

Mark Scheme for June 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.

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For answers marked by levels of response:

- a. **Read through the whole answer from start to finish**
- b. **Decide the level that best fits** the answer – match the quality of the answer to the closest level descriptor
- c. **To determine the mark within the level**, consider the following:













Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

- d. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

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
	Level 1
	Level 2
	Level 3

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	=	alternative wording
ora	=	or reverse argument

Question		Answer	Marks	Guidance									
1	(a)	<p>any two from: microbes can respire faster (1) microbes can reproduce/grow faster (1) enzymes work faster / enzymes are closer to optimum (1)</p>	2	<p>allow non-comparative statements but must have at least one comparative statement to gain full marks</p> <p>e.g. microbes grow fast = 1 microbes grow fast and enzymes work fast = 1 enzymes work fast so microbes grow faster = 2</p> <p>ignore microbes work faster allow alternatives to microbes e.g. bacteria / fungi</p>									
	(b)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">adobo</td> <td style="text-align: center;"> </td> <td style="text-align: center;">drying the food stops enzymes working</td> </tr> <tr> <td style="text-align: center;">bummalo</td> <td style="text-align: center;"> </td> <td style="text-align: center;">acid provides for enzymes to work</td> </tr> <tr> <td style="text-align: center;">blatjang</td> <td style="text-align: center;"> </td> <td style="text-align: center;">a concentrated solution draws water out of the microbes</td> </tr> </table>	adobo	 	drying the food stops enzymes working	bummalo	 	acid provides for enzymes to work	blatjang		a concentrated solution draws water out of the microbes	1	all correct = 1 mark
adobo	 	drying the food stops enzymes working											
bummalo	 	acid provides for enzymes to work											
blatjang		a concentrated solution draws water out of the microbes											
Total			3										

Question		Answer	Marks	Guidance
2	(a)	(cells) have partially permeable membrane (1) potato / cells are more concentrated than the distilled water (1)	2	allow semi-permeable membrane answer must be comparative allow cells have lower water concentration (than distilled water) allow correct ref. to concentration gradient allow higher level answers relating to water potential assume unqualified references to concentration refer to solute e.g. water moves from high to low concentration = 0 but water moves from high water concentration to low water concentration = 1
	(b)	(i) any two from: cells are full of water / cells are rigid / cells swollen / AW (1) cells are turgid / turgor pressure (1) clear description of turgor: e.g. contents of cells pushing against cell wall (1)	2	ignore cells take in water (in question) ignore chip is rigid ignore cells are stronger / hard allow chip is turgid ignore not flaccid
		(ii) A (1)	1	
Total			5	

Question	Answer	Marks	Guidance
3 (a)	<p>(Level 3) Answer includes more than one correct assumption and a correct calculation and a sensible interpretation of the result. Quality of written communication does not impede communication of the science at this level. (5–6 marks)</p> <p>(Level 2) Answer includes a correct assumption and a correct calculation OR Answer includes a correct calculation and a sensible interpretation of the result. Quality of written communication partly impedes communication of the science at this level. (3–4 marks)</p> <p>(Level 1) Answer includes either a correct assumption or a correct calculation or a sensible interpretation. Quality of written communication impedes communication of the science at this level. (1–2 marks)</p> <p>(Level 0) Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted from grades D to A</p> <p>Indicative scientific points may include:</p> <p>assumptions:</p> <ul style="list-style-type: none"> • no immigration / emigration between release and recapture • no death / reproduction between release and recapture • identical sampling methods • the marking does not affect the survival rate • marked slugs have mixed with non-marked slugs • marks don't get removed <p>calculations:</p> <ul style="list-style-type: none"> ▪ calculation is $\frac{50 \times 45}{5} = 450$ ▪ estimate of population is 450 ▪ the population is halved <p>interpretations:</p> <ul style="list-style-type: none"> ▪ method of control is working / is successful as population has gone down/halved ▪ an appreciation that these are only estimates. <p>If mostly matches level 3 but only has one assumption, give 5 marks</p> <p>If give formula only i.e. $50 \times 45 / 5$ then award 1 mark if level 1, 3 marks if level 2, 5 marks if level 3</p> <p>If incorrect calculation, then can give sensible interpretation ecf for L1</p> <p>Use L1, L2, L3 annotations in scoris. Do not use ticks</p>

