

Science B

General Certificate of Secondary Education

Unit **B622/02**: Unit 2: Modules B2, C2, P2 (Higher Tier)

Mark Scheme for January 2011

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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)	Most animals are more compact than plants so they can move (1)	1	more than one tick scores zero
	(b) (i)	$C_6H_{12}O_6$ (1)	1	numbers must be subscript chemical symbols can be in any order eg $C_6O_6H_{12}$ scores (1) ignore equation unless glucose specifically labelled ignore any numbers in front of formula eg $6C_6H_{12}O_6$ scores (1)
	(ii)	for storage (1)	1	allow easier to store ignore store as fats and oils allow higher level answers eg sugar is soluble (1) eg starch is insoluble / stays inside the cell (1) eg so starch does not affect osmosis (1) assume it refers to starch unless otherwise stated
	(c)	any one from: spines to reduce water loss / stop animals eating it / for protection (1) surface area to volume ratio to reduce water loss (1) thick OR waxy cuticle to reduce water loss (1) green (stem) for photosynthesis (1) thick OR large stem to store water (1) no leaves / fewer stomata so less surface area for water loss (1)	1	must have an adaptation and matching reason for mark allow spikes / needles as equivalent to spines allow keep predators away (1) allow rounded shape to reduce surface area to volume ratio (1) allow SA and vol as abbreviations allow ribs OR stem expand to store water (1) allow store water to withstand drought (1)
		Total	4	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	Birds have beaks reptiles have teeth. (1)	1	more than one tick scores zero
		(ii)	some (soft) parts do not fossilise / fossilisation is rare / there are fossils still to be discovered / some fossils are in parts of the world we can't get to (1)	1	allow fossils may have been destroyed (1) allow not all animals fossilise (1) allow some parts of animal decay (1)
	(b)		more jobs / spend more money in local businesses (1)	1	allow examples of jobs / businesses (1) ignore unqualified reference to tourism eg more tourists (0) increases tourism (0) BUT more money from tourists (1) more tourism business (1)
	(c)		they eat the(ir) fish / less fish for the fishermen (1)	1	allow reverse argument (1) eg if not protected there will be more fish for the fishermen (1) so the fishermen can catch more fish (1) allow because they want the fish (for themselves) (1) allow they eat all the fish (1)
Total				4	

Question		Expected Answers	Marks	Additional Guidance
3	(a)	1300 (2) but if answer is incorrect 6500 /100 x 20 or 6500/5 or 6500 x 0.2 (1)	2	
	(b) (i)	<u>acid rain</u> (1)	1	not global warming eg increases global warming and acid rain (0)
	(ii)	no (no mark) rise in fish population is not significant / no overall rise in graph / no clear pattern in graph / AW (1)	1	if yes score (0) allow idea that there is no evidence that salmon are affected by the pollution / AW (1) allow graph still low (1) allow insufficient time to demonstrate trend / AW (1) allow there may be other reasons for the increase in catch / AW (1) allow only refers to number caught not actual population / AW (1)
	(c)	not accurate because not enough samples / samples may not represent the whole area (1)	1	allow reference to values eg E may be an anomaly because there are none in there / it is very different to the other samples (1)
		Total	5	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	<u>binomial</u> (1)	1	
	(b)	(i) any four from: poison / kill (1) idea of resistance (1) selection of the best or fittest rat / better adapted (to survive) / survival of the fittest (1) idea of variation / mutation (1) pass on adaptation to next generation / change in gene frequency / more resistant rats in each new generation (1)	4	USE TICKS FOR THIS QUESTION allow higher level answers eg anticoagulant / AW (1) ignore reference to immunity / tolerance
		(ii) reference to acquired characteristics passed on to offspring / AW (1)	1	allow parents become resistant to warfarin so offspring do as well (1) allow Lamarck had no knowledge of genes OR mutation (1) ignore reference to immunity / tolerance
	(c)	lack of evidence OR proof / no knowledge of genetics (1)	1	ignore reference to religion / creation theory / reference to relationship to apes
		Total	7	

Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	calcium carbonate → carbon dioxide + calcium oxide (1)	1	allow $\text{CaCO}_3 \rightarrow \text{CO}_2 + \text{CaO}$ (1) allow mix of formulae and names symbols must be correct and numbers as subscript allow = sign for arrow not and for + not + heat in equation but allow heat above arrow
		(ii)	a reaction in which one substance is changed into two or more new substances (by heat) (1)	1	allow breaking down / up / split (a substance using heat) (1) allow decomposes (1) allow making two (or more) substances from one (1) not breaks down into two elements ignore disintegrate ignore rot / decay ignore just bonds are broken
	(b)		any two from: concrete is hard (1) steel flexible (1) steel is strong (1)	2	ignore concrete is strong
Total				4	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	0.3 (g) (1)	1	
	(b)	answer in the range 2.8 - 3.0 (1)	1	allow answer in the range 2min48s – 3min0s (1) allow range within range specified (1)
	(c) (i)	powdered chip curve is steeper / has a larger gradient (1)	1	allow same volume of gas produced in a shorter time / reaction finishes in a shorter time (1) allow levels off / becomes straight in shorter time (1) ignore faster time allow reverse argument (1)
	(ii)	larger (surface) area (1) more collisions (1)	2	allow more particles exposed (1) allow more chance of collisions (1) allow higher level answer increases frequency of collisions (1) ignore faster collisions
	(d)	0.6 (g/minute) (1)	1	
		Total	6	

Question			Expected Answers	Marks	Additional Guidance
7	(a)	(i)	continental and oceanic (1)	1	must get both answers correct for 1 mark
		(ii)	<p>DIAGRAM plates moving apart / together / subducted (1)</p> <p>OR both convection currents shown (in mantle) + label (1)</p> <p>BUT plates moving apart / together linked to the direction of the convection currents in mantle (2)</p> <p>WRITTEN DESCRIPTION convection currents / subduction / AW (1) link direction of movement to direction of convection currents (1)</p>	2	<p>convection current (1)</p> <p>convection current (2)</p> <p>allow diagrams showing plates moving apart N.B. convection currents must be labelled or written on answer line ignore unqualified reference to convection</p>
	(b)		<p>any one from: slow cooling produces large crystals (1) fast cooling produces small crystals (1)</p>	1	allow rate of cooling different (1)
Total				4	

Question		Expected Answers	Marks	Additional Guidance
8	(a)	boxes filled in correctly photosynthesis combustion respiration (2)	2	1 or 2 correct 1 mark 3 correct 2 marks
	(b)	$2\text{CO} + 2\text{NO} \rightarrow \text{N}_2 + 2\text{CO}_2$ formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae allow = instead of \rightarrow ignore heat above arrow allow correct multiples eg $4\text{CO} + 4\text{NO} \rightarrow 2\text{N}_2 + 4\text{CO}_2$ (1) not 'and' or '&' for + allow one mark for correct balanced equation with incorrect use of upper and lower case formulas eg $2\text{CO} + 2\text{NO} \rightarrow \text{N}_2 + 2\text{CO}_2$ no subscript (1) $2\text{Co} + 2\text{No} \rightarrow \text{N}_2 + 2\text{Co}_2$ lower case symbols (1) BUT $2\text{co} + 2\text{no} \rightarrow \text{n}_2 + 2\text{co}_2$ no subscript and lower case symbols (0)
		Total	4	

Question		Expected Answers	Marks	Additional Guidance
9		the solvent evaporates (1) the oil is oxidised (1)	2	allow the oil reacts with the oxygen / air (1)
		Total	2	

