



GCSE

Science B

General Certificate of Secondary Education

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

Mark Scheme for June 2011

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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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The **Abbreviations, annotations and conventions** used in the detailed Mark Scheme are:

/	=	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

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Question			Expected Answers	Marks	Additional Guidance
1	a		small(er) surface area (to volume ratio) / to lose less heat (1)	1	allow won't get as cold (1) ignore stops them losing (body) heat ignore references to hearing or streamlining
	b	i	largest = 5000 and smallest = 1700 (1)	1	both required for the mark allow 5000 and 2000 (1) allow 2300 and 1700 (1) allow 3600 and 1800 (1)
		ii	any sample may not be representative of whole area / difficulty of surveying such a large area / may count bears more than once or bears move around the area / samples may have been taken at different times / different methods of counting used (1)	1	marks are awarded for the idea of the reliability of the sampling method to give the range allow some areas have a larger population than other areas allow bears may migrate or be under the ice or not all the polar bears come out at once (1) allow not possible to count all the bears (in the area) ignore references to total population size e.g. could have been less or more polar bears each year due to predator- prey cycle
	c		any two from: cause global warming / greenhouse effect / increase in temperatures (1) melting of the ice / idea of loss of habitat (1) harder to hunt (for seals) (1)	2	reference to ozone layer loses first marking point, so max 1 allow cause the Earth or water to warm up or cause the Earth or water to heat up (1) allow carbon dioxide in the atmosphere traps heat (1) allow sea levels rising (1) ignore melting water

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Question			Expected Answers	Marks	Additional Guidance
	d	i	USA – UK – China – India (1)	1	
		ii	idea that some are developed countries, some are not / idea that some countries are more industrialised / idea of different number of motor vehicles (1)	1	allow some are LEDCs and some are MEDCs (1) not just different power demands or more fossil fuel burnt allow idea of each person uses more energy e.g. some countries rely on appliances which use lots of energy (1)
			Total	7	

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Question			Expected Answers	Marks	Additional Guidance
2	a		rotted / decayed / not mineralised / (they are) soft tissues (1)	1	allow decompose / biodegrade / broken down (1) allow by bacteria or microbial action ignore eroded / degraded / disintegrate / deteriorate / dissolve
	b		binomial (1)	1	
	c	i	parasite (and host) (1)	1	allow parasitism / parasitic
		ii	<p>idea of variation or mutation (1)</p> <p>idea of being better adapted to survive (and reproduce) (1)</p> <p>idea of inheritance (1)</p>	3	<p>USE TICKS IN THIS QUESTION</p> <p>e.g. some animals born with less hair (than others) / some animals born with more hair than others or less hair due to mutations (1)</p> <p>e.g. so less parasites and so more likely to survive / humans with less hair more likely to survive / more likely to reproduce / survival of the fittest (1)</p> <p>e.g. less hair passed on to offspring / will pass on genes for less hair (1)</p>
		iii	idea of genes or DNA not being involved (1)	1	<p>assume unqualified answer refers to hair not being involved</p> <p>allow hair being scratched out will not change genes (1)</p> <p>allow do not pass on acquired characteristics (1)</p>
			Total	7	

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Question			Expected Answers	Marks	Additional Guidance
3	a		water (1) glucose or sugar and oxygen (1)	2	allow correct formulae both required
	b			3	allow ✓s and ✕s instead of yes and no
			photosynthesis		
			respiration		
			colour		
			yes		
			yes		
			purple		
			no		
			yes		
			yellow		
			(1)		
			(1)		
			(1)		
	c		the factor that will limit the rate / how fast it will occur / the factor that is in the most limited supply (1)	1	allow if there's not enough of that factor it would limit the process from happening allow the amount of carbon dioxide limits the amount of photosynthesis
			Total	6	

