

Additional Science B

General Certificate of Secondary Education

Unit **B624/02**: Modules B4, C4, P4

Mark Scheme for June 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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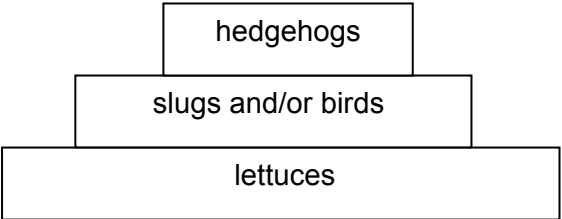
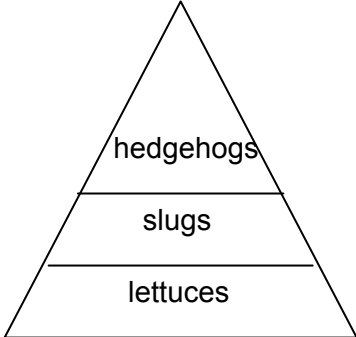
Annotations

Annotation	Meaning
	Correct response
	Incorrect response
	Benefit of doubt
	Benefit of the doubt not given
	error carried forward
	Omission Mark
	Ignore
	reject
	contradiction

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
<u> </u>	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)	(i)	phloem (1)	1	allow sieve tubes (1) allow phonetically correct spelling not xylem and phloem
		(ii)	xylem is blocked or the plant receives minerals via the xylem (1)	1	allow the tubes or vessels carrying the minerals become blocked (1) allow xylem is damaged or infected (1) allow xylem vessels carry up water from roots which also carries the minerals (1) ignore references to phloem
		(iii)	any three from: water is lost from the guard cells (1) (water lost from cells) by osmosis (1) (cells) become flaccid (1) (cells) change shape or bend (1) reference to uneven thickness of cell walls of guard cells (1)	3	ignore water is lost from the stomata allow turgor pressure decreases / no longer turgid (1) allow cells become plasmolysed (1) marks may be awarded from a labelled diagram
		(iv)	kills beetles / fungus and stops them attacking other trees (1)	1	allow stops the infection spreading (1)
	(b)	(i)	2002 (1)	1	allow 2001 (1) allow 02 or 01 (1)
		(ii)	there has not been a cold November (since 2002) / temperatures seem to be increasing (1) then any one from: so the beetles are not dying (1) due to global warming (1)	2	allow reference to data for extra marking point eg has not been colder than -6 (^o C) (2) second two marking points are conditional on correct temperature reference e.g. temperatures are decreasing so the beetles survive more (0) ignore references to climate change
			Total	9	

Question		Answer	Marks	Guidance	
2	(a)	<p>correct shape of pyramid and only three layers (1)</p> <p>lettuces on first level, slugs and/or birds on the next and hedgehogs on the third (1)</p> <p>ie</p>  <p>(2)</p>	2	<p>if four layers then (0) marks</p> <p>ignore any gaps</p> <p>allow left or right justified</p> <p>allow triangle shape</p> <p>eg</p>  <p>(2)</p>	
	(b)	(i)	nitrifying (1)	1	allow nitrobacter or nitrosomonas (1) not nitrifying
		(ii)	used for photosynthesis / prevent (leaves) turning yellow (1)	1	allow (to make) chlorophyll or chloroplast(s) (1) allow to keep (the leaves) green (limit of acceptability) (1)
		(iii)	respiration (1) active transport (1) concentration gradient or diffusion gradient (1)	3	allow concentrated gradient (1)
			Total	7	

Question			Answer	Marks	Guidance
3	(a)	(i)	saprophytic (1)	1	allow saprobiontic / saprotrophic / saprophytes (1) ignore detritivore or decomposer
		(ii)	faster respiration or faster reproduction of micro-organisms (1)	1	allow micro-organisms multiply faster (1) allow idea that enzymes work more efficiently / AW (1) ignore references to micro-organisms growing faster or working faster or rate of reaction is faster
	(b)		any two from: draws water out of micro-organisms (1) by osmosis (1) prevents or reduces their reproduction (1)	2	allow draws water out of bacteria or fungi or mould or decomposers (1) allow dries up the micro-organisms or bacteria or fungi or mould or decomposers (1) ignore removes water from food allow kills micro-organisms or bacteria or fungi or mould or decomposers (1)
			Total	4	

