

# **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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## Annotations

Annotation	Meaning
	Correct answer
	Incorrect response
	Benefit of Doubt
	Not Benefit of Doubt
	Error Carried Forward
	Given mark
	Underline (for ambiguous/contradictory wording)
	Omission mark
	Ignore
	Correct response (for a QWC question)
	QWC* mark awarded
	a correct response is associated with a piece of clearly incorrect science within the same statement and award no mark

\*Quality of Written Communication

### Subject-specific Marking Instructions

- For questions in which the command word is 'suggest' ignore incorrect responses and credit a correct response wherever it occurs
- Accept phonetic spellings unless otherwise indicated
- All marks are stand-alone unless otherwise stated in Additional Guidance
- For 'idea of' marking points a wide range of wording is acceptable. The mark is to be awarded for the idea.

Question			Answer	Marks	Guidance
1	(a)	(i)	<u>primary structure</u> ;	1	<b>ACCEPT</b> 1° structure <b>IGNORE</b> polypeptide
1	(a)	(ii)	NH <sub>2</sub> at one end ; COOH at opposite end ;  C in centre (of a single amino acid) bonded (separately) to one R and one H ;	3	If R group not shown as ' <b>R</b> ' then award <b>max 2</b> (as general structure asked for in Q) <b>IGNORE</b> labels  <b>ACCEPT</b> displayed structure of NH <sub>2</sub> / HNH <b>ACCEPT</b> displayed structure of COOH if correct double bond shown  <b>AWARD</b> only if the candidate has drawn a single 'amino acid' molecule  $  \begin{array}{c}  \text{H} \\    \\  \text{H}_2\text{N} - \text{C} - \text{COOH} \\    \\  \text{R}  \end{array}  $
1	(b)	(i)	strength / toughness / insolubility ;	1	<b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>  <b>ACCEPT</b> strong / tough <b>IGNORE</b> flexible / inelastic <b>IGNORE</b> withstand pressure

Question			Answer	Marks	Guidance
1	(b)	(ii)	<p>1 peptide bonds , between amino acids / in polypeptide ;</p> <p>2 every 3<sup>rd</sup> amino acids is , same / glycine ;</p> <p>3 coil / twist / spiral / helix ;</p> <p>4 left-handed (helix) ;</p> <p>5 glycine / small R group , allows closeness / twisting (of polypeptide chains) ;</p> <p>6 three polypeptide chains ;</p> <p>7 hydrogen / H , bonds between (polypeptide) chains ;</p> <p>8 no / few, hydrophilic (R) groups on outside (of molecule) ;</p> <p>9 (adjacent molecules joined by) crosslinks ;</p> <p>10 crosslinks / ends of molecules , being staggered ;</p> <p>11 <u>fibril</u> ;</p>	6	<p>One molecule of collagen is 3 polypeptide chains twisted around each other. <b>CREDIT</b> annotated diagrams unless contradicted by text</p> <p><b>2 ACCEPT</b> high proportion of / 35% , glycine / same amino acid</p> <p><b>3 CREDIT</b> in context of single polypeptide or 3 polypeptides <b>but DO NOT CREDIT</b> 'α-helix' in the context of a single polypeptide <b>3 IGNORE</b> wound</p> <p><b>4</b> 'α-helix, which is left handed' – <b>AWARD</b> mp4 but <b>DO NOT CREDIT</b> mp3</p> <p><b>7</b> Must be in correct context <b>7 DO NOT CREDIT</b> H<sup>+</sup> / H<sub>2</sub> bonds</p> <p><b>9 ACCEPT</b> covalent bonds between adjacent molecules <b>9 DO NOT CREDIT</b> in context of bonding between 3 polypeptides <b>9 IGNORE</b> disulfide</p> <p><b>11 IGNORE</b> micro</p>

