

Science B

General Certificate of Secondary Education

Unit **B622/02**: Modules B2, C2, P2 (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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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

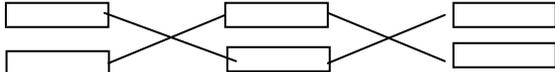
Abbreviations, annotations and conventions used in the detailed Mark Scheme.

- / = 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

Question			Answer	Marks	Guidance
1	(a)	(i)	128 (2) BUT $\frac{4+1+7}{3}$ or $\frac{12}{3}$ or (average per quadrat =) 4 or $8 \div 0.25$ or 32 (quadrats in pond) (1)	2	correct answer, no working = 2 allow $\frac{12}{0.75}$ or 16 for 1 mark (the average per m ²)
		(ii)	more samples / place quadrats randomly (1)	1	allow sample at different times / take care to avoid disturbing larvae allow more quadrats allow use bigger quadrats / larger samples / sample more places ignore sample same quadrat several times and take mean ignore comments about marking or recapturing
	(b)	(i)	see if offspring are fertile (shows they are same species) / ora (2) OR breed them (together) / produce offspring / mate (1) use DNA (1)	2	 allow genes or chromosomes for DNA
		(ii)	any one from: live in same or similar habitat (1) closely related (species) (1) (recent) common ancestor (1) mimicry / convergent evolution (1)	1	allow environment / ecosystem for habitat allow shared habitat allow share the same genus or family ignore reference to same breed allow have the same ancestor allow similar genes / similar DNA allow same or similar selection pressures / same or similar adaptations
	(c)		ice / frozen / peat / bogs / tar (pits) (1)	1	allow desiccation / dehydration / mummification in a cold place is not sufficient
			Total	7	

Question		Answer	Marks	Guidance
2	(a)	<p>any two from: white (fur) – camouflage (1)</p> <p>thick fur - keep warm / insulation / reduce heat loss (1) fat / blubber – keep warm / insulation / reduce heat loss (1) large feet – (spread load when) walking on snow / AW (1) fur on soles of feet – for insulation / grip large claws / long claws / sharp claws - to grip the ground (1) large size - reduce surface area (to volume ratio) / to keep warm / reduce heat loss (1) small ears - reduce surface area (to volume ratio) / to keep warm / reduce heat loss (1) short legs – reduce surface area (to volume ratio) / to keep warm / reduce heat loss (1)</p>	2	<p>need feature and explanation for mark allow white so cannot be seen by prey or predators / white so they blend in just fur is insufficient stop getting cold is insufficient for idea of keeping warm</p> <p>allow feet have large surface area to walk on snow</p> <p>ignore claws or teeth for hunting</p>
	(b)	<p>decrease / go down (1)</p> <p>less food / fewer lemmings to eat (1)</p>	2	<p>ignore die out / become extinct</p> <p>ignore just ‘fewer lemmings’ allow less prey / no food / no lemmings to eat / foxes will starve</p>
	(c)	<p>diets not identical / habitats don’t completely overlap (1)</p>	1	<p>allow different breeding seasons / active at different times (of day / year) / wolves (hunt) in packs / foxes are solitary / different hunting styles / different methods to catch prey / have different prey / wolves hunt larger prey</p>
	(d)	<p>organism that benefits to host’s detriment / AW (1)</p>	1	<p>allow parasite gains while other organism loses idea that it lives or feeds off another animal is not sufficient</p>
Total			6	

Question			Answer	Marks	Guidance
3	(a)	(i)	research / meat / food / oil / blubber / cosmetics (1)	1	allow shoe cream / alcohol / crayons / candles / fertiliser / soap / lipstick / ointment / perfume / ambergris / sinews / tennis rackets / leather / belts / shoes / handbags / luggage / buttons / piano keys / jewellery / stays or corsets ignore make money / provide jobs / medicines / zoos
		(ii)	any two from: difficult to get international agreement (1) (because) different countries have different views / AW (1) difficult to police / difficult to monitor / difficult to enforce (1) (because) in international waters / oceans are vast (1)	2	allow cultural reasons e.g. it is their way of life / named country that traditionally eats whale meat allow cannot watch everywhere allow whales migrate / whales move to different parts of the ocean allow scientific research (1)
	(b)		any two from: (lower) carbon dioxide (concentration) (1) (lower) temperature (1) (lower) light (intensity) (1)	2	allow warmth but ignore heat allow it is cold allow sunlight
	(c)		idea of competition / survival of the fittest / those with more flipper-like legs more likely to survive (1) idea of inheritance / that more flipper-like legs are passed on (1)	2	both answers may come from the same box
Total				7	

