

Additional Science B

General Certificate of Secondary Education **B624/02**

Unit 2: Modules B4, C4, P4

Mark Scheme for June 2010

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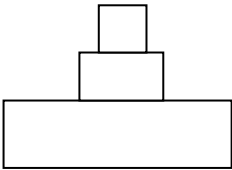
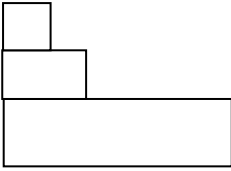
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Question		Expected Answers	Marks	Additional Guidance
1	(a)	upper epidermis (1)	1	allow labelled on diagram by part X
	(b)	more or many chloroplasts or chlorophyll (to absorb light) (1) at or near top of leaf (to absorb light) (1)	2	allow densely packed ignore large surface area ignore simply 'next to surface' i.e. must refer to top surface ignore closer to light ignore any reference to shape ignore permeable cell wall / membrane to absorb CO ₂ or water
	(c) (i)	<u>xylem</u> (1)	1	if answer line blank allow correct answer circled, underlined or ticked in list
	(ii)	chlorophyll (1)	1	ignore chloroplast
	(iii)	any two from: (minerals taken up by) active transport (1) against a diffusion gradient / from low to high concentration / AW (1) needs energy / respiration to occur (1)	2	allow against concentration gradient ignore simply from low concentration (in stem of question) allow using energy from photosynthesis allow higher level answer: carrier molecules / pumps (1) allow ATP / adenosine triphosphate (1)
		Total	7	

Question	Expected Answers	Marks	Additional Guidance
2 (a)	<p>blue tits (area 30 squares)</p> <p>caterpillars (area 50 squares)</p> <p>cabbages (area 450 squares)</p>  <p>correct labelled pyramid i.e. caterpillars in middle and blue tits on top (1)</p> <p>correct bar sizes to give accurate scale diagram (1) allow +/- 1/2 square tolerance on width and height of bars</p>	2	<p>second mark is dependent on first marking point</p> <p>allow scale drawing non-pyramid e.g.</p>  <p>labelling of cabbages not required</p> <p>If all bars are all same height (10 small squares) then bar for caterpillars is 5 squares wide and bar for blue tits is 3 squares wide. If bars not all same height then bar for caterpillars must occupy area of 50 small squares and blue tits 30 squares.</p>
(b) (i)	respiration / heat (loss or transfer) / movement (1)	1	<p>allow processes of heat transfer e.g. radiation, conduction, convection</p> <p>allow evaporation</p> <p>allow milk production</p> <p>ignore sweating or breathing</p>
(ii)	1100 (kJ) (1)	1	
(iii)	<p>7.246 (%) or 7.25(%) or 7.2(%) or 7(%) scores (2)</p> <p>BUT $\frac{250}{3450} \times 100$ scores (1)</p>	2	<p>allow 7.24(%) or 7.3(%) or 7.0(%) (i.e. incorrect rounding) = (1)</p> <p>allow 0.07246 or 0.0725 or 0.072 or 0.07 for 2 marks</p> <p>allow 0.0724 or 0.073 or 0.070 for 1 mark</p>

Question	Expected Answers	Marks	Additional Guidance
(c)	idea that herons' food is killed or reduced / pesticide kills or reduces things in food chain / AW (1) idea that pesticide passes along food chain / AW (1) BUT (bio) accumulation / (concentration) increases along food chain / highest (concentration) in herons (2)	2	ignore (mechanism of transfer) run-off / leaching / spray drift from land into river ignore references to eutrophication e.g. pesticide kills the stickleback ignore simply 'kills / poisons herons' allow (pesticide) builds up along food chain (2) allow higher level answers: pesticide is persistent / is not broken down / is stored in body tissues / can not be excreted (1) pesticide reduces egg shell thickness (1)
	Total	8	

