1) ignore fire and animal extinction fossils on its own is not enough
		Total	4	

Question		Expected Answers	Marks	Additional Guidance
10	(a)	cosmic rays (1) granite rocks (1)	2	if additional answers circled, -1 mark for each additional, minimum 0
	(b)	particles can gain electrons owtte (1)	1	ignore reference to ionising radiation / heating
	(c)	reduces / gets less / gets smaller (1)	1	not slows down
	(d)	any two from landfill (1) encased in glass (1) buried underground / AW (1) reprocessed (1) piped out to sea (1) store in lead lined containers (1) store under water (1)	2	allow reused (1) put in steel drums
		Total	6	

Question		Expected Answers	Marks	Additional Guidance
11	(a)	1200 (2) but $0.6 \div 0.5$ for 1	2	allow 1.2 kW (2) 1.2 W (1)
	(b)	7.2 (1)	1	allow 7 no ecf
	(c)	advantage costs less (1) disadvantage operating overnight (1)	2	allow idea of having to store overnight without knowing following day's demand - night storage heaters (1) allow additional meters / bill / standing charges (1) not always available
		Total	5	
		Overall Total	60	

Grade Thresholds

General Certificate of Secondary Education
Science B (Specification Code J640)
January 2009 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
B621/01	Raw	60	-	-	-	33	27	21	16	11	0
	UMS	69	-	-	-	60	50	40	30	20	0
B621/02	Raw	60	43	34	25	17	12	9	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B622/01	Raw	60	-	-	-	37	30	23	17	11	0
	UMS	69	-	-	-	60	50	40	30	20	0
B622/02	Raw	60	47	39	31	23	16	12	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A*	A	B	C	D	E	F	G	U
J640	300	270	240	210	180	150	120	90	60	0

The cumulative percentage of candidates awarded each grade was as follows:

	A*	A	B	C	D	E	F	G	U	Total No. of Cands
J640	0.7	7.8	29.9	62.1	86.5	93.8	97.9	99.4	100.0	676

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

14 – 19 Qualifications (General)

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Facsimile: 01223 552627

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Facsimile: 01223 552553