Question			Answer	Marks	Guidance
1	(c)	(i)	transport / AW , of, oxygen / O <sub>2</sub> ;	1	<p><b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>ACCEPT</b> buffering blood / carrying CO<sub>2</sub> / storing oxygen  <b>IGNORE</b> binding oxygen  <b>IGNORE</b> Iron</p>
1	(c)	(ii)	<p><i>haemoglobin (has / is):</i></p> <p><b>1</b> globular ;</p> <p><b>2</b> hydrophobic (R) groups on inside / hydrophilic (R) groups on outside ;</p> <p><b>3</b> 4 , chains / sub-units / polypeptides ;</p> <p><b>4</b> <i>idea that</i> subunits are (two) different types ;</p> <p><b>5</b> α / alpha , helix ;</p> <p><b>6</b> <i>idea that</i> proportion of glycine similar to that , of other amino acids / in other proteins ;</p>	3	<p><b>IGNORE</b> prompt lines – mark as prose but max 2 if an incorrect statement about haemoglobin is given</p> <p><b>IGNORE</b> statements about collagen even if incorrect, answers must refer to haemoglobin</p> <p><b>1 IGNORE</b> not fibrous / ball shaped</p> <p><b>3 IGNORE</b> strands / molecules / proteins  <b>4 ACCEPT</b> in haemoglobin the subunits are not all the same</p> <p><b>3&amp;4</b> “two alpha and two beta chains” = 2 marks (mp 3 and 4)</p> <p><b>5 ACCEPT</b> a-helix</p> <p><b>6 ACCEPT</b> wide(r) range of amino acids</p> <p><b>IGNORE</b> refs to Fe (as part of prosthetic group)</p>
			<b>Total</b>	<b>15</b>	

Question			Answer		Marks	Guidance
2	(a)		enzymes ;		1	<b>IGNORE</b> protein / catalysts <b>ACCEPT</b> enzymic
2	(b)	(i)	1	similar, shape / structure ;	3	<b>1 IGNORE</b> same shape <b>1 ACCEPT</b> 'ethanol same shape as part of DEG'  <b>2 IGNORE</b> they contain C, H and O <b>2 IGNORE</b> the end is the same <b>2 ACCEPT</b> e.g. they both have OH <b>2 ACCEPT</b> similar parts identified on diagram if they are clearly indicating an example of similarity  <b>3 ACCEPT</b> implication of both <b>3 IGNORE</b> attach / enter <b>3 IGNORE</b> both will form ESC (with alcohol dehydrogenase)
			2	example of similarity ;		
			3	both , will fit into / complementary (shape) to / bind to / bond to , <u>active site</u> (of alcohol dehydrogenase ) ;		
2	(b)	(ii)	1	(ethanol) <u>competes</u> with DEG ; <b>ora</b>	3	<b>1 ACCEPT</b> ethanol / DEG , is , a <u>competitive</u> inhibitor  <b>2 ACCEPT</b> 'ethanol more likely to form ESC' <b>2 ACCEPT</b> implication of 'more likely' from context <b>2 IGNORE</b> attach / enter  <b>3 ACCEPT</b> DEG product is diluted <b>3 ACCEPT</b> no DEG breakdown  <b>IGNORE</b> 'you will drink less of it'
			2	(when at high(er) concentration) ethanol more likely to , collide with / bind to / bond to , active site ; <b>ora</b>		
			3	less , DEG breakdown / toxic product ; <b>ora</b>		
<b>Total</b>					<b>7</b>	

Question			Answer	Marks	Guidance
3	(a)	(i)	B <u>and</u> C ;	1	Both need to be given for the mark to be awarded. <b>DO NOT CREDIT</b> if A also given.
3	(a)	(ii)	(involved) after , pathogen / AW , has entered the body ;	1	<b>IGNORE</b> ref to primary defence without the clear idea that the pathogen has <u>entered the body</u> <b>IGNORE</b> refs to mechanisms of action, e.g. 'phagocytes do not make antibodies' <b>ACCEPT</b> attacking foreign bodies after they have <u>passed through the skin</u>
3	(a)	(iii)	(phagocytes) able to, digest / break down / engulf / target / deal with, a range of / many different , pathogens ; <b>ora</b>	1	<b>ACCEPT</b> bacteria or virus as synonym for pathogen if the idea of a variety is clearly present <b>ACCEPT</b> phagocytes can break down <i>any</i> pathogen <b>ACCEPT</b> phagocytes do not have (antigen-)specific receptors <b>IGNORE</b> phagocytes do not make memory cells <b>IGNORE</b> antigen if used as synonym for pathogen
3	(a)	(iv)	<p>1 lobed / narrow , nucleus ;</p> <p>2 (cells) can change shape ;</p> <p>3 can squeeze / move / fit / AW , between cells / through pores , in (walls of) capillaries ;</p> <p>4 histamine makes , capillary walls / endothelium , leaky ;</p>	2	<p>2 <b>ACCEPT</b> in context of cell or nucleus</p> <p>2 <b>ACCEPT</b> cells , are plastic / have flexible structure / have flexible membrane</p> <p>2 <b>IGNORE</b> squashable / stretch</p> <p>3 <b>ACCEPT</b> holes / gaps / fenestrations</p>