Question		Expected Answers	Marks	Additional Guidance
3	(a)	<p>high temperature kills microorganisms <input type="checkbox"/></p> <p>the solution prevents microorganisms getting oxygen <input type="checkbox"/></p> <p>the solution causes microorganisms to lose water <input checked="" type="checkbox"/></p> <p>the solution is too acidic for microorganisms <input type="checkbox"/></p>	1	more than one tick scores zero
	(b) (i)	osmosis (1)	1	<p>allow plasmolysis</p> <p>ignore loss of water / dehydration / desiccation</p> <p>ignore flaccid / crenation</p>
	(ii)	plasmolysed (1)	1	<p>allow flaccid</p> <p>ignore crenation</p> <p>ignore loss of turgor</p>
	(c) (i)	pressure of water or membrane or cytoplasm or cell contents against (cell) wall (1)	1	<p>allow cell wall resists pressure of water</p> <p>allow alternative wording for pressure e.g. water pushes against the cell wall</p>
	(ii)	animal cells do not have a (cell) wall (1)	1	<p>ignore plants have a cell wall</p> <p>allow animal cells burst or lyse but not cell walls burst</p>
		Total	5	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	101 (1)	1	
	(b) (i)	nitric (acid) (1)	1	allow correct formula i.e. HNO ₃
	(ii)	neutralisation (1)	1	if answer line blank allow correct answer circled, underlined or ticked in list
	(c)	<p>Level 1 (1 mark) idea that fertiliser or nitrates increase the growth of water plants or that the outcome is that living organisms in the water die</p> <p>Level 2 (2 marks) idea that (algal bloom) blocks off sunlight (from other plants which then die)</p> <p>Level 3 (3 marks) idea that in addition to level 2, (aerobic) bacteria use up the oxygen in the water</p>	3	<p>Use ticks in this question</p> <p>Mark scheme is hierarchical – level 1 is required before level 2 can be awarded and levels 1 & 2 required before level 3 can be awarded</p> <p>allow algal bloom for increased growth of water plants idea that fertiliser kills or poisons fish does not score, but does not negate other correct science at level 1</p> <p>allow idea that plants below surface cannot photosynthesis for level 2</p> <p>allow decomposers or microbes or micro organisms for bacteria</p>
		Total	6	

Question		Expected Answers	Marks	Additional Guidance
5	(a)	$N_2 + 3H_2 \rightarrow 2NH_3$ formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae allow any correct multiple e.g. $2N_2 + 6H_2 \rightarrow 4NH_3$ allow = or \rightleftharpoons for arrow not 'and' or & for + allow one mark for correct balanced equation with incorrect use of upper and lower case formulae e.g. $n_2 + 3H_2 \rightarrow 2nH_3$ e.g. $N_2 + 3H_2 \rightarrow 2NH^3$
	(b)	rate - increases yield - no effect (1)	1	both required for the mark
	(c)	used to make fertilisers / produce more food (1)	1	allow make nitric acid / make polymers or plastics / dyes / explosives / as a fertiliser / smelling salts / cleaning materials / hair perms allow increased plant growth but ignore 'helps plants grow' allow provides nitrogen / nitrates ignore to make lots of different chemicals ignore bleach
	(d) (i)	(yield or it) decreases / goes down / AW (1)	1	ignore references to rate
	(ii)	(yield or it) increases / goes up / AW (1)	1	ignore references to rate
		Total	6	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	filtration - to remove solid particles (1) sedimentation (1)	2	allow remove (large) objects or bits allow to remove insoluble particles ignore to remove (large) particles
	(b)	from lead pipes (1)	1	allow from lead compounds in petrol / shot gun pellets / (lead) fishing weights / (lead) roofing ignore just 'from pipes' allow from old pipes allow from rocks
		Total	3	

Question		Expected Answers	Marks	Additional Guidance
7	(a)	allotrope (1)	1	if answer line is blank then allow correct answer circled, underlined or ticked in list
	(b)	layers weakly held together / layers can slide over each other (1)	1	ignore references to intermolecular forces or bonds
	(c)	(delocalised) electrons move (1)	1	allow delocalised electrons / free electrons / sea of electrons
	(d)	hard (1) high melting point (1)	2	allow hard wearing allow it can't be scratched ignore hard to break or good at cutting hard things ignore strong or sharp or dense ignore durable allow it will not melt allow (good) thermal conductor as an additional marking point
		Total	5	

