

## **Mark Scheme for June 2010**

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Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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Question			Expected Answer	Mark	Additional Guidance
1	(a)	(i)	microbes / (living) organisms / cells / enzymes ;  (make) product / for human benefit / (carry out) conversion / reaction / industrial process ;	2	<b>CREDIT</b> microorganisms / bacteria / prokaryotes / fungi <b>CREDIT</b> living things <b>CREDIT</b> cell components / parts of cells  <b>CREDIT</b> example such as (named) food or medicine BUT <b>IGNORE</b> cheese (as stated in question) <b>IGNORE</b> process unqualified
1	(a)	(ii)	microbes / <b>AW</b> , killed / removed / not present ;  enzymes <u>denatured</u> ;  (so no) competitors / unwanted reactions / (human) health risk ;	2 max	<b>Mark the first two suggestions</b> <b>IGNORE</b> contamination / sterile <b>IGNORE</b> idea of preserving milk  <b>AW</b> for microbes as in (a)(i) plus <b>ACCEPT</b> organisms  <b>DO NOT CREDIT</b> microbes denatured  <b>CREDIT</b> (no) competition <b>CREDIT</b> (no) food spoilage / change of flavour / loss of quality <b>CREDIT</b> (no) pathogens / harmful microbes / TB  <b>“Kills harmful microbes”</b> or <b>“Kills pathogens”</b> scores 2 marks (mps 1 & 3)

Question			Expected Answer	Mark	Additional Guidance
1	(b)	(i)	<p>1 enzyme ;</p> <p><i>plus any 2 of the following</i></p> <p>2 (enzyme) not, changed / used up ; <b>ora</b></p> <p>3 <i>idea of ESC (forms) / substrate and enzyme (bind) ;</i></p> <p>4 products (and enzyme) released at end ;</p>	<p>1</p> <p>max 2</p>	<p><b>Award mp 1 plus 2 max from the other mark points</b></p> <p>1 <b>ACCEPT</b> globular / tertiary / catalyst / catalytic (protein)</p> <p>2 <b>ora</b> = can be used again / re-used <b>IGNORE</b> enzyme recycled</p> <p>3 ESC = enzyme-substrate complex <b>ACCEPT</b> substrate entering active site</p>
1	(b)	(ii)	<p>1 (enzyme can be removed to be) used again ;</p> <p>2 (enzyme can) to leave pure(r) product ; <b>ora</b></p> <p>3 (enzyme) more stable / more efficient / works better ;</p>	<p>2</p>	<p><b>Mark the FIRST suggestion on each numbered line</b> <b>IGNORE</b> 'cheaper' without qualification</p> <p>2 <b>ACCEPT</b> cheaper / easier, downstream processing</p> <p>3 <b>CREDIT</b> less susceptible to, pH / temperature, change / extremes  <b>"enzymes work at high temperatures"</b> = 0  <b>"enzymes work at higher temperatures"</b> = 1            (because comparative statement made)</p>

