

**Science B**

General Certificate of Secondary Education **B622/02**

Unit 2: Modules B2, C2, P2

**Mark Scheme for June 2010**

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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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Question		Expected Answers	Marks	Additional Guidance
1	(a)	$6\text{H}_2\text{O} + 6\text{CO}_2 = \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ (2) correct formulae for $\text{H}_2\text{O}$ and $\text{C}_6\text{H}_{12}\text{O}_6$ (1) correctly balanced (1)	2	balancing mark is conditional on correct formulae <b>allow</b> multiples <b>allow</b> 1 mark for correctly balanced equation with minor errors in subscript or case e.g. $6\text{H}_2\text{O} + 6\text{CO}_2 \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
	(b)	oxygen taken in is essential to ensure the plant has a constant supply of energy (1) the oxygen taken in is used for respiration (1)	2	4th and 7th box any more than two ticks negates a mark e.g. two correct and three ticks (1) e.g. one correct and three ticks (0)
	(c)	<b>more</b> carbon dioxide or $\text{CO}_2$ / higher temperature (1)	1	<b>allow more</b> water or $\text{H}_2\text{O}$ <b>ignore</b> more rain <b>allow</b> more heat or more warmth <b>ignore</b> more temperature or just 'warmth' or more chlorophyll or more surface area
	(d)	starch / oil / fat / lipids (1) for storage (1)  <b>or</b> cellulose (1) make cell walls (1)  <b>or</b> proteins / amino acids (1) growth / repair (1)	2	to gain second mark use must match the substance they name to its use  <b>allow</b> one mark for any use if they do not name a substance  <b>allow</b> other possible products e.g. lignin for support <b>allow</b> sucrose for transport (2) <b>allow</b> wax for waterproofing (2) <b>allow</b> chlorophyll (1) for <b>photosynthesis</b> (1) <b>but</b> chlorophyll for food scores (1)  <b>ignore</b> chloroplasts but chloroplasts for photosynthesis scores (1)
		<b>Total</b>	<b>7</b>	

Question		Expected Answers	Marks	Additional Guidance
2	(a)	invertebrates do not have a backbone or spine / vertebrates have a backbone or spine (1)	1	<b>USE TICKS IN THIS QUESTION</b> assume answer refers to invertebrates <b>ignore</b> no skeleton / bones <b>allow</b> invertebrates have no spinal cord
	(b) (i)	(the number of) different <b>species</b> (stream B has 5 the rest have less than 5) (1)	1	<b>allow</b> different <b>types / range</b> of organisms <b>allow</b> different <b>types / range</b> of animals (and plants)
	(ii)	D <b>any two from:</b> lower biodiversity / fewer species (1)  no caddis fly lava or dragon fly nymph (1)  <b>more</b> rat-tailed maggot (1)  bloodworm present (1) ora	2	no marks for D but D must be correct for any marks to be awarded <b>allow</b> no animals that need clean water (1) <b>allow more</b> animals that live in polluted water (1)  <b>ignore</b> fewer organisms / fewer leech / no flatworms  must be <b>more</b> rat-tailed maggot not just fact they are present e.g. rat tailed maggots only live in polluted water scores 0  <b>allow</b> stream D has no other species other than the ones that live in polluted water (2)  <b>allow</b> rat-tailed maggots <b>and</b> blood worms can survive in polluted water and all other animals cannot live in the water because of the pollution (2)
		<b>Total</b>	<b>4</b>	