Question		Expected Answers	Marks	Additional Guidance
8	(a)	electrons	1	more than one answer scores (0) allow correct answer underlined, circled or ticked in list if answer line is blank
	(b)	dust (on insulators) / clothes clinging (1)	1	allow sparks or explosion risk or fire risk allow examples of the above e.g. when refuelling or e.g. flour mill allow lightning (damage) / AW allow damage to electronic components or electrical appliances allow interference with communications e.g. interferes with TV signals e.g. crackling on TV screen allow burn or kill (people) ignore causes pain / it hurts or references to hair standing on end
		Total	2	

Question		Expected Answers	Marks	Additional Guidance
9	(a)	(speed) - fast / AW (1) (description) - electron (1)	2	allow very fast / medium (fast) / quite fast (1) allow any description indicating speed is between alpha and gamma ignore average allow e ⁻
	(b) (i)	neutrons (1)	1	
	(ii)	unstable / AW (1)	1	allow it breaks down or it can split or decays allow too many neutrons ignore unbalanced
	(c)	any four from: tracer or radioisotope in pipe or liquid / AW (1) gamma mentioned (1) idea of radiation getting through ground or pipe/ alpha or beta NOT getting through ground (1) (radiation detected by) Geiger tube / GM tube / Geiger counter / gamma camera (1) idea of blockage indicated by more radiation at or before OR idea of blockage indicated by less or no radiation after (1)	4	use ticks in this question allow gamma in pipe (2) allow idea of gamma radiation getting through ground or pipe or idea of gamma radiation can penetrate (2) not alpha or beta goes through the ground allow photographic paper allow idea that radiation level changes at or near the blockage
	(d) (i)	(material X) - 2 (days) (1)	1	if answer line blank allow correct answer on the graph
	(ii)	points plotted at (3,40) and (6,20) or line which passes through these points (1)	1	allow +/- 1/2 square tolerance if points only plotted correctly (with no line), award the mark ignore any line or points after 6 days
Total			10	

Question		Expected Answers	Marks	Additional Guidance
10	(a)	4 (2) but if answer incorrect then 12 ÷ 3 scores (1)	2	ignore incorrect units
	(b)	doubles / 6 (amps) / AW (1)	1	allow increases / AW not 5 or 96 (amps) ignore stronger
		Total	3	

Question		Expected Answers	Marks	Additional Guidance
11	(a)	high frequency scores (2) but any correct mention of frequency or pitch or Hz (1)	2	e.g. pitch or frequency or Hz above threshold of human hearing (2) (pitch or frequency or Hz) above 20 000 Hz / 20 kHz(2) high pitched or high Hertz / Hz (2) if candidate refers to an incorrect numerical value (in Hz) ignore it and credit other marking points ultrasound or "it" is 20 000 on its own scores (0) allow low frequency or pitch scores (1) allow above the threshold of human hearing (1) if no other mark scored allow too high to hear (1) ignore too quiet ignore outside the range of human hearing
	(b)	reflections or echoes (from layers) / (reflections) return at different times (1)	1	ignore ultrasound waves bounce off layers e.g. signals bounce back at different times scores 1
	(c)	no damage to (living) cells or tissue or organs (1)	1	assume unqualified answer refers to ultrasound e.g. it could damage cells scores 0, but X-rays damage cells scores 1 allow can detect soft tissue / AW or reverse argument allow X-rays cause cancer or mutations or affect DNA ignore unqualified damage e.g. X-rays are harmful to humans / ultrasound is safer ignore shows movement
	(d)	(high speed) electrons hitting metal / (high speed) electrons fired at metal / AW (1)	1	allow named metal (e.g. tungsten)
		Total	5	

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