Question		Answer	Marks	Guidance	
4	(a)	saves energy / can wash more fragile clothes / AW (1)	1	allow uses less electricity or less hot water (1) ignore takes less time allow dyes are less likely to run (1) allow does not shrink (clothes) (1) allow does not damage (clothes) (1) allow do not denature enzymes / AW (1) allow less greenhouse gases produced or less carbon dioxide produced (1) ignore less pollution / environmentally friendly / reduces carbon footprint / less carbon emissions ignore any reference to cost alone eg more economical	
	(b)	any three from: hydrophilic head is water loving (1) hydrophobic tail (1) is grease loving and/or water hating (1) idea that tail lifts off grease (1) idea that detergent molecules surround grease and so prevent it returning to clothes (1)	3	marks may be awarded from a labelled diagram allow hydrophilic end bonds with water (1) allow hydrophobic end or hydrophobic head (1)	
	(c)	(i)	using a solvent other than water (1)	1	allow other substances attracted to dirt (1) allow chemicals other than water (1) allow use a solution other than water (1) allow named solvent eg tetrachloromethane/tetrachloroethene (1)
		(ii)	to remove stains that will not dissolve in water (1)	1	allow references to clothes that are damaged by water eg shrinking or dyes running (1) allow references to materials that cannot be put into water eg silk or leather cannot be put in a washing machine (1) ignore clothes being ruined without reference to water
			Total	6	

Question		Answer	Marks	Guidance
5	(a)	30.3 (g) (1)	1	unit not needed
	(b)	<p>$\frac{\text{actual mass}}{\text{predicted mass}} \times 100$ (1)</p> <p>but</p> <p>$\frac{4.4}{5.5} \times 100$ scores 2</p>	2	<p>allow $\frac{am}{pm} \times 100$ (1)</p> <p>allow $\frac{4.4}{5.5}$ (1)</p> <p>allow correct reasoning eg $5.5 / 100 = 1\%$ so $80\% = 4.4\text{g}$ (2)</p>
	(c)	<p>RFM of ammonia is 17 (or 2NH_3 is 34) and RFM of ammonium sulfate is 132 (1)</p> <p>idea that 34g of ammonia produces 132g of ammonium sulfate (1)</p> <p>but</p> <p>13.2 (g) scores 3</p>	3	<p>these may be anywhere in the answer</p> <p>idea that 2 moles of ammonia produces 1 mole of ammonium sulfate (1)</p>
	(d)	<p>any two from:</p> <p>has nitrogen to make amino acids or has nitrogen to make proteins (1)</p> <p>proteins needed for growth (1)</p> <p>idea of replacing nitrogen used by previous crop (1)</p>	2	<p>allow has nitrogen to make DNA or RNA (1)</p> <p>allow proteins needed to make the crops bigger (1)</p>
Total			8	

Question		Answer	Marks	Guidance
6	(a)	have strong covalent bonds (1)	1	allow has many strong bonds (1) ignore just many covalent bonds ignore just strong bonds allow strong intramolecular bonds (1) not strong intermolecular bonds
	(b)	slippery (1) black / grey / marks the paper (1)	2	allow layers slide easily (1) allow leaves a layer behind on the paper (1) allow rubs off onto the paper / can be rubbed off paper (1) ignore dark allow weak bonds or weak forces between the layers (1) causes graphite to be slippery (1) ignore references to intermolecular bonds or intermolecular forces between layers
	(c)	60 (1)	1	allow correct answer underlined, ticked or circled if answer line is blank allow C ₆₀ (1)
	(d)	any two from: semiconductors (in electrical circuits) (1) (industrial) catalysts (1) reinforce graphite or reinforce tennis rackets (1) (idea of) drug delivery systems (1)	2	allow to attach catalysts (1) allow to reinforce other sports equipment eg golf clubs (1) allow to transport medications or to transport drugs (1) allow used as cages to transport molecules (1)
		Total	6	