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Question			Expected Answers	Marks	Additional Guidance
4	a		<p>any one from: malleable (1) so it is easy to bend (around corners) (1)</p> <p>or</p> <p>ductile (1) so it can be drawn into wires (1)</p> <p>or</p> <p>does not corrode (1) so it will last longer / maintains good conductivity (1)</p>	2	<p>explanation must be linked to property for second mark allow property written anywhere in the answer allow easily shaped (1) allow ductile (1) so it can be bent easily (1) allow flexible (1) so it can be bent easily (1) allow bendy for max 1</p> <p>allow does not rust (1) allow idea of low reactivity (1) allow high melting point (1) so the wires won't melt (1) ignore good conductor of heat ignore no reactivity</p> <p>ignore easy to recycle ignore references to cost ignore strong</p>

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Question		Expected Answers	Marks	Additional Guidance
	b	<p>advantage – lighter or less dense, so better fuel economy /</p> <p>corrodes less, so lasts longer (1)</p> <p>disadvantage – expensive, so car costs more /</p> <p>weaker (than steel), so more likely to be damaged in a collision (1)</p>	2	<p>property and consequence required for each marking point</p> <p>if no marks awarded, allow 1 mark for two correct properties or two correct consequences or one property and one consequence e.g. advantage - <i>lighter</i> so more efficient and disadvantage -bends easily <i>so more dangerous in crash scores</i> (1)</p> <p>allow lighter or less dense, so car will go faster or have greater acceleration (1) allow it is light so car uses less energy ignore references to fuel efficiency</p> <p>allow higher level answers in terms of impervious layer of aluminium oxide</p> <p>allow weaker so car dents more easily (1) ignore the aluminium bends more easily allow aluminium is more expensive (than steel) as it is harder or more expensive to produce (1) allow harder to weld aluminium so has to be fixed together (1)</p>
		Total	4	

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Question			Expected Answers	Marks	Additional Guidance
5	a		C (1) increased rate of reaction (1) remains unchanged (1)	3	allow the rate of reaction has gone to 10 (1) allow same mass at start and end (1) if A or B is given allow 1 mark for increased rate if D is given allow 1 mark for remains unchanged
	b		only catalyse or speed up one reaction (1)	1	allow need different catalysts for different things (1) allow it will only catalyse certain things (1)
			Total	4	

Question			Expected Answers	Marks	Additional Guidance
6	a		granite marble limestone (1)	1	
	b		cement (1)	1	not concrete
	c	i	$\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ (1)	1	allow correct multiples e.g. $2\text{CaCO}_3 \rightarrow 2\text{CaO} + 2\text{CO}_2$ allow = instead of \rightarrow not and or & for + not '+ heat', but allow heat above the arrow
		ii	break down (of a substance)(using heat) (1)	1	allow a reaction which produces two or more substances from one substance (by heating) (1) allow (substance) decomposes (with heat) / break up (of a substance)(with heat) (1) ignore breaks up bonds not heat particles broken down ignore decay / dissolve
			Total	4	

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Question			Expected Answers	Marks	Additional Guidance
7	a		<p>near crust colder than near core (1)</p> <p>near crust is more rigid than near core (1)</p>	2	<p>assume unqualified answer refers to mantle near crust</p> <p>allow near crust – colder and more rigid / aw (2)</p> <p>allow near core – hotter and non rigid or more runny / aw (2)</p> <p>allow mantle is more solid near the crust or more liquid near the core (1)</p> <p>ignore mantle is solid near the crust and liquid near the core</p> <p>ignore references to hard and soft</p> <p>ignore references to density</p>
	b		tectonic plates are less dense (than the mantle) (1)	1	<p>allow ora</p> <p>allow crust is less dense (than the mantle) (1)</p>
			Total	3	