Question			Answer	Marks	Guidance
3	(a)	(v)	<p>1 (pathogen) engulfed / enveloped / surrounded by cytoplasm (from phagocyte) ;</p> <p>2 <u>endocytosis</u> / <u>phagocytosis</u> ;</p> <p>3 (formation of) <u>phagosome</u> / <u>phagocytic vacuole</u> / <u>phagocytic vesicle</u> ;</p> <p>4 (phago) <u>lysosomes</u> ;</p> <p>5 (lysosomes / phagosome) move towards / fuse with (each other) ;</p> <p>6 (named) enzyme(s) / lysins / hydrogen peroxide / free radicals (in lysosomes) ;</p> <p>7 (pathogen) digested / broken down / hydrolysed ;</p> <p>8 (to) amino acid / sugar / glucose / fatty acid / glycerol ;</p> <p>9 (break down products) absorbed / AW (into cytoplasm) <b>or</b> unwanted products removed (by exocytosis) ;</p> <p>10 cytoskeleton involved in (endocytosis / movement of vesicles) ;</p>	6	<p><b>ACCEPT</b> phonetic spellings throughout</p> <p><b>1 ACCEPT</b> 'pseudopodia / cytoplasm / cell membrane , extend from phagocyte'</p> <p><b>1 DO NOT CREDIT</b> eaten. <b>ACCEPT</b> ingested</p> <p><b>3 CREDIT</b> in correct context only</p> <p><b>5 ACCEPT</b> attracted to / joins</p> <p><b>7 IGNORE</b> destroyed / broken up / killed</p> <p><b>9 IGNORE</b> refs to antigen presentation <b>9 ACCEPT</b> enter cytoplasm</p>
			<p><b>QWC</b> key points in sequence ;</p>	1	<p><b>Award</b> if the following mark points have been awarded: <b>mp 1 or 2</b> followed by <b>mp 6 or 7</b></p>

Question			Answer	Marks	Guidance
3	(b)	(i)	<u>Mycobacterium</u> / <i>M. tuberculosis</i> / <i>M. bovis</i> ;	1	<b>ACCEPT</b> phonetic spellings <b>IGNORE</b> case of initial letter No need to underline
3	(b)	(ii)	droplets (containing pathogen) ;  (released by) coughing / sneezing ;  inhaled by (uninfected) , individual / AW ;	2	<b>IGNORE</b> airborne  <b>IGNORE</b> laughing / talking / kissing / breathed out

