



GCSE

Additional Science B

General Certificate of Secondary Education

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

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

Question			Expected Answers	Marks	Additional Guidance
1	a		respiration (1)	1	not breathing
	b	i	hydroponics (1)	1	allow hydroponics allow phonetic spellings
	b	ii	idea of better control of minerals or nutrients / idea of better control of disease (1)	1	allow can grow plants in barren areas / areas without soil or with poor soil / can recycle nutrients or fertiliser / pesticides can be put into water/ control pests / less space needed / less chance of getting a disease (1) ignore water contains minerals ignore cannot get diseases or pests but allow cannot get soil related diseases or soil related pests (1) allow better yield

Question		Expected Answers	Marks	Additional Guidance
c		(cell) wall (1)	1	allow lignin / cellulose
d		<p>use ✓'s in this question</p> <p>advantages:</p> <p>up to two from</p> <p>idea of largest yield when grown in water (compared to other plants) (1)</p> <p>idea of (largest) increased yield compared to growing in soil (1)</p> <p>uses data to support idea of higher yield (1)</p> <p>disadvantages:</p> <p>up to two from</p> <p>low(est) percentage of the plant that can be eaten (1)</p> <p>leads to problem of disposing of remains as will not rot (1)</p>	3	<p>allow cucumbers have the highest yield / grow the most (of all the plants) (1)</p> <p>e.g. you get more when grown in water than in soil / grows better in water than soil (1)</p> <p>e.g. 65.7 (%) in water and only 5.4(%) in soil (1) e.g. you get 60.3% more yield in water (2) e.g. 65.7(%) is the highest (in the table) (1)</p> <p>if no other advantage marks scored allow higher yield (1)</p> <p>allow only 20(%) can be eaten allow a lot of cucumber(s) can't be eaten / a big percentage can't be eaten /ora (1)</p> <p>allow in disadvantages: beans contain more protein / cucumbers more difficult to digest / cucumbers have less dry mass</p>
		Total	7	

B624/02

Mark Scheme

June 2011

Question			Expected Answers	Marks	Additional Guidance
2	a	i	fermentation (1)	1	allow it ferments / treatment with bacteria / add yeast / fungi / anaerobic respiration / decay / rotting / breakdown (of plants)
	a	ii	renewable / carbon dioxide is taken in at the same rate that it is given out / no net release of carbon dioxide / no sulfur impurities / does not lead to acid rain (1)	1	ignore just less / no carbon dioxide released or no / less greenhouse gases allow carbon neutral allow less sulfur dioxide released / less or no particulates released
	b	i	lets some molecules through but not others (1)	1	allow lets small molecules through allow lets water through but not other substances allow only lets water through allow idea of only some things or substances can go through allow idea of things or substances can go through but not others ignore stops salt getting through ignore lets water through but stops salt getting through and lets water through scores (1) not lets salt through but not water ignore references to holes ignore references to direction
	b	ii	tick in first box (1)	1	more than one box ticked scores 0
			Total	4	

B624/02

Mark Scheme

June 2011

Question		Expected Answers	Marks	Additional Guidance
3	a	chlorophyll (1)	1	ignore chloroplast
	b	i palisade (mesophyll) (1) spongy (mesophyll) (1)	2	if mesophyll only written twice = 1
	b	ii contains (most of) the chloroplasts / chlorophyll or less photosynthesis / food or starch or sugar production (1)	1	allow idea of plant having less chloroplast / chlorophyll (1) if photosynthesis linked to gas exchange then scores 0
	c	i A = saprophytes / decay (bacteria) / decomposers (1) B = nitrifying (bacteria) (1)	2	allow decomposition / purifying bacteria allow nitrosomonas / nitrobacter
	c	ii lower rate of respiration / reproduction / enzyme action in bacteria (1)	1	allow decay happens more slowly allow idea that warmth speeds up respiration / reproduction / enzyme action in bacteria ignore less growth
	c	iii minerals..... minerals..... if respiration..... diffusion..... plants take..... Oxygen is osmosis occurs....	2	each incorrect tick over two negates a correct tick
		<input type="checkbox"/>		
		<input checked="" type="checkbox"/>		
		<input type="checkbox"/>		
		<input type="checkbox"/>		
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		<input checked="" type="checkbox"/>		
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B624/02

Mark Scheme

June 2011

Question		Expected Answers	Marks	Additional Guidance
4	a	salt (1)	1	
	b	$H^+ + OH^- \rightarrow H_2O$ (1)	1	order of reactants unimportant allow OH_2 / HOH allow correct multiples subscripts and superscripts must be correct e.g. H^2O scores 0
	c	87.5 (%) (2) but if answer incorrect then $\frac{4.2}{4.8} \times 100$ OR $\frac{\text{actual mass}}{\text{predicted mass}} \times 100 \quad / \quad \frac{\text{am}}{\text{pm}} \times 100$ (1)	2	allow 88 (2)
	d	copper oxide + sulfuric acid \rightarrow copper sulfate + water (1)	1	allow correct formulae i.e. $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$ or mix of correct formulae and words not and or & for + allow = instead of \rightarrow allow correct formulae or mix of words and correct formulae
	e	carbon dioxide (1)	1	allow CO_2
	f	30 (tonnes) scores (3) but if answer incorrect relative formula mass of urea = 60 scores (1) and ratio of ammonia to urea is 2:1 scores (1)	3	allow 60 anywhere in working for 1 mark e.g. 34g of ammonia makes 60g of urea (2)
		Total	9	