Question	Expected Answer	Mark	Additional Guidance
1 (c)	<p><b><i>This is a QWC question</i></b>  <i>Section I - Obtaining the gene</i></p> <p>1 use restriction, enzyme / endonuclease ;  2 to, cut out / get / isolate, (rennin) gene / DNA coding for rennin  <b>or</b> to, fragment / digest, DNA ;</p> <p>3 <u>gene</u> probe ;  <b>OR</b>  4 obtain rennin mRNA ;  5 (use) reverse transcriptase ;  6 to make cDNA ;  <b>OR</b>  7 sequence, rennin (protein) ;  8 work out base code ;  9 make this DNA sequence ;</p> <p>10 sticky ends ;</p> <p><i>Section II - Vector</i></p> <p>11 cut (open), plasmid / phage ;</p> <p>12 using same <u>restriction</u> enzyme ;</p> <p>13 annealing / base pairing of sticky ends ;  14 join sugar-phosphate backbones ;  15 (using DNA) ligase ;  16 <u>recombinant</u>, vector / plasmid / phage / DNA ;</p> <p><i>Section III - Introduction into host cell</i></p> <p>17 mix with bacteria ;  18 detail of conditions ;  19 <u>transformation</u> (plasmid) / <u>transduction</u> (phage) ;</p>	max 7	<p>1 <b>CREDIT</b> named example e.g. <i>Eco</i> R1, <i>Bam</i> H1, <i>Hin</i> dIII  2 <b>DO NOT CREDIT</b> 'cut gene'  <b>IGNORE</b> 'break up DNA'</p> <p><b>NOTE</b>  1-9 <b>CREDIT</b> whichever of the three alternative "obtaining the gene"  protocols yields most marks,  <b>either award marking points</b>  1-3  <b>or</b> 4-6  <b>or</b> 7-9</p> <p>10 can be awarded, once only, in Sections I or II</p> <p>11 <b>DO NOT CREDIT</b> 'cut out plasmid'  <b>DO NOT CREDIT</b> 'ring of DNA' unless it is clear that  plasmid is being referred to</p> <p>12 <b>CREDIT</b> same named enzyme (re. mp1)</p> <p>13 <b>CREDIT</b> idea of sticky end bases hydrogen bonding  14 <b>CREDIT</b> formation of phosphodiester bonds</p> <p>18 e.g. Ca<sup>2+</sup> ions added / heatshock (freeze then inc to 40°C)  19 <b>CREDIT</b> transform / transformed / transduce / transduced  <b>IGNORE</b> transgenic</p>
	<p><b>QWC – sequencing of steps – at least 1 mark point scored from each of the three sections, in the correct order ;</b></p>	1	<p>I. obtaining gene (mp 1 – 9) followed by  II. vector (mp 13 – 16) followed by  III. introduction to host cell (mp 17 – 19)</p>
	<b>TOTAL</b>	<b>17</b>	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	red ; vermillion ; cinnabar ;	3	
2	(a)	(ii)	(recessive) epistasis / epistatic ;	1	<b>ACCEPT</b> complementary epistasis <b>DO NOT CREDIT</b> dominant epistasis
2	(a)	(iii)	<p>1 gene products are enzymes ;</p> <p>2 multi-enzyme / multi-step, pathway ;</p> <p>3 <u>3</u>, steps / enzymes, change tryptophan to red pigment ;</p> <p>4 product of one reaction / intermediate compound, is, substrate / starting point, for next ;</p> <p>5 dominant allele gives, functional / wild-type / AW, enzyme ;</p> <p>6 recessive allele gives, non-functional / different / AW, enzyme ;</p>	max 3	<p>2 needs to be a clear generalised statement (and not implied - e.g. by awarding mp 3)</p> <p><b>IGNORE</b> 'metabolic' pathway (as given in question)</p> <p>3 <b>ACCEPT</b> V, C <u>and</u> B are responsible for the change of tryptophan to red</p>
2	(b)	(i)	<p>1 if (<i>red-eyed parent</i>) was heterozygous there would be no difference between, sexes / males and females ;</p> <p>2 red-eyed males <b>and</b> white-eyed females would occur ;</p> <p>1:1:1:1 ratio <b>or</b> 1:1 ratio in both sexes ;</p>	max 2	<p><b>IGNORE</b> ref to sex linkage</p> <p>2 <b>ACCEPT</b> "because there are no red-eyed males <b>and</b> white-eyed females (in results)" "all 4 phenotypes would, occur / be represented"</p> <p><b>DO NOT</b> infer phenotype(s) from genotype(s)</p> <p>3 If 4 phenotypes stated / listed <i>together with the ratio</i>, then award mp 2 as well</p>

Question			Expected Answers						Marks	Additional Guidance	
2	(b)	(ii)	parental genotypes	XrXr	XRY-					<p><b>ACCEPT</b> alternative letters <b>only if a KEY is given</b>. Must have capital letter for dominant allele and small (same) letter for recessive allele.</p> <p><b>CREDIT GAMETES</b> <b>either</b> on the correct line <b>or</b> in correct place on Punnett square, whichever is correct. They do not need to be in circles.</p> <p><b>ACCEPT</b> ecf once only if Y wrongly shown as carrying 'r' allele</p> <p><b>ACCEPT</b> ecf once only if X and Y missing</p> <p><b>DO NOT CREDIT</b> F1 genotypes written in blank space if F1 phenotypes put on bottom lines instead</p>	
			gametes	Xr	XR and Y-						
			F1 genotypes	XRXr	XrY-					3	
2	(b)	(iii)	phenotype of fly	O	E	O - E	(O - E) <sup>2</sup>	$\frac{(O - E)^2}{E}$		<p><b>One mark per row</b></p> <p><b>ACCEPT</b> fractions in last column (4/25)</p> <p><b>ACCEPT</b> not significant <b>IGNORE</b> ref to happening by chance</p> <p><b>ACCEPT</b> ecf for last two points <b>IGNORE</b> arguments referring to null hypothesis</p>	
			red-eyed female	27	25	2	4	0.16	;		
			white-eyed male	23	25	-2	4	0.16	;		
			$\chi^2 = 0.32$ ; no significant difference (at 95% confidence level) ;								4
			<b>Total</b>								16