Question		Expected Answers	Marks	Additional Guidance
3	(a)	<p>more kangaroos more eagles (1) link more <b>food</b> to increase in eagle population (1)</p> <p><b>or</b></p> <p>fewer kangaroos fewer eagles (1) link less <b>food</b> to decrease in eagle population (1)</p>	2	<p><b>USE TICKS IN THIS QUESTION</b> <b>allow</b> higher level answers e.g. eagle numbers can go up because they can raise more young when there are more kangaroos (2)</p> <p>'lack of food' on its own scores 0</p> <p>must show link between food and population for second mark e.g. more kangaroos means more eagles but fewer kangaroos fewer eagles (1)</p> <p><b>but</b> more kangaroos means more eagles because eagles have more food (2) <b>allow</b> the numbers go up because they have more food or prey (1)</p>
	(b)	spread load (on sand) / stop them sinking (into sand) (1)	1	<p><b>allow</b> so kangaroo can hop or spring or jump</p> <p><b>ignore</b> so they can walk on sand / so they can move <b>ignore</b> references to balance or surface area <b>ignore</b> for better grip</p>
		<b>Total</b>	<b>3</b>	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	produce milk (1)	1	<b>allow</b> suckle young / have <b>mammary glands</b> <b>allow</b> have hair <b>but ignore</b> fur <b>allow</b> give birth (to live young) <b>allow</b> idea of young developing in womb <b>ignore</b> have babies or warm blooded <b>ignore</b> reference to breathing air / oxygen / gills <b>ignore</b> don't lay eggs'
	(b)	(i) <b>any two from:</b>  <b>idea</b> of variation or mutation (1)  <b>idea</b> of being better adapted to survive (1)  <b>idea</b> of inheritance of named adaptation or inheritance of genes /  <b>OR</b>  gene frequency changes /  <b>OR</b>  slow change of adaptation over generations (1)	2	<b>USE TICKS IN THIS QUESTION</b>  e.g. smaller back legs / e.g. some are born with no legs e.g. some are (more) streamlined  e.g. so some catch more fish e.g. are better / faster swimmers e.g. are better at escaping predators e.g. are more successful <b>allow</b> 'survival of the fittest'  e.g. genes passed on to next generation e.g. shorter legs passed onto the next generation  e.g. more animals have the feature each generation <b>allow</b> allele for gene  e.g. legs got smaller and smaller each generation until they disappeared
		(ii) idea of genes or DNA not being involved (1)	1	e.g. losing legs in accident does not change their genetics (1) e.g. still have genes for legs <b>allow</b> chromosomes for genes

Question		Expected Answers	Marks	Additional Guidance
	(c) (i)	fertile (1)	1	
	(ii)	share a recent / common ancestor (1)	1	<b>allow</b> they have the same ancestor <b>allow</b> ancestors come from the same family or same species <b>allow</b> they share <b>lots</b> of genes / similar DNA <b>ignore</b> ancestors are closely related <b>or</b> ancestors are similar
		<b>Total</b>	<b>6</b>	

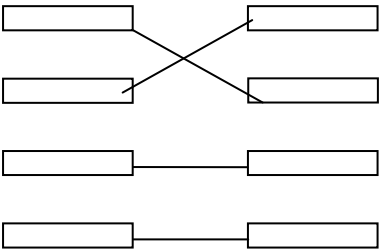
Question		Expected Answers		Marks	Additional Guidance
5	(a)	water (1)		1	allow H <sub>2</sub> O
	(b)	solvent evaporates (1)  oxidation of the <b>oil</b> (by oxygen) (1)		2	<b>allow</b> named solvent evaporates e.g. water or white spirit or turps evaporates <b>ignore</b> binding medium or pigment or oil evaporates or solvent dries  <b>allow</b> reaction between the oil and air (1) <b>allow</b> binding medium oxidised (1)
	(c)	<b>property</b>  increased strength (1)  increased flexibility (1)  harder <b>to break</b> (1)	<b>explanation</b>  due to steel (reinforcing) (1)  due to steel (reinforcing) (1)  because it combines the properties of steel with concrete (1)	2	marks can be scored for two correct properties or one correct property and an explanation  <b>allow</b> steel rods stop the concrete stretching (2) <b>allow</b> steel increases the tensile strength of the concrete (2) <b>allow</b> steel makes it stronger (2) <b>allow</b> its stronger (1) but <b>ignore</b> just 'strong' <b>allow</b> 'because it contains steel' (1) <b>allow</b> iron instead of steel <b>ignore</b> just 'hard' or 'harder'
		<b>Total</b>		<b>5</b>	



Question		Expected Answers	Marks	Additional Guidance
6	(a)	continental (1)	1	
	(b)	less dense (than the mantle) (1)	1	<b>ignore</b> lighter <b>allow</b> lighter weight (than the mantle) / ora
		<b>Total</b>	<b>2</b>	

