

Additional Science B

General Certificate of Secondary Education

Unit **B624/02**: Modules B4, C4, P4 (Higher Tier)

Mark Scheme for January 2013

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.










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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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Annotations

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt not given
	error carried forward
	information omitted
	ignore
	reject
	contradiction

Subject Specific Marking Instructions

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
- = underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
- ecf = error carried forward
- AW = alternative wording
- ora = or reverse argument

Question			Answer	Marks	Guidance
1	(a)		any two from not enough oxygen / decomposers need oxygen (1) ; too cold (1) ; (too) salty / presence of salt (1)	2	allow no oxygen ignore respiration cannot occur unless qualified not 'not enough temperature' allow not enough heat / warmth allow salt is a preservative
	(b)	(i)	D (1)	1	mark answer line first but if blank allow indication on diagram
		(ii)	(action of) nitrogen fixing bacteria (1) (action of) lightning (1)	2	not just bacteria / nitrifying bacteria / nitrogen fixation allow named bacteria eg <i>Rhizobium</i> , <i>Azotobacter</i> , <i>Clostridium</i> not lightning allow reference to Haber process (1)
	(c)		palisade (mesophyll cells) (1)	1	not mesophyll unless qualified by palisade
Total				6	

Question			Answer	Marks	Guidance
2	(a)	(i)	osmosis (1)	1	ignore diffusion
		(ii)	allows some substances / molecules through (not others) / ora (1)	1	allow lets water through not sugar / glucose (1) must make reference to both water and sugar / glucose allow lets small molecules through (not large) / ora (1)
	(b)		turgor / osmotic / wall (1) plasmolysed (1)	2	not turgid not crenation
Total				4	

Question			Answer	Marks	Guidance
3	(a)	(i)	less growth / yellow (1)	1	ignore withered / dry ignore just discoloured / lose colour allow yellow/brown or brown/yellow or green/yellow or yellow/green (1) allow small plant / AW
		(ii)	chlorophyll (1)	1	ignore chloroplast
	(b)	(i)	5 (1)	1	allow 4.8 to 5.2
		(ii)	if too many then the plant uses too much energy / food / resources making / operating traps (so less left for growth) (1) if too few then plant does not obtain (enough) minerals / nutrients / chemicals (to enable it to grow) (1)	2	not does not trap enough energy / food from insects
			Total	5	

Question		Answer	Marks	Guidance
4	(a)	diagram or explanation showing a tapering pyramid with four trophic levels (1)	1	allow triangle with four segments do not measure size of blocks in pyramid – look for largest at bottom tapering to smallest at top look at diagram first, ignore writing unless direct contradiction
	(b)	(i) may directly harm organisms that are not pests / reduce other animals food sources / may accumulate in organisms / may reduce biodiversity (1)	1	ignore poison producers
		(ii) for: as the amount of pesticide has gone up, so has the death rate (1) against: references to drops in death rate when amount is still increasing (1)	2	
	(c)	fermentation / action of yeast (1)	1	allow brewed
Total			5	

Question		Answer	Marks	Guidance
5	(a)	salt (1) ; water (1)	2	order unimportant
	(b)	ammonium sulfate (1)	1	allow (NH ₄) ₂ SO ₄ not ammonia sulfate
	(c) (i)	acid used – phosphoric acid (1) ; alkali used – ammonium hydroxide / ammonia (1)	2	allow H ₃ PO ₄ allow NH ₄ OH / NH ₃ ignore ammonium
	(ii)	use an indicator (1) add alkali (dropwise) to acid until colour (just) changes (1)	2	eg universal indicator / litmus / (screened) methyl orange / phenolphthalein / data logger and pH probe
	(iii)	evaporation / heat the solution (1)	1	allow leave to crystallise / leave to stand (in a warm place)
	(d)	H ⁺ + OH ⁻ → H ₂ O (1)	1	
Total			9	

Question		Answer	Marks	Guidance
6	(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 not ionic and covalent bonds easily broken
	(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 / can withstand high temperatures allow (good) thermal conductor as an additional marking point
		Total	5	

Question		Answer	Marks	Guidance
7	(a)	$N_2 + 3H_2 \rightarrow 2NH_3$ formulae (1) ; balancing (1)	2	balancing mark is conditional on correct formulae allow any correct multiple eg $2N_2 + 6H_2 \rightarrow 4NH_3$ 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 eg $n_2 + 3H_2 \rightarrow 2nH_3$ eg $N_2 + 3H2 \rightarrow 2NH^3$
	(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) increases / goes up / aw (1)	1	ignore references to rate
	(ii)	(yield or it) decreases / goes down / aw (1)	1	ignore references to rate
Total			6	

Question		Answer	Marks	Guidance
8	(a)	beta (1); gamma (1)	2	allow symbols for beta and gamma (1) any order
	(b)	any two from radiation / alpha / americium – 241 ionises the air (particles) (1); ions / ionised air particle move (between charged plates) (1); causes current / completes circuit (1); smoke (particles) absorb radiation / alpha (1) therefore less ionisation (1); reduced current / incomplete circuit sounds alarm (1)	2	allow mention of just oxygen or just nitrogen or just particles (1) allow smoke stops / blocks radiation (1) not smoke (particles) react with radiation ignore slows down ionisation
Total			4	

Question		Answer	Marks	Guidance
9	(a)	firing electrons at metal targets (1)	1	ignore bounce / reflect
	(b)	Gamma rays and X-rays have similar wavelengths.	1	
	(c)	easier to control / different voltages have different penetrations / AW (1)	1	allow idea that there are no dangerous isotopes to handle / store / dispose of (1) ignore unqualified reference to safety
	(d)	any one from detect cancer / tumours (1); tracer (1)	1	
	(e)	any one from scan / pregnancy scan / AW (1); breaking (kidney) stones (1)	1	allow look for / treat tumours allow cleaning delicate equipment allow to treat muscle injury allow blood flow measurements
Total			5	

Question		Answer	Marks	Guidance
10	(a)	risk of sparks / explosions / fire / AW (1)	1	
	(b)	idea of electron transfer (1) BUT ruler positive because it has lost electrons (2)	2	eg electrons move to ruler (1) allow correct answers in terms of cloth eg electrons move to cloth (2) electrons move from cloth (1) any reference to positive electrons or protons moving = 0
	(c)	any two from idea of current / charge passed through patient / going to heart (1) heart shocked / contracts (1) idea of precautions to avoid shocking / harming operator / assistants (1) maximum of 1 mark for precautions	2	ignore paddles on chest not just electricity / electric shock moves ignore reference to voltage eg keeping others clear / stand clear allow earthing the trolley (1) allow limiting / controlling the current / charge (1) ignore reference to voltage allow insulated clothing / boots (1)
		Total	5	

Question		Answer	Marks	Guidance
11	(a)	prevents the flex overheating / flex melting / prevent (further) damage to the lamp (1)	1	allow cable / insulated wire for flex (1) allow prevent plug damage as long as it is clear it is not the fuse in the plug (1) allow stops appliance / lamp over heating (due to increase in current) (1) ignore damage to user / electric shock ignore damage to bulb ignore unqualified reference to breaking circuit
	(b)	0.33 (amps) (2) but if answer incorrect 230 / 690 (1)	2	allow 1 / 3 or 0.33(2) allow 0.3 (1) ignore units only look at workings if calculation incorrect
Total			3	

Question		Answer	Marks	Guidance
12	(a)	thorium (1)	1	allow Th (1)
	(b)	(Th) 234 90 (1) (alpha) 4 2 (1)	2	marks are for correctly calculating the mass number and the atomic number, correct symbol not needed any order
Total			3	

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