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	<p>1 similar / same, cells / metabolism ;</p> <p>2 similar / same / share, <u>genes</u> or have <u>genes</u> in common ;</p> <p>3 similar / same, (embryonic) development ;</p> <p>4 shared, ancestry / ancestor or all related by evolution ;</p>	max 2	<p>1 <b>ACCEPT</b> they are all eukaryotic cells</p> <p>4 <b>CREDIT</b> due to phylogeny <b>ACCEPT</b> all same <u>kingdom</u> <b>IGNORE</b> 'they are all animals'</p>
3	(a)	(ii)	<p>1 small ;</p> <p>2 short life cycle ;</p> <p>3 easy to, keep / breed / AW ;</p> <p>4 cheap (to buy / keep ) ;</p> <p>5 readily available / common / not rare ;</p> <p>6 large cells ;</p> <p>7 previously well-studied / many known mutants ;</p>	max 2	<p><b>Mark the FIRST answer on each numbered line</b></p> <p>2 <b>ACCEPT</b> fast development / mature quickly / fast reproductive rate / short generation time</p> <p>3 <b>ACCEPT</b> produce many offspring</p> <p>7 <b>ACCEPT</b> genome has been, mapped / sequenced</p>
3	(b)	(i)	scanning ; electron (microscope) ;	2	<p><b>CREDIT</b> SEM = 2 marks <b>ACCEPT</b> transmission electron / TEM = 1 mark <b>IGNORE</b> micrograph</p>
3	(b)	(ii)	description of legs in place of antennae in, mutant / 3.2 / AW ;	1	<p><b>ACCEPT</b> projections on head / antennae / feelers, <u>longer</u> (in Fig. 3.2)</p> <p><b>DO NOT CREDIT</b> antennae / projections vs. none <b>DO NOT CREDIT</b> mandibles / fangs <b>DO NOT CREDIT</b> incorrect statement e.g. legs on mouth</p>
3	(b)	(iii)	homeotic / homeobox / hox ;	1	



Question	Expected Answers	Marks	Additional Guidance
3 (c)	<p>1 <i>synthesis</i></p> <p>2 DNA, copied into / →, mRNA <b>or</b> described ;</p> <p>3 <u>transcription</u> / <u>transcribed</u> ; one strand copied ;</p> <p>4</p> <p>5 complementary base-pairing ;</p> <p>6 triplet code / code read in threes / codon is 3 bases ;</p> <p>7 base sequence determines amino acid sequence ;</p> <p>8 <u>translation</u> ;</p> <p>9 <u>ribosomes</u> ; role of tRNA described ; <b>(max 6)</b></p> <p>10 <i>roles of polypeptides</i></p> <p>11 (named) structural protein ; enzymes / catalyse reactions / control metabolism ;</p> <p>12</p> <p>13 hormones / growth factors ;</p> <p>14 receptor proteins ; adenyl cyclase / cAMP ;</p> <p>15</p> <p>idea of switching genes, on / off ;</p> <p>16</p> <p>homeotic / homeobox, genes</p> <p>17 <b>or</b> homeodomain proteins ; <i>idea of master switch gene /</i> one gene turns on/off whole set of other genes / cascades of gene switching ;</p> <p>18</p> <p>apoptosis ; <b>(max 6)</b></p>	7 max	<p><b>MAX 6</b> marks for synthesis <b>MAX 6</b> marks for roles</p> <p><b>1 DO NOT CREDIT</b> descriptions that contain errors</p> <p><b>3 ACCEPT</b> coding / sense / non-sense / template, strand (implying one only)</p> <p><b>4 CREDIT</b> description of base pairing as correct to context</p> <p><b>9</b> e.g. “tRNA brings amino acid” or “tRNA anticodon binds to mRNA codon”</p> <p><b>10</b> e.g. actin / myosin / collagen / keratin</p> <p><b>12 CREDIT</b> growth hormone / GH / somatotrophin / FSH</p> <p><b>14</b> most likely to be expressed in context of mp 12</p> <p><b>15 CREDIT</b> transcription factors / regulatory proteins / repressor proteins</p>
	<b>QWC – balanced account ;</b>	<b>1</b>	At least 2 marks from points 1 - 9 <b>and</b> at least 2 marks from points 10 – 18
	<b>Total</b>	<b>16</b>	