Question		Expected Answers	Marks	Additional Guidance
5	a	<p>use ✓'s in this question</p> <p>crush the plant / grind up the plant (1)</p> <p>add a solvent or named solvent (1)</p> <p>(separate chemicals using) chromatography / distillation / crystallise / solvent extraction (1)</p>	3	<p>allow cut it up or cut or chopped or squeezed or pressed or mashed or pulp it or blend it (1)</p> <p>allow 'freeze and then defrost' (1)</p> <p>allow add water or ethanol or propanone / dissolve the chemical (1)</p> <p>ignore add a solution or boil it</p> <p>ignore add an acid</p> <p>allow correct description of separation process (1)</p> <p>ignore evaporation</p> <p>ignore filtering</p> <p>marks can be awarded from annotated diagrams</p>
	b	<p>any two from</p> <p>different versions made (1)</p> <p>idea of research (and development) (takes a long time) (1)</p> <p>(time required) to meet legal requirements(1)</p> <p>testing (takes a long time) (1)</p> <p>but</p> <p>human trials needed (2)</p>	2	<p>ignore difficult to find raw materials</p> <p>ignore vague references to safety or technology</p> <p>allow needs government clearance or approval</p> <p>e.g. to ensure that it works / has not got any serious side effects</p> <p>allow testing on humans = 2</p>
		Total	5	

B624/02

Mark Scheme

June 2011

Question			Expected Answers	Marks	Additional Guidance
6	a		(run off from) fertilisers (1)	1	allow sewage / NPK
	b	i	B (1)	1	
	b	ii	A (1)	1	
	b	iii	silver nitrate – (pale) yellow precipitate and barium chloride – white precipitate	1	both required for the mark
	b	iv	$\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$ correct formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae or mix of correct formulae and words not and or & for + allow = instead of → allow correct multiples allow one mark for balanced equation with minor errors of subscripts, superscripts, etc e.g. $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NACl}$ (1)
			Total	6	

Question		Expected Answers	Marks	Additional Guidance
7	a	electron (1)	1	
	b	<p>use ✓'s in this question</p> <p>any three from:</p> <p>defibrillator / defib / AW (1)</p> <p>paddles charged or at a high voltage (1)</p> <p>good electrical contact with chest (1)</p> <p>charge passed through patient / (patient given) shock / shock to heart / patient or heart given charge (1)</p> <p>heart contracts (1)</p> <p>idea of not shocking (other) staff (1)</p>	3	<p>allow phonetic spelling</p> <p>allow defibrillator charged (2)</p> <p>allow shaved or dry or bare or lubricant on chest (1)</p> <p>ignore just pads on skin or chest or body or either side of heart</p> <p>allow (electric) current or electrons runs through body (1)</p> <p>but ignore electricity runs through body</p> <p>ignore shot of electricity / charge</p> <p>allow stand back / insulating mat / insulating handles / insulating gloves / insulating shoes (1)</p>
		Total	4	

B624/02

Mark Scheme

June 2011

Question		Expected Answers	Marks	Additional Guidance
8		3.75 (2) but if answer is incorrect $\frac{15}{4} = (1)$	2	allow 3.8 (2)
Total			2	

Question		Expected Answers	Marks	Additional Guidance
9 a		idea that the ultrasound is reflected (1) from the (boundary between) organs (1) idea that ultrasound returns at different times (1)	2	ignore rebound / bounce back allow echo (1) allow from (different) tissue / (named) tissue / layers / interfaces / surfaces / bones (1) allow ultrasound can echo off surfaces (2) ignore references to ultrasound shows up soft tissue ignore idea of ultrasound passing through tissue allow reflects at different times (2) ignore different rates if any confusion with alpha, beta or gamma rays or electrons then scores 0
b		ultrasound able to produce images of soft tissue / does not damage living cells or tissues / does not cause cancer or ionisation (1) ORA for X-rays	1	ignore X-rays are more harmful unless qualified e.g. X-rays are more energetic therefore cause more damage (1) allow X-rays only show up bones ignore gives a clearer picture
Total			3	

Question			Expected Answers	Marks	Additional Guidance
10	a	i	time taken for the count rate to drop to half its original value (1)	1	allow time taken for half (radioactive) atoms or nuclei or isotope or substance to decay allow time taken for half of the (radioactive) material to decay allow time taken for radioactivity to halve allow numerical examples not half the life of the material not time taken for particles to halve not time taken for atomic mass to halve
	a	ii	640 (2) If answer is incorrect evidence of two half lives = (1)	2	e.g. 160 to 80 to 40 for 1 mark
	b	i	uranium (1) lead (1)	2	must be in correct order
	b	ii	amount of uranium compared to lead (1)	1	allow ecf from 10(b)(i) or correct answer ignore radio-carbon dating or uranium dating allow how much of each substance there is in the rock (1) as this assumes the substances being referred to are those mentioned in part (i)
			Total	6	

B624/02

Mark Scheme

June 2011

Question		Expected Answers	Marks	Additional Guidance
11	a	fission / chain (1) heats/boilssteam / (water) vapour (1) turbine / blades.....generator / coils / magnets / electromagnets (1)	3	not fusion ignore evaporates both needed both needed ignore fan for turbine
	b	mention of neutrons (1) but neutrons absorbed or gained (by metals) (2)	2	mention of electrons or protons (being absorbed) scores 0 allow neutrons lost (1 max)
		Total	5	

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