

Additional Science B

General Certificate of Secondary Education

Unit **B623/02**: Modules B3, C3, P3 (Higher Tier)

Mark Scheme for January 2013

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.










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 doubt
	Benefit of the doubt not given
	error carried forward
	Omission Mark
	Ignore
	reject
	contradiction

Subject-specific Marking Instructions

/	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	alternate wording
ora	or reverse argument

Question		Answer	Marks	Guidance
1	(a)	mitochondria (1)	1	if answer line blank allow answer indicated on diagram
	(b)	so that the zygote becomes diploid after fertilisation (1)	1	allow to get the correct number of chromosomes (after fertilisation) allow to get a diploid when the two haploids join allow idea that there is a complete set of chromosomes when it joins with the egg
	(c) (i)	change in the sequence of bases (1)	1	allow example of base change allow section of DNA or chromosome missing, repeated or in the wrong place ignore change in the structure of DNA
	(ii)	code for a different amino acid / may stop the production or change the shape of the protein (1)	1	allow change the sequence of amino acids
	(iii)	cannot (produce enzymes to) digest the egg membrane / cannot get into egg (1)	1	allow egg wall not egg shell / egg cell wall not digest the egg
		Total	5	

Question		Answer	Marks	Guidance
2	(a)	carbon dioxide / urea / ammonia (1)	1	allow correct formulae ignore waste
	(b)	diffusion (1)	1	
	(c)	<p>any two from</p> <p>large surface area (1)</p> <p>thin wall / wall one cell thick (1)</p> <p>(idea of a) permeable wall (1)</p> <p>good blood supply (1)</p> <p>concentration / diffusion gradient maintained (1)</p>	2	<p>allow villi</p> <p>not thin cell wall (of the cell)</p> <p>not just thin</p> <p>not permeable cell wall</p> <p>not thinner blood vessels</p> <p>allow small distance to diffuse</p> <p>ignore little holes</p> <p>ignore just two arteries / more arteries</p>
		Total	4	

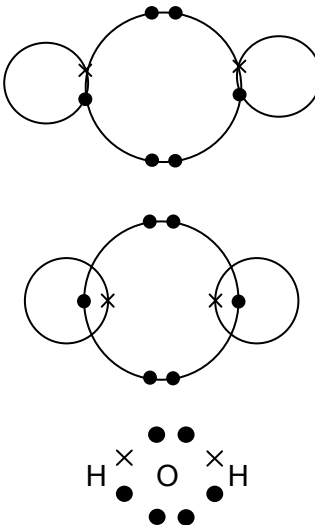
Question			Answer	Marks	Guidance
3	(a)	(i)	site of exchange (with the tissues or air) / to allow heat loss (1)	1	<p>allow diffusion (of substances into or out of blood e.g. oxygen / nutrients) allow gas exchange ignore to get oxygen to the muscles not diffusion of blood</p> <p>allow to allow the formation of tissue fluid ignore squeezes tissues fluid out</p>
		(ii)	<p>average thickness of walls (only) 0.001mm (1)</p> <p>means they are more permeable / very permeable / short(er) diffusion distance / substances diffuse easily (1)</p> <p>OR</p> <p>small diameter (of 0.01mm) (1)</p> <p>means they can form a network inside organs (1)</p>	2	<p>max one mark if no correct link between adaptation and explanation award marks for correct answers anywhere on answer lines</p> <p>allow thin walls / walls one cell thick not thin cell walls not just thin / thin membrane</p> <p>allow faster diffusion / more diffusion / easier diffusion allow easier gas exchange / more efficient gas exchange not faster diffusion of blood</p> <p>allow diameter (only) 0.01mm allow narrow / small lumen not just thin</p> <p>allow dense collection of capillaries (1)</p>
	(b)		12 (%)	1	
	(c)		pulmonary (artery)	1	
Total				5	

Question		Answer	Marks	Guidance	
4	(a)	tips of root and shoot / tips of roots / tips of shoots (1)	1	allow end of root / end of shoot / meristems not just tips ignore tip of plant unless qualified ignore stem tips	
	(b)	(i)	(positive) phototropism (1)	1	allow phototropic (response)
		(ii)	auxin (1)	1	allow IAA ignore ethane / ethylene
	(c)	(i)	can kill the weeds (using weed killer / herbicide) on the fields without killing or damaging the soya plants (1)	1	allow idea of soya plant not being harmed / killed / affected by the weed killer
		(ii)	idea that (in some areas) GM crops are more important for food production (1) idea that (in some areas) ethical / health / (religious) beliefs are more important (1)	2	allow in LEDC (less economically developed countries) there are food shortages so food is more important allow specific nutrient (shortages) e.g. vitamin A linked to GM or golden rice (1) allow arguments about extinction / environmental issues ignore (economical) costs
			Total	6	

Question		Answer	Marks	Guidance
5	(a)	hydrogen (1) potassium hydroxide (1)	2	allow H ₂ not H ² / H2 / H allow KOH order of products unimportant
	(b)	have same number of electrons in outer shell / one electron in their outer shell (1)	1	not has 2 or more electrons in outer shell allow all form a 1+ ion allow they lose one electron allow same number in outer shell if clear it is referring to electrons e.g. same number of atoms in outer shell scores 0 ignore same or similar electronic structure
	(c)	oxidation (1) loss of electrons (1)	2	allow answer ticked, circled or underlined if answer line left blank mark independently
Total			5	