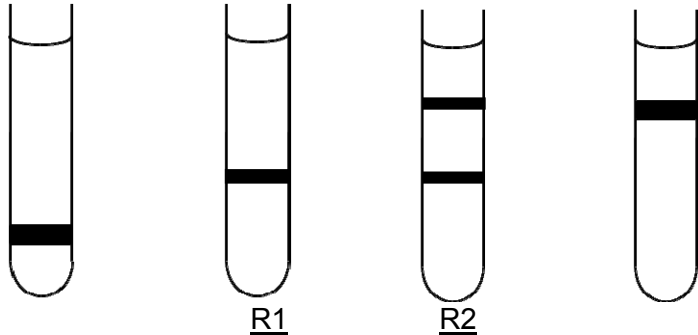
Question			Answer	Marks	Guidance
3	(c)	(i)	<p><b>1</b> <u>in both years</u> incidence (of TB) , decreases / AW , as income , increases / AW ; <b>ora</b></p> <p><b>2</b> no change in, low / lower middle, (income groups) ;</p> <p><b>3</b> increase in upper middle (income group) ;</p> <p><b>4</b> decrease in high (income group) ;</p> <p><b>5</b> <i>idea of overall very little change between 2000 and 2008 ;</i></p> <p><b>6</b> <u>calculated difference</u> in figures with units to support points 3 to 5 ;</p>	3	<p><b>Mark points 1-5 cannot be inferred from figures</b></p> <p><b>1 ACCEPT</b> 'incidence is higher in low income group and lower in high income group, in both years / always'</p> <p><b>3 ACCEPT</b> upper middle less in 2000</p> <p><b>4 ACCEPT</b> high (group) more in 2000</p> <p><b>6 ACCEPT</b> any increase or decrease e.g., high group has gone down by 3 per 100000</p> <p><b>6 ACCEPT</b> also</p> <ul style="list-style-type: none"> <li>• 10% increase in upper middle group</li> <li>• 17.6% / 18% , decrease in high income group</li> <li>• 1% / 1.3% , increase overall</li> <li>• high income group in 2008 is , 82.4% / 82% / 0.824 / 0.82 , of original value</li> </ul> <p><b>6 IGNORE</b> 0% increase in low / lower middle income groups</p> <p>There is no need to refer to years as only 2 are shown</p>

Question			Answer	Marks	Guidance
3	(c)	(ii)	<p>1 overcrowded / AW (living space) ;</p> <p>2 poorly ventilated (living space) ;</p> <p>3 poor diet / malnourished ;</p> <p>4 poor health ;</p> <p>5 homelessness ;</p> <p>6 <i>idea that</i> more likely to consume , meat / milk, from infected cattle ;</p> <p>7 <i>idea of</i> vaccination / medical treatment , more difficult to access ;</p>	3	<p><b>IGNORE</b> prompt lines and mark as prose</p> <p><b>1 ACCEPT</b> cramped</p> <p><b>4 ACCEPT</b> poor immune system <b>4 IGNORE</b> hygiene / standard of living</p> <p><b>7 CREDIT</b> healthcare more expensive <b>7 ACCEPT</b> poor healthcare <b>7 IGNORE</b> less aware of the risks</p>
			<b>Total</b>	<b>21</b>	

Question			Answer				Marks	Guidance
4	(a)	(i)	species	number of individuals (n)	n/N	(n/N) <sup>2</sup>	3	<p><b>Award 3 marks for the correct answer (0.6366)</b></p> <p><b>If answer is incorrect:</b></p> <p><b>IGNORE</b> numbers in first 4 rows</p> <p>'N = 100' = 1 mark</p> <p><math>\Sigma(n/N)^2</math></p> <p><b>ALLOW</b> ecf for correct calculation from candidate's incorrect N value</p> <p><math>1-(\Sigma(n/N)^2)</math></p> <p><b>ALLOW</b> ecf for correct calculation from candidate's <math>\Sigma(n/N)^2</math> value</p> <p><b>Answer must be given to 4 dp for ecf</b></p>
			Dog's mercury	40	0.40	0.1600		
			Wild strawberry	13	0.13	0.0169		
			Common avens	43	0.43	0.1849		
			Wood sorrel	4	0.04	0.0016		
				N = 100		$\Sigma(n/N)^2 = 0.3634$ $1-(\Sigma(n/N)^2) = 0.6366$		
4	(a)	(ii)	<p><i>species richness</i>                      number of <u>species</u> (in an area / habitat) ;</p> <p><i>species evenness</i>                      number of / how many, <u>individuals</u> there are of, <u>each / every, species</u> (in an area / habitat) ;</p>				2	<p><b>IGNORE</b> organisms / abundance / quantity / variety  <b>DO NOT CREDIT</b> amount</p> <p><b>ACCEPT</b> 'organisms' as AW for individuals  <b>CREDIT</b> relative abundance of (each) species / population size of each species</p> <p><b>IGNORE</b> relative abundance of, a / one, species  <b>DO NOT CREDIT</b> amount</p>