Question		Answer	Marks	Guidance
	(b) (i)	C (1)	1	
	(ii)	(cells with) most chloroplasts / palisade layer is near the top of the leaf (1)	1	allow upper epidermis is transparent / one cell thick ignore cuticle ignore large surface area / thin
	(iii)	they (carotene / xanthophyll) absorb different wavelengths (to chlorophyll) (1) a wider range of wavelengths can be absorbed / more of the spectrum is absorbed (1)	2	allow absorb different colours (of light) allow correct reference to just one pigment ignore absorb wrong wavelengths ignore just 'absorb more light'
		Total	10	

Question		Answer	Marks	Guidance
4	(a)	$C_6H_{12}O_6$ and $6O_2$ (1)	1	any order must use subscripts
	(b)	idea that not enough mass/materials/substances/nutrients lost from soil to supply the mass/material/substances/nutrients gained by the tree (1) correct calculation : soil lost 1kg but tree gained 78kg (1)	2	allow the tree gained (much) more mass than the soil lost allow total weight changed from 102kg → 179kg allow soil would have been 22kg (if scientists were correct) allow the tree gained 77kg from somewhere else (not soil) = 2 marks allow tree gains 78kg but soil only lost 1kg = 2 bod
	(c) (i)	(water lost in) transpiration (1) idea that only a small proportion is used in photosynthesis (1)	2	allow evaporation from plant
	(ii)	more transpiration (1) idea that wind moves away water vapour (1)	2	allow more water lost through stomata allow more evaporation / more diffusion (out of leaf) ignore simply 'more water lost'
Total			7	

Question			Answer	Marks	Guidance
5	(a)	(i)	90 (%) (1)	1	allow 90.32258 or correct rounding
		(ii)	vessel at A = capillary (1) vessel at B = vein (1)	2	allow capillary bed / arteriole ignore small artery allow venule / named vein e.g. vena cava
	(b)		reduces effective blood circulation / blood could fall back into heart / backflow would happen (1) pressure is not maintained / reduces pressure (1)	2	ignore references to oxygenated/deoxygenated ignore less blood but allow less blood pumped around body ignore job of valves e.g. valves stop backflow allow not enough pressure to push blood around allow oedema / idea of fluid building up in tissues / lungs ignore references to higher pressure e.g. inside heart
			Total	5	

Question		Answer	Marks	Guidance																		
6	(a)	<table border="1"> <thead> <tr> <th>part of the kidney</th> <th>letter</th> <th></th> </tr> </thead> <tbody> <tr> <td>cortex</td> <td>E</td> <td></td> </tr> <tr> <td>medulla</td> <td>D</td> <td></td> </tr> <tr> <td>renal artery</td> <td>(A)</td> <td></td> </tr> <tr> <td>renal vein</td> <td>B</td> <td></td> </tr> <tr> <td>ureter</td> <td>C</td> <td>(2)</td> </tr> </tbody> </table>	part of the kidney	letter		cortex	E		medulla	D		renal artery	(A)		renal vein	B		ureter	C	(2)	2	3 or 4 correct (2) 1 or 2 correct (1)
part of the kidney	letter																					
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Question	Answer	Marks	Guidance
(b)	<p>(Level 3) Explains the role of ADH in controlling the amount of water removed in urine and how alcohol affects the action of ADH. Quality of written communication does not impede communication of the science at this level. (5–6 marks)</p> <p>(Level 2) Explains the role of ADH in controlling the amount of water removed in urine. Quality of written communication partly impedes communication of the science at this level. (3–4 marks)</p> <p>(Level 1) Gives a simple description that the kidneys remove excess water. Quality of written communication impedes communication of the science at this level. (1–2 marks)</p> <p>(Level 0) Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to A*</p> <p>Indicative scientific points at level 3 includes level 2 points plus</p> <ul style="list-style-type: none"> explains that alcohol causes even more water to be lost / even less reabsorbed. <p>ignore alcohol reduces ADH (in question)</p> <p>Indicative scientific points at level 2 may include:</p> <ul style="list-style-type: none"> ADH increases the amount of water reabsorbed / reduces amount lost in urine less ADH decreases the amount of water reabsorbed / increases amount lost in urine ADH increases permeability of kidney tubules so more water is reabsorbed back into the blood increased water in blood reduces the amount of ADH <p>Indicative scientific points at level 1 may include:</p> <ul style="list-style-type: none"> kidneys remove excess water (to form dilute urine) kidneys reabsorb less water. <p>ignore drinking more water/beer increases volume of urine ignore drinking more water/beer makes urine more dilute (in question)</p> <p>allow level 1, 2 marks max for drinking alcohol causing more dilute urine than drinking water (no mention of ADH)</p> <p>Use L1, L2, L3 annotations in scoris. Do not use ticks.</p>