Question		Expected Answers		Marks	Additional Guidance									
4	(a)		<table border="1"> <thead> <tr> <th></th> <th>similarity</th> <th>difference</th> </tr> </thead> <tbody> <tr> <th>structure</th> <td>mitochondria <b>or</b> vesicles <b>or</b> postsynaptic receptors ;</td> <td>NMJ membrane(s), wavy / AW * <b>ora</b> <b>or</b> receptors different (shape) <b>or</b> enzymes in different places ;</td> </tr> <tr> <th>function</th> <td>(neuro)transmitter, released / crosses gap <b>or</b> changes potential difference / AW ** <b>or</b> enzymes break down (neuro)transmitter ;</td> <td>different neurotransmitters / ACh vs. dopamine <b>or</b> muscle contraction vs. nerve impulse <b>or</b> different enzymes ;</td> </tr> </tbody> </table>		similarity	difference	structure	mitochondria <b>or</b> vesicles <b>or</b> postsynaptic receptors ;	NMJ membrane(s), wavy / AW * <b>ora</b> <b>or</b> receptors different (shape) <b>or</b> enzymes in different places ;	function	(neuro)transmitter, released / crosses gap <b>or</b> changes potential difference / AW ** <b>or</b> enzymes break down (neuro)transmitter ;	different neurotransmitters / ACh vs. dopamine <b>or</b> muscle contraction vs. nerve impulse <b>or</b> different enzymes ;	4	<p><b>One mark per box</b></p> <p><i>difference</i> <b>NMJ</b> is neuromuscular junction * <b>AW ACCEPT</b> wiggly / bumpy / not smooth / rough / larger SA / any suitable description <b>but IGNORE</b> microvilli</p> <p><i>difference</i> <b>ACh</b> is acetylcholine</p> <p><i>similarity</i> ** <b>AW CREDIT</b> depolarises / -70 mV → +40 mV <b>but IGNORE</b> pass on action potential</p>
	similarity	difference												
structure	mitochondria <b>or</b> vesicles <b>or</b> postsynaptic receptors ;	NMJ membrane(s), wavy / AW * <b>ora</b> <b>or</b> receptors different (shape) <b>or</b> enzymes in different places ;												
function	(neuro)transmitter, released / crosses gap <b>or</b> changes potential difference / AW ** <b>or</b> enzymes break down (neuro)transmitter ;	different neurotransmitters / ACh vs. dopamine <b>or</b> muscle contraction vs. nerve impulse <b>or</b> different enzymes ;												
4	(b)	(i)	<p>1 phenelzine ;</p> <p><b>no ecf from incorrect drug</b></p> <p>2 <i>idea that</i> does not bind to (dopamine) receptor ; <b>ora</b></p> <p>3 <i>idea that</i> binds to, MAO / enzyme ;</p> <p>4 allosteric site / non-competitive inhibitor ;</p>	1           max 1	<p><b>Award mp1 and, if correct, any 1 from the remaining points</b></p> <p>2 <b>CREDIT</b> other two do bind to dopamine receptor</p> <p>3 <b>IGNORE</b> inhibits, MAO / enzyme (as given in the question)</p> <p>4 <b>ACCEPT</b> “not a competitive inhibitor”</p>									
4	(b)	(ii)	<p>(drug) occupies / blocks / binds to, (dopamine) receptors ; without causing, action potential / response ; reduces <b>effect of</b> dopamine / is a dopamine antagonist ;</p>	2	<p><b>CREDIT</b> “without causing depolarisation” / AW <b>DO NOT CREDIT</b> “inhibits dopamine” or “reduces dopamine levels”</p>									