Question			Answer	Marks	Guidance
4	(a)	(iii)	(habitat) dominated by, one / few / AW, species ;  change in one species , likely to affect whole habitat / AW ;  community / ecosystem / habitat / area , is unstable / not able to withstand change / <u>easily</u> damaged ;	2	<b>ACCEPT</b> high number of one species  <b>IGNORE</b> environment / biodiversity as AW for community <b>IGNORE</b> the community / AW will be damaged
4	(b)		<p>1 <i>idea of</i> random sampling ;</p> <p>2 standardisation of technique ;</p> <p>3 use of, key/identification chart ;</p> <p>4 survey at different , times of year / season ;</p> <p>5 include , trees / species larger than quadrat ;</p>	2	<b>IGNORE</b> prompt lines and mark as prose  <b>1 ACCEPT</b> description of randomisation method  <b>2 ACCEPT</b> description of standardisation method <b>2 ACCEPT</b> count the same way each time  <b>4 IGNORE</b> 'repeat' unqualified <b>4 IGNORE</b> different times of day / different times
			<b>Total</b>	<b>9</b>	

Question			Answer	Marks	Guidance
5	(a)	(i)	X cytosine / pyrimidine ;  Y nucleotide ;	2	<b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks  X <b>ACCEPT</b> <u>nitrogenous</u> base / <u>organic</u> base X <b>IGNORE</b> C
5	(a)	(ii)	at least one line between all opposite bases ;  two lines between A and T <b>and</b> three lines between both instances of C and G ;	2	<b>IGNORE</b> bond labels / H / O / $\delta^+$ / $\delta^-$  Bases on left strand do not need to be labelled but <b>CON</b> this mark if incorrectly labelled
5	(a)	(iii)	polypeptide ; ribosome ;	2	<b>ACCEPT</b> protein
5	(a)	(iv)	(usually) single stranded / would not have 2 strands ;  uracil / U, instead of thymine / T ;	2	<b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks  <b>IGNORE</b> shorter <b>ACCEPT</b> only one backbone  <b>DO NOT CREDIT</b> incorrect spelling of thymine with 'a'  <b>IGNORE</b> difference in sugar as on the diagram ribose and deoxyribose would appear the same
5	(b)	(i)	<u>one</u> strand, from original DNA <b>and</b> <u>one</u> strand newly formed ;  an , (original) strand / polynucleotide , acts as template (for new strand) ;	2	<b>ACCEPT</b> one old and one new strand  <b>ACCEPT</b> each strand is copied

Question			Answer	Marks	Guidance
5	(b)	(ii)	(DNA) can be replicated without error / same sequence of nucleotides is produced ;  reduces occurrence of mutation ;  allows (re-)formation of , hydrogen / H , bonds ;	2	<b>ACCEPT</b> formation of identical DNA <b>ACCEPT</b> same / correct , order / sequence , of bases  This mark point is for the correct use of the term 'mutation' and does not imply without error. <b>ACCEPT</b> prevents mutation  <b>DO NOT CREDIT</b> H <sup>+</sup> / H <sub>2</sub> bonds
5	(c)	(i)	horizontal band drawn in tube <u>R1</u> clearly higher than band in <sup>15</sup> N tube and clearly lower than band in <sup>14</sup> N tube ;	1	<b>DO NOT CREDIT</b> if more than one band drawn <b>IGNORE</b> thickness of bands and whether bands are shaded  <b>DO NOT CREDIT</b> if there is any overlap with a band in another tube  
5	(c)	(ii)	one band (in <u>R2</u> ) clearly at the same height as that in tube <u>R1</u> <b>and</b> one band (in <u>R2</u> ) clearly at the same height as that in the <sup>14</sup> N tube ;	1	<b>DO NOT CREDIT</b> if more than two bands drawn <b>IGNORE</b> thickness of bands and whether bands are shaded