Question			Answer	Marks	Guidance
7	(a)	(i)	idea that like charges repel or same charges repel (1)	1	allow positive charge repels another positive charge (1) ignore all have positive charge or all have the same charge
		(ii)	idea of electron transfer or electron loss (from hair) (1)	1	allow loss of negative charge (from hair) (1) not electrons moving from comb to hair not gain of positive charge or gain of protons
	(b)		negative (no mark) idea of gain of negative charge from hair (1) but idea of gain of electron(s) from hair (2)	2	if answer is positive or no charge (0) marks allow more negative charge than positive charge (1) not loss of positive charge or loss of protons
			Total	4	

Question			Answer	Marks	Guidance
8	(a)		4 (ohms/ Ω) (2) but if answer is incorrect 5 \div 1.25 (1)	2	
	(b)	(i)	becomes 10 (V) (1)	1	allow doubles (across the resistor R) (1) ignore increases
		(ii)	(current) reduces / decreases / AW (1)	1	allow any value less than 1.25 (A) but not 0 (A) (1) ignore weakens not slower not voltage reduces
			Total	4	

Question		Answer	Marks	Guidance	
9	(a)	<p>idea that beam is focused on tumour (1)</p> <p>idea that the beam is rotated so (all) the tumour receives a full dose (1)</p> <p>idea that other cells or healthy cells or non-cancerous cells receive only a limited / less / smaller dose (1)</p>	3	<p>give credit to correct annotations / labels on the diagram</p> <p>allow beam is directed onto or concentrated on or targeted or aimed at or fired at the tumour (1)</p> <p>allow attacks the tumour from all angles (1)</p> <p>allow rotated with the tumour at the centre (1)</p> <p>allow gets every part of tumour (1)</p> <p>allow only the tumour is receiving full strength gamma rays scores (2) because it implies that healthy cells receive less</p> <p>allow idea that there is danger of healthy tissue developing cancer (1)</p>	
	(b)	<p>time for activity to half or time for number of radioactive atoms to half or time for the radioactive mass to half or time for half the isotope to decay(1)</p> <p>(Y) idea that the half life of X is too long or the half life of Y is shorter (1)</p> <p>or</p> <p>(Y) idea that X remains radioactive (in the body) for too long or Y remains radioactive (in the body) for a shorter time (1)</p>	2	<p>allow time for half the radioactive substance to decay (1)</p> <p>allow time for the count rate to drop to half its value (1)</p> <p>allow time for the radioactive nuclei to half (1)</p> <p>allow time taken for half of the unstable nuclei to decay (1)</p> <p>not time for half the radioactive nucleus to decay</p> <p>not just time for the mass or nuclei to half</p> <p>if answer is not Y eg X then (0) marks</p> <p>allow Y decays quicker (1)</p>	
	(c)	(i)			
		(i)	(an) alpha / α particle (1) (a) beta / β particle (1)	2	allow alpha ray (1) allow beta ray (1)
		(ii)	131 54 (1)	1	both numbers needed
			Total	8	

Question		Answer	Marks	Guidance
10	(a)	<p>scan</p> <p>reflect or echo or return</p> <p>break up or fragment or destroy or shatter</p> <p>frequency or oscillations</p>	2	<p>all 4 correct for 2 marks 1 2 or 3 correct for 1 mark</p> <p>ignore bounce or rebound</p> <p>ignore high pitch</p>
	(b)	<p>✓ in last box (1)</p> <p>The ultrasound waves are not loud enough</p> <p>The ultrasound waves travel as transverse waves</p> <p>The ultrasound waves are just areas of air pressure changes</p> <p>The ultrasound waves do not have enough energy</p> <p>The ultrasound waves are above the range of human hearing ✓</p>	1	
	(c)	<p>number of (complete) waves per second or vibrations per second or oscillations per second (1)</p>	1	<p>allow any units of time</p> <p>allow number of waves in a certain amount of time (1)</p> <p>allow amount of waves in one second (1)</p>
		Total	4	

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