Question		Answer	Marks	Guidance
4	(a)	magma is less dense (than crust) (1)	1	assume answer refers to the density of the magma allow ora ignore reference to pressure / lighter low density is insufficient needs comparative such as lower
	(b)	explosive – silica-rich – rhyolite (1) runny – iron-rich – basalt (1) OR explosive – silica rich AND runny – iron-rich (1) silica-rich – rhyolite AND iron-rich – basalt (1)	2	
	(c)	any one mark from predict future eruptions / warn people when volcano will erupt / AW (1) to see if volcano is active or dormant / find out why eruptions happen / find out how eruptions happen / research the structure of the volcano / AW (1) gain information about the Earth's structure / study plate tectonics / study rocks under the Earth's surface / AW (1)	1	ignore to find out about volcanoes because they are unpredictable is not sufficient allow which are dangerous and which are not ignore reference to earthquakes ignore reference to the core but allow reference to mantle or crust
Total			4	

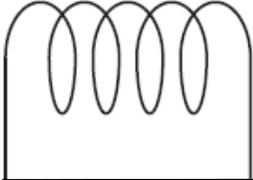
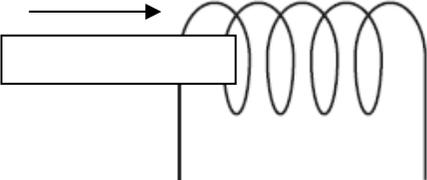
Question		Answer	Marks	Guidance
5	(a)	Nitrogen / N / N ₂ - (78%) Oxygen / O / O ₂ - (21%) (carbon dioxide) – 0.035% all three correct (2) but one or two correct (1)	2	allow any value or range from 0.03 to 0.04%
	(b)	(i) incomplete combustion (of petrol or diesel in a car engine) (1)	1	allow burning in a limited amount of air or oxygen
		(ii) any time or range between 11 (am) and 12 (pm) inclusive (1)	1	allow midday / noon
	(c)	(F) C (A) E D (B) all three correct (2) but C / E and D correct (1)	2	Check the sentences for an order if boxes are empty <div style="display: flex; justify-content: center; gap: 10px;"> <div style="border: 1px solid black; padding: 2px 10px;">F</div> <div style="border: 1px solid black; padding: 2px 10px;">C</div> <div style="border: 1px solid black; padding: 2px 10px;">A</div> <div style="border: 1px solid black; padding: 2px 10px;">E</div> <div style="border: 1px solid black; padding: 2px 10px;">D</div> <div style="border: 1px solid black; padding: 2px 10px;">B</div> </div>
Total			6	

Question		Answer	Marks	Guidance
6	(a)	zinc + sulfuric acid → zinc sulfate + hydrogen (1)	1	allow reactants and products in either order allow correct formulae or mix of formulae and words $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$ ignore incorrect balancing allow = instead of → not and / & instead of +
	(b)	(i)	2	must be comparative allow (both) have a shorter reaction time than no catalyst ignore faster / quicker reaction time allow no colour change / AW allow (both) stay red-brown but both are red-brown at the end is insufficient ignore changes state ignore they don't change the amount of product made
		(ii)	2	allow more surface / more area / more surface area (1) more frequent collisions / more chance of collisions / more collisions per second (1) allow more collisions per unit time / collisions more often more collisions unqualified is not sufficient ignore references to successful / effective / energetic collisions allow more collisions for one mark if no other mark awarded
		(iii)	1	allow less than 10 (seconds) / any stated value less than 10 (s)
		Total	6	

Question		Answer	Marks	Guidance
7	(a)	granite is harder (than marble) / ora (1)	1	assume answer refers to granite must be a comparative e.g. very hard is insufficient allow implications of hardness e.g. it is more difficult to scratch / dents less allow marble is softer / marble is less hard ignore stronger / tougher / more hardwearing
	(b)	(steel is) less likely to corrode (than iron) (1)	1	allow (steel) will not rust / (steel is) harder (than iron) / (steel is) stronger (than iron) / steel rusts more slowly / steel rusts less assume answer refers to steel
	(c)	(i)	1	both needed for one mark allow waste copper / boulder copper / copper not purified for the anode not impure copper for cathode
		(ii)	1	both needed for one mark allow (at anode) gets thinner / copper ions are formed / (anode) loses mass / (anode) loses electrons / (anode) loses copper allow (at cathode) gets thicker / copper ions are discharged / (cathode) gains mass / (cathode) supplies electrons allow correct ionic equations anode: $\text{Cu} - 2\text{e}^- \rightarrow \text{Cu}^{2+}$ cathode: $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$
			Total	4