Question		Answer	Marks	Guidance
5	(d)	<p>same concentration of sugar (solution in each tube) ;  same volume of, mixture / solution / sugar solution (in each tube) ;</p> <p>spin (all tubes) at same , speed / acceleration ;  spin (all tubes) for same (length of) time ;</p>	3	<p><b>IGNORE</b> prompt lines - mark as prose  <b>IGNORE</b> amount throughout</p> <p><b>IGNORE</b> mass  <b>IGNORE</b> mass  <b>IGNORE</b> volume , of sugar / DNA extract</p> <p><b>ACCEPT</b> tubes spun at constant speed</p> <p><b>IGNORE</b> temperature / pH  <b>IGNORE</b> mass of DNA</p>
		<b>Total</b>	<b>17</b>	

Question			Answer	Marks	Guidance
6	(a)	(i)	<p>range / variety / number , of species (in an area) ;</p> <p>range / variety of, habitats / ecosystems ;</p> <p>variety of , alleles / genes ;</p>	2	<p><b>IGNORE</b> amount throughout</p> <p><b>ACCEPT</b> a combination of species richness and species evenness</p> <p><b>ACCEPT</b> abundance</p> <p><b>IGNORE</b> organisms</p> <p><b>ACCEPT</b> number of habitats</p>
6	(a)	(ii)	<p>1 part of (local) food , chain / web ;</p> <p>2 tourism ;</p> <p>3 native species / <i>idea of</i> heritage of the area ;</p> <p>4 to protect a neighbouring red squirrel population ;</p> <p>5 <i>idea that</i> Northumberland red squirrel population is nationally significant ;</p>	2	<p><b>IGNORE</b> prompt lines and any reference to biodiversity</p> <p><b>CREDIT</b> a correct response anywhere in the answer</p> <p><b>IGNORE</b> unspecified refs to ethical, aesthetic or economic</p> <p><b>1 ACCEPT</b> keystone species</p> <p><b>3 ACCEPT</b> native to UK</p> <p><b>5</b> e.g. Northumberland has significant proportion of total population so loss of this population might jeopardise all British squirrels</p> <p><b>IGNORE</b> refs to genetic resource as no suggestion that this population is distinct from red squirrels elsewhere.</p>

Question			Answer	Marks	Guidance
6	(a)	(iii)	<p><i>idea that:</i> it is wrong to interfere with nature ;</p> <p>it is wrong to kill animals ;</p> <p>grey has (as much) right to live there (as red) ; <i>idea that</i> might be useful in the future / enjoyed by future generations ; grey will be part of food chain ;</p>	1	<p><b>ACCEPT</b> qualified refs to , moral / ethical / religious , reasons <b>IGNORE</b> it's wrong to play God</p> <p><b>ACCEPT</b> it is cruel</p>
6	(b)		<p><i>idea that:</i></p> <p>1 harder to see ; <b>ora</b></p> <p>2 (harder to see because) more timid / frightened of people / spend less time on ground / smaller ; <b>ora</b></p> <p>3 species may be wrongly identified ;</p> <p>4 grey squirrels more likely to visit gardens / parks / public areas ; <b>ora</b></p> <p>5 people are more inclined to report grey sightings ; <b>ora</b></p> <p>6 AVP : <b>ora</b></p>	2	<p><b>IGNORE</b> prompt lines and mark as prose <b>CREDIT</b> correct response where seen</p> <p>1 <b>ACCEPT</b> 'they remain hidden'. <b>IGNORE</b> 'they may be hiding'</p> <p>2 <b>IGNORE</b> 'they may be hiding'</p> <p>6 <b>ACCEPT</b> grey squirrels might be less camouflaged (so easier to see)</p> <p>6 <b>ACCEPT</b> red squirrels might be (more) nocturnal / AW 6 <b>IGNORE</b> squirrel species hard to distinguish / same individual counted more than once</p>