Question		Answer	Marks	Guidance
	(c)	genetically identical / tissue match (1) (twins/kidneys) are same age / size (1)	2	allow no risk of rejection but ignore less risk of rejection allow same genes / DNA / chromosomes not similar genes / tissue ignore references to blood group allow similar size
		Total	10	

Question		Answer	Marks	Guidance
7	(a)	<p>supports claim (that found in stomach) because it works best/optimum around pH 2 (1)</p> <p>does not support claim that it is a protease since there is no evidence (to support or reject claim) (1)</p>	2	<p>allow optimum pH matches stomach pH</p> <p>allow idea it could be another type of enzyme</p>
	(b)	<p>any four from: (protein) not digested in mouth/oesophagus or is digested in stomach (1)</p> <p>no protease in mouth/oesophagus or protease is in stomach (1)</p> <p>protease needed to digest coat of tablet (1)</p> <p>protease needed to digest wall of beads (to release medicine) (1)</p> <p>early release from thin beads / later release from thick walled beads (1)</p>	4	<p>allow break down as an alternative for digestion</p> <p>ignore acid</p> <p>if answer clearly refers to protease (or protein-digesting enzymes) then do not need to keep repeating this to gain subsequent marks</p>
Total			6	

Question		Answer	Marks	Guidance
8	(a)	6.0 – 2.1 (1) BUT 3.9 (litres) (2)	2	allow 6.0 -2.2 (1) or 3.8 (2) ignore 4 (litres)
	(b)	any two from: lining of airways becomes inflamed (1) fluid builds up (in lungs) (1) muscles around bronchioles contract (1) airways/bronchioles constricted/narrowed (1)	2	ignore symptoms of asthma e.g. wheezing / tight chest / difficulty breathing / less air in lungs allow lining of airways becomes swollen ignore lungs become inflamed allow mucus builds up allow muscles in bronchioles go into spasm ignore just 'airways shrink' but allow airways shrink and restrict air flow ignore airways close allow lung capacity reduced ignore references to bronchi / trachea / alveoli
Total			4	

Question		Answer	Marks	Guidance
9	(a)	idea that CO₂ from the atmosphere is used up during photosynthesis or CO₂ returned to atmosphere when biofuel is burnt (1) but idea that CO₂ used up in photosynthesis is balanced by CO₂ returned to atmosphere when burnt (2)	2	ignore carbon neutral
	(b)	otherwise it could explode / so it does not explode (1)	1	allow it will explode at 10% allow will not burn at very low levels
	(c)	less energy content / less energy efficient / releases less energy (1)	1	allow idea of land that normally used for crops is lost to biofuels / habitat destruction ignore uses lots of land allow idea that production could be too slow in cold climates ignore less efficient
Total			4	

Question		Answer	Marks	Guidance
10	(a)	<p>no maggots when covered because flies could not get in / lay eggs (1)</p> <p>this shows the flies are needed to produce maggots or maggots develop from eggs not meat (1)</p>	2	<p>allow reverse argument: only get maggots when uncovered as flies can get in / lay eggs</p> <p>ignore just 'maggots don't come from meat'</p>
	(b)	<p>no bacteria in B because they were killed / bacteria killed in both flasks in stage 2 (1)</p> <p>bacteria cannot get into B / can get into A (1) BUT shape of the neck in B stops the bacteria getting in / the shape of the neck allows bacteria into flask A (2)</p> <p>bacteria multiply in A / in B gravy stays sterile (1)</p>	3	<p>ignore B has no bacteria / A has bacteria</p> <p>ignore bacteria grow/develop in A (in question) ignore bacteria do not grow/develop in B (in question)</p> <p>allow ideas about how they reproduce as extra marking points e.g. bacteria in A feed and multiply by asexual reproduction or binary fission (1)</p> <p>ignore references to oxygen / lack of oxygen</p>