Question		Expected Answers	Marks	Additional Guidance
7	(a)	nitrogen (1)	1	<b>allow</b> N <sub>2</sub> / N <b>allow</b> other ways of indicating answer but answer on answer line takes precedence
	(b)	2CO + 2NO → N <sub>2</sub> + 2CO <sub>2</sub> correct formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae <b>allow</b> = or ⇌ instead of → <b>allow</b> multiples <b>not</b> 'and' or & in equation <b>allow</b> 1 mark for correctly balanced equation with minor errors in subscript or case e.g. 2Co + 2nO → N2 + 2CO <sub>2</sub> (1)
		<b>Total</b>	<b>3</b>	

Question		Expected Answers	Marks	Additional Guidance
8	(a)	magnesium + hydrochloric acid → magnesium chloride + hydrogen (1)	1	<b>allow</b> $\text{Mg} + \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$ <b>allow</b> mix of correct formulae and names but <b>ignore</b> any balancing <b>allow</b> = or $\rightleftharpoons$ instead of → <b>not</b> 'and' or '&' for + <b>allow</b> reactants in either order <b>allow</b> products in either order
	(b) (i)	80 (seconds) (1)	1	<b>allow</b> any value in the range 61 - 80
	(ii)	between 0 seconds and 20 seconds (1)	1	<b>allow</b> any time interval between 0 and 20 e.g. 19 - 20
	(iii)	2 (cm <sup>3</sup> /s) (1)	1	
	(c)	particles move more quickly or particles move faster (1)  more frequent collisions (1)  <b>BUT</b>  <b>collisions</b> are more effective or successful or energetic (2)	2	<b>ignore</b> particles have more (kinetic) energy / particles vibrate faster / particles move more  <b>allow</b> more collisions per second / collisions more often / more chance of a collision (1) <b>ignore</b> faster collisions <b>ignore</b> just more collisions
		<b>Total</b>	<b>6</b>	

Question	Expected Answers	Marks	Additional Guidance
<p>9 (a)</p>	<p><b>any one from:</b>  <b>advantage</b>                      aluminium has lower density (1)                      car body of <b>same size</b> lighter with aluminium (1)</p> <p>aluminium corrodes less (1)</p> <p><b>any one from:</b>  <b>disadvantage</b>                      aluminium is (more) expensive (1)                      aluminium is not as strong (1)</p>	<p>2</p>	<p><b>ignore</b> aluminium is lighter or weighs less but <b>allow</b> aluminium is (more) lightweight  <b>allow</b> car body of the (same size) car made with aluminium will use less fuel</p> <p><b>allow</b> aluminium does not corrode / aluminium does not rust  <b>allow</b> car body made of aluminium will last longer  <b>allow</b> o.r.a. if specified  <b>allow</b> aluminium does not need painting</p> <p><b>allow</b> aluminium is weaker</p>
<p>(b)</p>	<p>brass - copper and zinc                      nitinol - nickel and titanium                      solder - lead and tin</p> 	<p>2</p>	<p>all <b>three</b> correct matches (2)  <b>one</b> or <b>two</b> correct (1)</p>
<p><b>Total</b></p>		<p>4</p>	

Question		Expected Answers	Marks	Additional Guidance
10	(a)	kinetic (1)  electrical (1)	2	<b>allow</b> KE or ke <b>ignore</b> movement  <b>allow</b> electricity
	(b)	ADVANTAGES <b>any one from:</b> renewable (1) rugged (1) no polluting (waste) (1) surrounding land can be used (1)  DISADVANTAGES <b>any one from:</b> visual pollution (1) noisy (1) depends on wind speed / AW (1) wind farm needs <b>large</b> area (1)	2	<b>allow</b> cheap to run or cheap to use' / not much maintenance <b>ignore</b> just 'cheap' or cheap to make or no cost to run <b>allow</b> no fuel needed / wind is free <b>ignore</b> clean or less harmful or it is free <b>ignore</b> it will never run out <b>ignore</b> sustainable or eco-friendly or environmentally friendly  <b>allow</b> eyesore / ruins scenery  <b>allow</b> takes up a lot of space but <b>ignore</b> takes up space  <b>allow</b> expensive to set up <b>allow</b> relatively low output (per turbine) <b>allow</b> harms birds
	(c)	6 (2)  <b>but if answer is incorrect</b>  energy / time OR 60/10 (1)	2	<b>ignore</b> energy = power x time
		<b>Total</b>	<b>6</b>	