Question		Answer	Marks	Guidance
6	(c)	<p>1 size (of development) ;</p> <p>2 <i>idea of environmental sensitivity / which species present / which habitats present , in the area ;</i></p> <p>3 potential damage (to area / organisms) ;</p> <p>4 <i>idea of potential strategies to minimise impact ;</i></p>	3	<p><b>IGNORE</b> prompt lines and mark as prose  <b>IGNORE</b> refs to benefits of development            Answers should be given in terms of assessing aspects of the development.</p> <p><b>1 ACCEPT</b> 'how big will it be?'</p> <p><b>2 ACCEPT</b> e.g. 'what lives there?' / 'whether a rare species live there' 'whether red squirrels live there' / 'the biodiversity of the area' / is it an SSSI? / species richness</p> <p><b>3 ACCEPT</b> e.g. 'how much damage will it do?' / effect on ecosystem / how much it would be destroyed / how many organisms will it kill?</p> <p><b>4 ACCEPT</b> e.g. 'what can be done about it?' / possible change to reduce impact  <b>4</b> Must be a general statement  <b>4 IGNORE</b> stated example without the general idea</p>
<b>Total</b>			<b>10</b>	

Question			Answer	Marks	Guidance
7	(a)	(i)	<i>idea of</i> if one susceptible to, this / the disease, all likely to be ;	1	<b>DO NOT CREDIT</b> if the response is referring to diseases in general
7	(a)	(ii)	<p>1 environment / environmental factor ;</p> <p>2 (variation in) weather conditions / temperature ;</p> <p>3 rainfall / soil water content ;</p> <p>4 soil , (named) mineral / nitrate , content / AW ;</p> <p>5 (named) biotic factor (might vary) ;</p>	2	<p><b>2 ACCEPT</b> climate</p> <p><b>3 IGNORE</b> 'availability of water' unqualified</p> <p><b>4 IGNORE</b> nutrient</p> <p><b>4 ACCEPT</b> mineral availability / amount of fertiliser added</p> <p><b>5</b> e.g. number of pests / competition from other plants / disease</p>
7	(a)	(iii)	mutation ;	1	<p><b>ACCEPT</b> deletion etc.</p> <p><b>IGNORE</b> (named) mutagenic agent</p>

Question		Answer	Marks	Guidance
7	(b)	<p>1 cross / breed, with disease resistant variety ;</p> <p>2 method to test offspring for disease resistance ;</p> <p>3 select , best offspring / offspring with resistance ;</p> <p>4 (inter)breed, offspring with resistance / best offspring ;</p> <p>5 (continue process) for (many) generations ;</p> <p>6 <i>idea of</i> avoid breeding, closely related / AW , individuals to preserve genetic diversity ; <b>ora</b></p> <p>7 (regularly back) cross with, wild variety ;</p> <p>8 <i>idea of</i> preserving rare varieties in case they are needed in the future ;</p> <p>9 AVP ;</p>	6	<p>If a candidate describes resistance as immunity <b>DO NOT CREDIT</b> the first time it is seen but apply <b>ECF</b> thereafter</p> <p><b>1 ACCEPT</b> make two disease resistant individuals reproduce <b>1 IGNORE</b> crossbreed two best individuals</p> <p><b>2 ACCEPT</b> general statement <b>or</b> example e.g: 'germinate seeds, expose to disease, see if die'</p> <p><b>3 ACCEPT</b> seeds / tubers / potatoes <b>3 IGNORE</b> children / babies</p> <p><b>5 IGNORE</b> many years</p> <p><b>6 ACCEPT</b> avoid , inbreeding / inline breeding <b>6 ACCEPT</b> 'maintain genetic diversity by breeding with plants from different field / area' <b>6 ACCEPT</b> breed with different varieties to widen the gene pool</p> <p><b>8 ACCEPT</b> use of seed bank to preserve range of alleles</p> <p><b>9</b> e.g, ref. to marker assisted selection / detail of pollination method / prevention of self-pollination / asexual reproduction of desired variety</p>
		<p><b>QWC ;</b></p>		1
<b>Total</b>			<b>11</b>	