Question			Expected Answers	Marks	Additional Guidance
8	a		<p>2nd box – ammonia (1) and carbon dioxide (1)</p> <p>4th box – photosynthetic organisms / (green) plants (1)</p>	3	<p>allow correct formulae NH_3 and CO_2</p> <p>allow trees / vegetation (1)</p> <p>allow photosynthesis (1)</p>
	b		<p>$2\text{CO} + 2\text{NO} \rightarrow \text{N}_2 + 2\text{CO}_2$</p> <p>correct formulae (1)</p> <p>balancing (1)</p>	2	<p>balancing mark is conditional on correct formulae</p> <p>but</p> <p>allow one mark for balanced equation with minor errors of subscripts, superscripts, etc e.g.</p> <p>$2\text{Co} + 2\text{NO} \rightarrow \text{N}_2 + 2\text{CO}_2$</p> <p>not and or & for +</p> <p>allow = instead of \rightarrow</p> <p>allow correct multiples e.g. $4\text{CO} + 4\text{NO} \rightarrow 2\text{N}_2 + 4\text{CO}_2$</p>
			Total	5	

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Question			Expected Answers	Marks	Additional Guidance
9	a		need (a lot of) water (1)	1	allow water is needed for steam (1) allow water is needed for cooling (1) allow isolated / too harmful to be in a community / aw (1) ignore less likely to harm humans ignore disposal of (low level) radioactive waste
	b	i	any one from: less or no air pollution (1) no contribution to global warming (1)	1	allow example of air pollution e.g. greenhouse gases / carbon dioxide / carbon emissions / oxides of nitrogen / sulfur dioxide allow emits less or no harmful gases (into the air) (1) ignore less pollution / less emissions allow uranium produces electricity for a longer period of time (1) allow idea that a small amount of uranium produces a large amount of electricity (1) ignore uranium is renewable / fossil fuels are non-renewable ignore fossil fuels are running out / uranium is not running out ignore cost

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Question			Expected Answers	Marks	Additional Guidance
	b	ii	<p>any one from: waste remains radioactive for long time / waste has a long half life (1)</p> <p>terrorist threat (1)</p> <p>danger of accident (1)</p> <p>decommissioning costs high (1)</p> <p>problem of disposal of waste (1)</p>	1	<p>ignore waste takes a long time to decompose</p> <p>ignore radiation is harmful (to humans) / radiation can cause cancer but allow (radioactive) waste can cause cancer or (radioactive) waste gives off (harmful) radiation</p> <p>allow steal it to make bombs (1), but ignore just for making bombs,</p> <p>allow waste is hard to dispose of (1)</p> <p>ignore cost</p>
	c		<p>reduce energy or heat loss /</p> <p>reduce cost (1)</p>	1	<p>allow higher level answers e.g. reduces current</p> <p>ignore stops energy or heat loss</p> <p>ignore reduce electricity loss</p> <p>ignore more efficient</p> <p>allow cheaper (1)</p>
			Total	4	

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Question			Expected Answers	Marks	Additional Guidance
10	a		<p>any two from: energy absorbed (by photocell) (1)</p> <p>electrons knocked free from silicon or atoms (in crystal) (1)</p> <p>electrons flow freely (through wires) (1)</p>	2	<p>USE TICKS IN THIS QUESTION</p> <p>allow (sun)light absorbed (by photocell) (1), but not heat absorbed</p> <p>allow photons absorbed (1)</p> <p>allow energy or (sun)light is captured or transferred to</p> <p>ignore energy is collected or gathered or stored (by photocell)</p> <p>allow lets off electrons (1)</p> <p>ignore particles knocked free from silicon</p>
	b		no power at night or bad weather (1)	1	<p>allow correct examples of bad weather e.g. reduced power output when cloudy (1) or reduced electricity when cloudy (1)</p> <p>allow no sun no electricity</p> <p>ignore it cannot produce light on a cloudy day</p> <p>allow not always sunny / need light for photocell to work / don't work at night (1)</p> <p>allow idea of little electricity generated / not very efficient / not very powerful (1)</p>
	c	i	<p>0.06 (2)</p> <p>but if answer not correct 3 x 0.02 (1)</p>	2	<p>ignore units</p> <p>but</p> <p>allow 60 mW (units given) (2)</p>
		ii	<p>16667 / 16666.7 (h) (2)</p> <p>but if answer not correct 1000 ÷ 0.06 (1)</p>	2	<p>allow 16666.6 (2)</p> <p>allow 16666 (1)</p> <p>allow 1 ÷ 0.06 / 16.7 / 16.6 / 17 (1)</p> <p>allow ecf from (c)(i)</p>
			Total	7	