Question			Expected Answers	Marks	Additional Guidance
4	(c)	(i)	humans are, diploid / $2n$ ; chromosomes, are in pairs / homologous ; one, (copy / gene / allele), from each parent / on each chromosome of pair ;	2 max	<b>DO NOT CREDIT</b> ref to bivalents
4	(c)	(ii)	(gel) <u>electrophoresis</u> ;	1	
4	(d)	1	13 b-p deletion (has most serious consequences) ;	3 max	6 <b>CREDIT</b> could be a silent mutation / 1 b-p substitution may not have an effect
		2	frameshift / alter reading frame ;		
		3	genetic code is triplet / read in groups of 3 bases ;		
		4	alters all amino acids (coded for) after the mutation ;		
		5	21 b-p deletion causes 7 amino acids to be lost ;		
		6	substitution changes, one / no, amino acids ;		
4	(e)	1	<u>natural selection</u> ;	4 max	3 <b>CREDIT</b> increases reproductive success / AW 4 <b>ACCEPT</b> more promiscuous / AW  6 <b>MUST HAVE</b> time element
		2	<u>selective advantage</u> ;		
		3	(allele / behaviour) increases, survival / breeding / AW ;		
		4	(because) helped, find food / find new resources / make new tools / get mates ;		
		5	<u>allele</u> passed on (to next generation) ;		
		6	(allele / behaviour) increased in frequency over, generations / time ;		
<b>Total</b>				<b>18</b>	

Question		Expected Answers	Marks	Additional Guidance
5	(a)	ecosystem ; producers / autotrophs ; primary ; trophic level(s) ; biotic / living ; minerals / elements ;	6	<b>DO NOT CREDIT</b> plants <b>DO NOT CREDIT</b> trophic <b>CREDIT</b> named, element / ion, e.g. nitrogen, nitrate <b>ACCEPT</b> symbol e.g. N / NO <sub>3</sub> <sup>-</sup> <b>ACCEPT</b> nutrient <b>DO NOT CREDIT</b> energy / waste products
5	(b)	(i) 1 limiting / density-dependent, factors ; 2 <u>carrying capacity</u> ; 3 intraspecific competition ; 4 for, food / nesting sites ; 5 interspecific competition ; 6 with, deer / tree shrew / giant squirrel ; <i>larger squirrel populations</i> 7 attract more predators ; 8 parasites / diseases, spread more easily ;	max 4	<b>3 ACCEPT</b> description e.g. • “competition with other members of the same species” • “competition with other (small) squirrels” <b>4 ACCEPT</b> they run out of food <b>5 ACCEPT</b> description e.g. “competition with other species” <b>7 DO NOT CREDIT</b> predation alone, must be linked to larger squirrel population <b>8 DO NOT CREDIT</b> disease alone, must be linked to larger squirrel population

Question			Expected Answers	Marks	Additional Guidance
5	(b)	(ii)	species richness & evenness decrease ; <b>ora</b>  (richness) 29 → 26 (species) ;  (evenness) large numbers of, 2 / some, species, but, low numbers / none, of other species ;	<b>max 2</b>	<b>ACCEPT</b> they both, decrease / decline / fall <b>or</b> they were higher at start <b>ACCEPT</b> 6 → 4 <b>or</b> 2 fewer (from table) <b>or</b> 3 fewer (from text) <b>CREDIT</b> suitable named e.g.s from table
5	(c)	(i)	rare initially / AW ;  prey, numbers have reduced / have become extinct / have left the area ;  idea of slower reproductive rate / AW ;	<b>max 1</b>	<b>ACCEPT</b> that there weren't very many at start  <b>DO NOT CREDIT</b> 'lack of food' unless has indicated that food is an animal  <b>ACCEPT</b> don't breed as fast / don't have as many offspring
5	(c)	(ii)	<b>1</b> aesthetic / amenity / recreational, value ;  <b>2</b> (eco)tourism ; <b>3</b> to, preserve biodiversity / preserve genetic diversity / stop extinction ; <b>4</b> ref. interactions between species / need to preserve whole habitat ;  <b>5</b> (rainforest species / preserve gene pool as) could be useful, in future / as potential, for, medicine / genetic engineering / AW ; <b>6</b> to support indigenous peoples / AW ;  <b>7</b> to stop effect of deforestation on, atmosphere / climate / soil ;  <b>8</b> AVP ;	<b>max 3</b>	<b>Mark the FIRST suggestion on each numbered line</b> <b>1 ACCEPT</b> description, e.g. beautiful / so people will visit / so people will use it for leisure <b>2 ACCEPT</b> description, e.g. raise money from visitors <b>3 ACCEPT</b> description, e.g. keep more species  <b>4 ACCEPT</b> description, e.g. if habitat destroyed there will be a knock-on effect on many species <b>5 ACCEPT</b> for drugs, pharmaceuticals, GM or GM e.g. (like crop improvement)  <b>6 ACCEPT</b> let native people continue to live in forest income for indigenous people <b>7 ACCEPT</b> to stop, CO <sub>2</sub> % rising / global warming / erosion <b>or</b> forest acts as C, sink / store  <b>8</b> e.g. <ul style="list-style-type: none"><li>• habitat for pollinators</li><li>• habitat for predators of pests</li></ul> <b>DO NOT CREDIT</b> 'right to life'