Question	Answer	Marks	Guidance
(c)	<p>any two from:</p> <p>(yes) milk contains harmful bacteria/microbes (1) pasteurisation will kill these bacteria/microbes (1)</p> <p>or</p> <p>(no) idea that people should have a choice (1) the raw milk may taste better / pasteurisation can alter the taste (1) pasteurisation may remove some of the nutrients from the milk (1)</p>	2	<p>allow pathogens ignore germs</p> <p>ignore references to shelf life</p> <p>allow (no) idea that although has bacteria in they are destroyed in the stomach/acid (1) ignore (no) idea that bacteria are not harmful but allow (no) idea that bacteria are not harmful with an explanation, e.g. not harmful if drunk quickly (before bacteria can multiply)</p> <p>explanation must match their yes or no answer unless they are clearly giving both sides of the argument</p> <p>eg (no) although pasteurisation will kill harmful bacteria in the milk people should be given the choice (2)</p>
(d)	<p>any two from:</p> <p>enzymes do not denature at high temperatures (1)</p> <p>can use the hydrogen sulfide to make food (1)</p> <p>do not need light to make food (1)</p> <p>tolerant to hydrogen sulfide / hydrogen sulfide does not poison them (1)</p>	2	<p>allow enzymes can work at high temperature ignore bacteria can withstand heat</p> <p>ignore feed on hydrogen sulfide</p>
	Total	9	

Question	Answer	Marks	Guidance
11	<p>(Level 3) Answer suggests factory was about 8/9/10km away and explains the patterns to include decay and explains the pattern in terms of oxygen levels. Quality of written communication does not impede communication of the science at this level. (5–6 marks)</p> <p>(Level 2) Answer suggests factory was about 8/9/10km away. Also Explains the patterns to include decay or explains the pattern in terms of oxygen levels. Quality of written communication partly impedes communication of the science at this level. (3–4 marks)</p> <p>(Level 1) Answer suggests factory was about 8/9/10km away or explains the patterns to include decay or explains pattern in terms of oxygen levels. Quality of written communication impedes communication of the science at this level. (1–2 marks)</p> <p>(Level 0) Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points may include:</p> <p>(algae/plants grow using the nutrient from the fertiliser, and block light)</p> <ul style="list-style-type: none"> • algae/plants die and are decayed by bacteria so bacteria numbers go up • decay/ bacterial respiration uses up oxygen • fish can't respire so die • further away fertiliser levels decrease, fewer bacteria, higher oxygen levels, more fish <p>ignore fertiliser kills fish</p> <p>If get the wrong distance in level 3 but have valid explanations, award 5 marks.</p> <p>Use the L1, L2, L3 annotations in scoris; do not use ticks.</p>
	Total	6	

Question	Answer	Marks	Guidance
12 (a)	water would be lost (when soil is burnt) / some of the loss in mass could be from water / to remove the mass of water / different soils have different amounts of water (1)	1	ignore simply 'soil contains water'
(b)	3.10 (2) but if answer incorrect 1.74 ÷ 56.10 x 100 (1)	2	note – two decimal places needed allow 3.1016 or rounding to anything other than 2 decimal places (1)
(c)	A because it had a high(er) humus content (1)	1	letter and explanation needed for mark
(d)	idea that larger soil particles have more air spaces / larger air spaces (1) plus so the water will drain through / water not retained or idea that there is more space for water to occupy / can take up more water or less water can cling to soil particles (1)	2	allow reverse argument e.g. smaller particles have smaller air spaces (1) hold onto water better (1) second mark is dependent on first
	Total	6	

Question		Answer	Marks	Guidance
13	(a)	cholesterol: males have a higher value in most countries / 4 countries / all except India / ORA (1) BMI: males have a higher value in most countries / 4 countries / all except Cyprus / ORA (1)	2	allow males have a higher cholesterol / ORA allow males have a higher BMI value / ORA allow 'males have higher values / ORA' for 1 mark if no other mark awarded
	(b)	idea that children are still growing (1) idea that results are (too) variable (1)	2	allow e.g. sudden growth spurts / different rates of growth note just 'growth spurts' gets 1
	(c)	(i) all points correctly plotted to within 0.5 square (2) but three / four points correctly plotted to within 0.5 square (1)	2	points are: (3.2, 24.5) (3.6, 22.6) (4.7, 28.0) (4.7, 25.2) (5.0, 27.0) ignore labels
		(ii) there is (now) no link / pattern / correlation (1) (because) points are scattered / random / AW (1)	2	allow examples e.g. Greece and Netherlands have same cholesterol but different BMI
	(d)	there is a different number of people in each country (1) taking an average/mean gives the two countries equal weighting or taking an average/mean of the two values does not give a true mean of all the people (1)	2	
Total			10	

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