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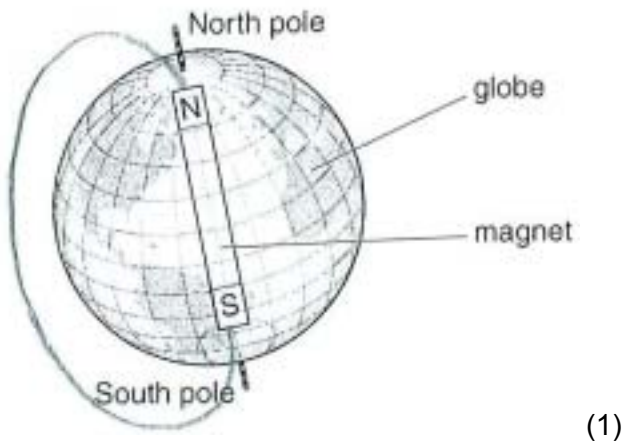
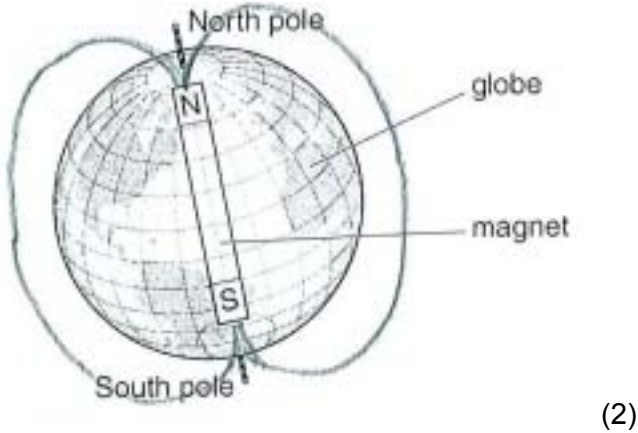
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Question			Expected Answers	Marks	Additional Guidance
11	a		Mars and Jupiter (1)	1	both needed any order allow correct answers ticked, circled or underlined in list if answer line is blank
	b		predict their path / trajectory (1)	1	allow alternative wording e.g. to see if they are on a collision course (with Earth) / to see which way they're going / idea of threat to Earth or to satellites / to see if there's a possibility that they'll get into Earth's atmosphere / idea of to change their path (1) ignore to shoot them down
	c	i	(speed) increases (1)	1	mark (i) and (ii) together candidates can write the correct answers anywhere within parts (i) and (ii). Speed mark must be recorded in (i) and gravity mark in (ii). allow get faster
		ii	gravitational strength or gravitational force or gravitational field or gravitational pull increases (1)	1	answer must be comparative not just more gravity ignore references to heat (from the Sun)
			Total	4	

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Question	Expected Answers	Marks	Additional Guidance
12 a	<p>at least one magnetic field line correctly drawn from Earth's pole to pole and/or magnet's pole to pole (1)</p> <p>but</p> <p>two or more magnetic field lines correctly drawn, at least one on each side (2)</p>	2	<div>  <p>(1)</p> </div> <div>  <p>(2)</p> </div> <p>lines must touch either the Earth's geographic poles or the poles of the bar magnet or the axes projections at each pole if field lines cross, then max 1</p> <p>ignore arrows on field lines</p>

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Question			Expected Answers	Marks	Additional Guidance
	b		any two from: create gamma rays (1) are deflected by the Earth's magnetic field (1) cause Aurora (Borealis) / Northern Lights / Southern Lights / Aurora (Australis) (1)	2	allow attracted to poles (1) allow move / spiral / spin / circle (around poles) (1) ignore cosmic rays are reflected allow produce light (energy) (1) allow ionise the air (1)
			Total	4	

Question			Expected Answers	Marks	Additional Guidance
13			two needed: idea that does not pass through lead idea that most passes through plastic idea that some passes through thin aluminium idea that not much passes through thick aluminium (1)	1	two needed for one mark
			Total	1	

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