Question		Answer	Marks	Guidance
8	(a)	<p>1 <u>Echiniscus</u> ;</p> <p>2 order ;</p> <p>3 phylum ;</p> <p>4 <u>Animalia</u> ;</p> <p>5 Eukaryota ;</p>	5	<p><b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>ACCEPT</b> phonetic spellings</p> <p>1 Initial letter must be upper case</p> <p><b>2 ACCEPT</b> super family / epifamily</p> <p><b>4 ACCEPT</b> animals</p> <p><b>4 IGNORE</b> case of initial letter</p> <p><b>5 ACCEPT</b> eukaryotes / Eukarya / eukaryotic</p> <p><b>5 IGNORE</b> case of initial letter</p>
8	(b)	<p>1 (phylogeny is) <u>evolutionary</u> relationships (between organisms) ;</p> <p>2 (phylogeny is study of) closeness of (evolutionary) relationships ;</p> <p>3 phylogeny is basis of / used in , natural / scientific / modern, classification ;</p> <p>4 <i>idea that</i> the closer the (evolutionary or genetic) relationship the closer the (taxonomic) grouping ;</p> <p>5 correct use of example ;</p>	3	<p><b>1 IGNORE</b> 'evolution' without further qualification</p> <p><b>1&amp;2 phylogeny is the closeness of evolutionary relationships = 2 marks</b></p> <p><b>1 ACCEPT</b> phylogeny is evolutionary history</p> <p><b>3 ACCEPT</b> new</p> <p><b>3 IGNORE</b> related to classification</p> <p><b>4 ACCEPT</b> ref to <b>recent</b> common ancestors as AW for close relationship</p> <p><b>4 ACCEPT</b> named taxonomic group for 'grouping'</p> <p><b>4 ACCEPT</b> 'if the DNA is very different then the group is not the same'</p> <p><b>5</b> e.g. gorillas and chimpanzees (closely grouped)</p>

Question		Answer	Marks	Guidance
8	(c)	<p>too small to see ;</p> <p>(unable to see them) until invention of microscope / development of suitable <u>viewing</u> apparatus / AW ;</p> <p>only 0.3mm in length ;</p>	2	<p>'can only be seen under microscope' = <b>1 mark (mp1)</b></p> <p><b>IGNORE</b> 'can't see it' without the idea of size, e.g.  can't see it clearly = <b>0 marks</b>,  can't see its features = <b>0 marks</b></p> <p><b>ACCEPT</b> implication of being too small to see, e.g.  'you need a microscope to see them' = <b>mp1</b>  'people couldn't see them in the past because we didn't have microscopes' = <b>2marks (mp1 and mp2)</b></p> <p><b>IGNORE</b> type of microscope if stated  <b>ACCEPT</b> 'magnifying glass'</p> <p><b>ACCEPT</b> <math>\pm 0.1</math> mm</p>
		<b>Total</b>	<b>10</b>	



**Mark Scheme Conventions**

The following conventions appear in the Mark Scheme

1. Bracketed words. The words in brackets are there to 'set the scene' and indicate the context in which the answer is expected. They do not need to appear. Award the mark as long as the statement in the brackets is not contradicted.
2. Solidus /. A solidus indicates alternative ways that a mark might be gained for a given Mark Point.
3. Use of the comma in a mark point. This indicates that some information from either side of the comma or commas is needed. It is used in conjunction with the solidus.

In some cases the Guidance column may indicate examples of wording or terms that are acceptable (ACCEPT) or that should be ignored (IGNORE). In the case of IGNORE read on to see if something creditworthy appears later in the response.

4. Underlining.
  - solid underline. The word or part of word underlined is required but minor mis-spellings are acceptable as long as the word is phonetically the same
  - wavy underline. This indicates that whilst the word underlined is not precisely needed, alternative responses need to be closely related in meaning or be a clear description.
5. *idea of*. This is used as a prefix to marking points where there may be a fairly wide range of responses which cover the essence of the required response. This often requires examiner judgement. These often, but not exclusively, appear in questions such as those related to environmental or health issues.
6. ORA: 'or reverse argument' In cases where candidates could be credited for having described a process from the opposite point of view, ora is sometimes used on a mark scheme to save space. For example, in question 6(b) the question could be answered from the point of view of why red squirrels are hard to see or why grey squirrels are easy to see.

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