Question		Expected Answers	Marks	Additional Guidance
11	(a)	<p>any three from:</p> <p>fuel burned (1)</p> <p>water heated / steam produced (1)</p> <p>steam drives turbine (1)</p> <p>turbine turns generator (1)</p> <p>generator produces electricity (1)</p>	3	<p><b>USE TICKS IN THIS QUESTION</b></p> <p><b>allow</b> nuclear fuel producing energy</p> <p><b>ignore</b> 'burning nuclear fuel' or 'fuel heated up'</p> <p><b>ignore</b> references to water condenses</p> <p><b>ignore</b> water vapour produced</p> <p><b>ignore</b> steam turns generator</p> <p><b>allow</b> steam turns propeller or fan or blades</p> <p><b>allow</b> turbine powers or spins generator</p> <p><b>allow</b> higher level answers e.g. coil moves (1) in magnetic field (1) voltage <b>induced</b> (1) or e.g. magnet moves (1) in a coil (1) voltage <b>induced</b> (1)</p>
	(b)	<p>reduce energy waste or power loss or reduce heat waste or reduce cost (1)</p>	1	<p><b>allow</b> cheaper</p> <p><b>allow</b> higher level answers e.g. less or low(er) current in the cables or thinner cables can be used</p> <p><b>ignore</b> electricity or current or voltage lost or wasted</p> <p><b>ignore</b> references to efficiency</p> <p><b>not</b> stops energy loss</p>
		<b>Total</b>	<b>4</b>	

Question	Expected Answers	Marks	Additional Guidance
12 (a)	<p><b>any two from:</b>            large quantity of fuel (1)            long length of time to reach destination (1)            effect on health (1)</p> <p>providing food or water (1)</p> <p>provide oxygen / maintaining stable atmosphere or pressure (1)</p> <p>warmth (1)            shield from cosmic rays (1)            idea of safety (1)</p>	2	<p><b>ignore</b> cost unless qualified</p> <p>e.g. the crew might die before they reach their destination            e.g. muscle wastage or mental health issues</p> <p><b>allow</b> removing carbon dioxide</p> <p><b>allow</b> there is a lot of radiation in space            e.g. spacecraft needs to come back to Earth  <b>ignore</b> 'it can be dangerous'</p>
	(b) can go to places which are hostile to humans or AW	1	<p><b>allow</b> lower payload / AW            e.g. no need to take food / oxygen  <b>allow</b> no restriction on time of mission  <b>allow</b> do not have to bring craft back</p> <p><b>allow</b> idea of no-one getting harmed  <b>ignore</b> it is safer unless qualified</p> <p><b>ignore</b> cost unless qualified</p>
	(c) temperature / magnetic field / gravity / atmosphere / radiation (1)	1	<p><b>allow</b> any scientific information that can be sent back electronically  <b>allow</b> presence of water / life  <b>allow</b> photograph or video (of surface)  <b>allow</b> information about rocks / minerals / chemicals / substances it is made of            but <b>ignore</b> rock samples / 'what it is made of' / what the surface is  <b>ignore</b> any reference to bringing back physical objects</p>
	<b>Total</b>	<b>4</b>	

Question		Expected Answers	Marks	Additional Guidance
13	(a)	<p><b>light from galaxies</b> moving away shifted to red end (of spectrum) or shows red shift / galaxies moving away show <b>light</b> with a longer wavelength or lower frequency (1)</p> <p>furthest / fastest galaxies show more red shift or even longer wavelength or lower frequency (1)</p>	2	<b>ignore</b> galaxies turn red or galaxies are red
	(b)	(i)	1	<p>assume answer is about black holes if not otherwise stated e.g. they have more mass (1)</p> <p><b>allow</b> high mass or heavy(weight)</p> <p><b>allow</b> reverse argument</p> <p><b>ignore</b> larger or larger density</p> <p><b>ignore</b> it depends on mass</p>
		(ii)	1	<b>allow</b> pull of <b>gravity</b> is too strong
<b>Total</b>			<b>4</b>	



Question		Expected Answers	Marks	Additional Guidance
14	(a)	X is gamma ( $\gamma$ ) Y is alpha ( $\alpha$ ) Z is beta ( $\beta$ )	1	all three needed
	(b)	atomic / nuclear bombs	1	not merely bombs or weapons allow nuclear weapons ignore nuclear power stations
		<b>Total</b>	<b>2</b>	

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