Question		Answer	Marks	Guidance
6	(a)	<p>idea that the densities of silver and copper are high(er) / density is too high (so wires would sag) (1)</p> <p>idea that silver and copper are too expensive (1)</p>	2	<p>allow they are more dense or denser than aluminium allow wires are heavy allow references to just one metal e.g. silver has a high density ignore they are heavier</p> <p>allow they are (more) expensive (than aluminium) allow they would cost more allow references to just one metal e.g. silver is expensive</p> <p>allow 'because of the density and cost' (1) if no other marks awarded allow reverse argument for aluminium e.g. aluminium is a lot lighter and cheaper (2)</p> <p>ignore any comment about corrosion not reference to melting point</p>
	(b)	<p>copper and then any two from</p> <p>it has a high density / it is dense (1)</p> <p>it is lustrous / shiny / attractive (1)</p> <p>it is relatively cheap (1)</p> <p>it does not rust / corrode (1)</p>	2	<p>no mark for name of metal but metal must come from table to score any marks</p> <p>allow metal is heavy (1)</p> <p>allow iron (no mark) because it has a high density/ it is heavy (1) and is cheap / cheapest (1) allow silver (no mark) because it has a high density / it is heavy (1) but no other mark</p>

Question		Answer	Marks	Guidance
	(c)	electrons move / delocalised or free or sea of electrons (1) BUT delocalised electrons move / free electrons move / sea of electrons move (2)	2	free electrons and ions move scores 1 only for idea of free electrons allow electrons free to move scores 1 but free electrons move scores 2
		Total	6	

Question			Answer	Marks	Guidance
7	(a)	(i)	C (1)	1	if answer line is blank allow correct answer ticked, circled or underlined
		(ii)	B and D (1)	1	order unimportant if answer line is blank allow correct answer ticked, circled or underlined
	(b)		shared pair of electrons drawn one from a H atom and one from an O atom (1) remainder of diagram correct (1)	2	ignore lack of inner electrons in oxygen if neither shared pair is shown (0) electrons can be drawn as all ● , all X or all other symbol e.g. e  (2) (2) (2)
Total				4	

Question		Answer	Marks	Guidance
8		iron(III) sulfate - orange/brown copper sulfate - blue iron(II) sulfate - pale green 	2	three correct scores 2 one or two correct scores 1
Total			2	

Question		Answer	Marks	Guidance
9		oxygen / O ₂ (1)	1	allow O
		2H ⁺ + 2e ⁻ → H ₂ (2) correct formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae but allow one mark for balanced equation with minor errors of subscripts, superscripts, etc. e.g. 2H ⁺ + 2e ⁻ → H ₂ (1) not and or & for + allow = instead of → allow correct multiples eg 4H ⁺ + 4e ⁻ → 2H ₂ (2)
Total			3	

Question		Answer	Marks	Guidance
10	(a)	increased engine size gives more CO ₂ / AW (1)	1	allow reverse argument allow more emissions / more pollution for idea of more CO ₂ ignore bigger car
	(b)	(i) 225 (1)	1	allow answer in the range 220-230
		(ii) 57 (1)	1	allow answer in the range 50 – 65 allow answer written on graph if answer line is blank allow any sensible extrapolation and if answer outside range, credit correct value taken from the graph
Total			3	

Question		Answer	Marks	Guidance
11	(a)	Louisa (no mark) most km for each litre / most distance for each litre / AW (1)	1	ignore incorrect driver allow more distance, less fuel used allow greatest distance on the same amount of fuel
	(b)	more energy needed to do work against increased drag / friction / air resistance / AW	1	
	(c) (i)	(kinetic) energy (1)	1	allow KE if energy type specified must be kinetic or movement ignore references to force or impact if energy type specified must be kinetic or movement
	(ii)	the stopping time is increased / the stopping time is longer / AW (1) the stopping distance is increased / AW (1) idea of decreased acceleration / AW (1)	3	must be clear it is not the car allow slows down the collision (between air bag and passenger) allow mention of $F = ma$ or work = force x distance ignore cushions impact or force or collision allow greater time for KE to be dissipated (2) allow slows down the deceleration ignore any reference to forwards acceleration
	(d)	any one from does not need to use hand to turn window handle / AW (1) easier to open or close window (1) quicker to open or close window (1)	1	allow only needs to push a button allow less distraction / better concentration allow hand off steering wheel for less time allow prevents children from opening them / can be controlled or locked by the driver ignore mention of crash
Total			7	

Question		Answer	Marks	Guidance
12	(a)	9.1 (2) but if answer is incorrect $100 \div 11$ (1)	2	allow 9.0909 to any number of decimal places (2) allow 9 (2)
	(b) (i)	2 (2) but if answer is incorrect $8 \div 4$ (1)	2	
	(ii)	distance (travelled) (1)	1	allow how far he's run / gone (in the race)
Total			5	

Question		Answer	Marks	Guidance
13	(a)	increased surface / area (presented to air) / AW (1)	1	ignore reference to aerodynamic / streamlining not large cross sectional area
	(b)	drag increases / AW (1)	1	allow resistance or friction for drag
	(c)	drag = weight (1)	1	allow air resistance / friction for drag allow gravity for weight allow forces are balanced / same / equal / they equal out
	(d) (i)	remains constant / AW (1)	1	
	(ii)	(PE does) work against drag / AW (1)	1	allow resistance or friction for drag allow (PE) changed into heat or thermal energy / (PE) changed into KE of air particles / energy is lost overcoming friction / work done moving air particles aside (and giving them KE) ignore (PE) changed into sound not (his) PE changed into (his) KE
		Total	5	

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