Question		Expected Answers	Marks	Additional Guidance	
10	(a)	<p>any two from: idea of low maintenance / running costs (1)</p> <p>no need for power (supply) cables / lines / mains electricity (1)</p> <p>long life / rugged / hard wearing (1)</p> <p>no need for fuel / saves fossil fuels / renewable energy source / Sun constant source of energy (1)</p> <p>give out no greenhouse gases / does not cause pollution (1)</p> <p>can be used in remote locations (1)</p>	2	<p>allow cheap to run / energy (source) is free / saves money on electricity (1) ignore unqualified cheap / reliable</p> <p>ignore unqualified renewable / reusable</p> <p>allow named greenhouse gas / reduces greenhouse effect / reduces global warming / reduces pollution (1)</p> <p>ignore unqualified environmentally friendly / does not harm environment</p>	
	(b)	<p>any one from: move the magnet or coil faster (1)</p> <p>more turns / loops (1)</p> <p>stronger magnet (1)</p>	1	<p>allow idea of increasing the relative speed between magnet and coil (1)</p> <p>allow more coil (1) ignore bigger coil</p> <p>ignore bigger magnet but allow more powerful OR additional magnet / increase the strength OR power of magnetic field (1)</p>	
	(c)	(i)	C (1)	1	if answer line is blank allow correct answer ticked underlined or circled in the list
		(ii)	D (1)	1	if answer line is blank allow correct answer ticked underlined or circled in the list
		Total		5	

Question		Expected Answers	Marks	Additional Guidance
11		18 (watts) (2) but if answer is incorrect 12 x 1.5 (1)	2	
		Total	2	

Question		Expected Answers	Marks	Additional Guidance
12	(a)	<p>any two from: planets collided (1)</p> <p>idea of (iron) cores merge (1)</p> <p>idea that debris ejected from collision OR debris orbits the Earth OR debris forms the Moon (1)</p>	2	<p>allow (large) asteroid collided with the Earth (1) ignore Moon collides with Earth</p> <p>allow the idea of joining to form the Earth's core (1)</p> <p>ignore idea of a single chunk knocked off or out of Earth</p>
	(b)	<p>any two from: astronauts have brought back rocks from the Moon (1)</p> <p>(idea that) rocks have similar composition or elements to rocks on Earth (1)</p> <p>Moon no OR little iron / no magnetic field / no (iron) core (1)</p> <p>rocks on Earth and Moon have same oxygen content (1)</p> <p>(average) density of the Earth > Moon (1)</p> <p>idea of scientists using computer simulations (1)</p> <p>idea that composition of other planets different to Earth (1)</p>	2	<p>allow idea of remote analysis / sampling (1)</p> <p>allow similar OR same rocks (on Earth and Moon) (1) ignore Moon made up of similar materials</p> <p>ignore references to the Moon being (still) trapped in Earth's gravitational field / gravity throughout answer</p>
		Total	4	

Question		Expected Answers	Marks	Additional Guidance
13	(a)	<p>any two from:</p> <p>low level waste put in land fill sites (1)</p> <p>store underground / bury (underground) (1)</p> <p>encase OR seal in glass / vitrify (1)</p> <p>idea of reprocessing (1)</p> <p>need to store for a very long time (1)</p>	2	<p>allow in mines (1)</p> <p>ignore bury under the sea (bed)</p> <p>allow seal in concrete / bitumen (1)</p> <p>ignore unqualified put in glass / concrete / steel</p> <p>BUT</p> <p>allow seal in glass / concrete / bitumen then put in steel container (2)</p> <p>allow turn into plutonium / uranium / nuclear fuel (1)</p> <p>allow 100s or 1000s of years but not just long time (1)</p> <p>ignore references to security unless related to needed for a very long time</p> <p>ignore send into space</p> <p>ignore reference to nuclear bombs / terrorism</p>
	(b)	idea of acceptable or safe level may change (over time) (1)	1	<p>allow remains radioactive for a (very) long period of time (1)</p> <p>ignore references to cancer</p>
		Total	3	

Question		Expected Answers	Marks	Additional Guidance
14	(a)	planets galaxy black hole	2	3 correct = (2) 2 or 1 correct = (1)
	(b)	1 dust and gas clouds form 2 gravity makes dust particles spiral together (3 protostar formed) (4 temperature becomes very high) 5 thermonuclear fusion takes place 6 main sequence star formed	2	1 and 2 correct (1) 5 and 6 correct (1) if zero scored award 1 mark if first and last boxes are correct
	(c)	gravitational Jupiter (1) planet Jupiter (1)	2	allow gravity / attractive for gravitational ignore other planets for second answer
		Total	6	

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