Question		Answer	Marks	Guidance
8	(a)	<p>any one from:</p> <p>no wires needed (1)</p> <p>low maintenance (1)</p> <p>no need for fuel (1)</p> <p>long life (1)</p> <p>renewable (energy source) (1)</p> <p>idea of no polluting waste (1)</p> <p>electricity (bill) is cheaper (1)</p>	1	<p>allow rugged / robust</p> <p>ignore reusable</p> <p>ignore no pollution unless qualified e.g. allow does not produce carbon dioxide / greenhouse gas / does not pollute at the point of use</p> <p>ignore eco-friendly</p> <p>allow electricity is free or energy is free or cheaper in the long run</p> <p>ignore unqualified references to cost e.g. it is cheaper is insufficient</p>
	(b)	no power at night / no power in bad weather (1)	1	<p>allow low power output instead of no power</p> <p>allow does not work when the sun is not out / not always reliable because it is not always sunny</p> <p>allow take up a lot of area e.g. land</p> <p>allow visual pollution e.g. look ugly</p> <p>allow costly to produce / costly to set up / long pay-back time</p> <p>just costly or expensive is not sufficient</p>
Total			2	

Question		Answer	Marks	Guidance
9	(a)	10.5 (kWh) (1)	1	
	(b)	168 (pence) (1)	1	allow £1.68 but £ sign needed allow ecf from (i)
		Total	2	

Question	Answer	Marks	Guidance
10	<p>diagram showing complete circuit (with ammeter in series) connected to coil (1)</p> <p>idea of relative movement of magnet and coil e.g. spin / turn magnet to coil / move coil to magnet (1)</p> <p>stronger or more powerful magnet / more turns on coil / faster (relative) motion (1)</p>	3	<p>ANNOTATE WITH TICKS AND CROSSES</p> <p>allow diagram showing ends of coil joined to form a complete circuit without using the ammeter not magnet connected into the circuit</p>  <p>allow an arrow on diagram to show magnet moving e.g. this diagram would score one mark</p>  <p>allow more coils allow moving magnet but now positioned closer to the coil allow (iron) core inside the coil ignore bigger magnet but allow more magnets</p>
	Total	3	

Question	Answer	Marks	Guidance
11	<p>any two from:</p> <p>not alpha as paper has no effect on the count rate (1)</p> <p>not gamma as count rate decreases with aluminium (1)</p> <p>it is beta because count rate hardly changes as it passes through paper but decreases through aluminium (1)</p> <p>AND</p> <p>(does not go down to zero because of) (random) background radiation (1)</p>	3	<p>ANNOTATE WITH TICKS AND CROSSES</p> <p>Answers for the first two marking points should imply some use of the results in the question</p> <p>allow correct use of figures to explain effects</p> <p>allow not alpha because (this) radiation goes through paper allow alpha does not go through paper</p> <p>allow not gamma because (this) radiation does not pass through aluminium</p> <p>allow it is beta because (this) radiation goes through paper but not aluminium</p> <p>allow description of background radiation e.g. radiation that is always there / radiation that is in the rocks / air around us</p>
	Total	3	

Question		Answer	Marks	Guidance					
12	(a)	<table border="1" style="margin-left: 20px;"> <tr> <td style="text-align: center;">E</td> <td style="text-align: center;">B</td> <td style="text-align: center;">(A)</td> <td style="text-align: center;">D</td> <td style="text-align: center;">C</td> </tr> </table> <p>all four correct (2)</p> <p>but</p> <p>any two correct (1)</p>	E	B	(A)	D	C	2	<p>E B A D C = 2 E B A C D = 1 B E A D C = 1 E D A B C = 1 C B A D E = 1</p> <p>If the same letter is written twice just mark the other letters so E B A D E scores 1 mark but E B A E D scores 0 because you have to decide which E was correct</p>
E	B	(A)	D	C					
	(b)	the gravitational force of Jupiter (prevents planet forming) (1)	1	<p>allow (because of) Jupiter's gravity / (because) Jupiter is pulling / there is a force from Jupiter</p> <p>ignore reference to other planets or the Sun</p>					
	(c)	<p>use telescope to identify or monitor NEO / use satellite to identify or monitor NEO (1)</p> <p>deflect by explosion / destroy by explosion (1)</p>	2	<p>allow monitor distance from Earth / monitor trajectory of NEO / monitor time before impact allow monitor where the NEO is</p> <p>allow destroy using a bomb / deflect using a missile / blow it up to shoot it is not sufficient</p>					
Total			5						

Question			Answer	Marks	Guidance
13	(a)		A (1)	1	allow other ways of indicating the answer providing the answer line is blank e.g. ticking or ringing A
	(b)		deflected / experience a force (1)	1	allow particles move or attracted towards the pole(s) allow spiral (towards the Earth) ignore particles are dragged ignore reference to the Aurora Borealis or Northern lights
			Total	2	

Question			Answer	Marks	Guidance
14	(a)	(i)	this galaxy is moving away (from Earth) (1)	1	allow the galaxy is receding
		(ii)	the faster it is moving (away) (1)	1	
	(b)		white dwarf (1)	1	if answer line is blank allow correct answer ticked, circled or underlined in list
			Total	3	

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