Question		Expected Answers	Marks	Additional Guidance
5	(d)	<p><i>management practices</i></p> <p><b>M1</b> coppicing / pollarding / description ;  <b>M2</b> selective felling / description ;  <b>M3</b> rotational felling / description ;  <b>M4</b> strip felling ;  <b>M5</b> replant after felling ; (max 2)</p> <p><i>explanation of benefits re. sustainability</i></p> <p><b>B1</b> preserves / prevents disruption to,  habitat / ecosystems / nesting sites ;  <b>B2</b> maintains / increases, species diversity / biodiversity ;  <b>B3</b> prevents, soil erosion / leaching ;  <b>B4</b> less disturbance by machinery ;  <b>B5</b> AVP ; (max 2)</p>	max 4	<p><b>LOOK FOR</b> key ideas expressed in different ways</p> <p><b>M1 CREDIT</b> coppicing with standards / rotational coppicing  <b>M2 ACCEPT</b> only some trees cut down  <b>M3 ACCEPT</b> cycle of felling different areas</p> <p><b>B5 CREDIT</b> specific benefits linked to a practice  e.g. <ul style="list-style-type: none"> <li>• faster recovery due to seeding from untouched areas nearby (M3)</li> <li>• pollarding so deer can't eat shoots (M1)</li> </ul> </p>
<b>Total</b>			<b>20</b>	

Question		Expected Answers	Marks	Additional Guidance															
6	(a)	<p><b>1</b> to cope with changing conditions / AW ;</p> <p><b>2</b> avoid <u>abiotic</u> stress ;</p> <p><b>3</b> to maximise photosynthesis <b>or</b> to obtain more, light / water / minerals ; <b>ora</b></p> <p><b>4</b> avoid, herbivory / grazing ;</p> <p><b>5</b> to ensure, germination in suitable conditions / pollination / seed set / seed dispersal ;</p>	max 2	<p><b>1</b> Looking for a general statement <b>DO NOT CREDIT</b> “adapt to change”</p> <p><b>3 CREDIT</b> named elements / ions <b>IGNORE</b> nutrients</p> <p><b>4</b> methods of preventing grazing could include producing more toxins / more spines / encouraging stinging ants <b>IGNORE</b> predation</p> <p><b>5 DO NOT CREDIT</b> ‘maximise reproduction’ without further qualification</p>															
6	(b)	<p><b>(i)</b></p> <p><b>1</b> in water / in <b>A</b> / with no abscisic acid, germination increases as conc. GA increases ;</p> <p><b>2</b> when abscisic acid present / in <b>B</b>, no germination ;</p> <p><b>3</b> maximum germination 90% with 5 mol dm<sup>-3</sup> GA, in water / without abscisic acid ;</p> <p><b>4</b> 2 comparative figures (x and y refs. plus units) ;</p> <p><b>5</b> GA concentration increases, logarithmically / by a factor of 10, on x axis ;</p> <p><b>6</b> 10 times more GA gives, 3 (conc 0.05 to 0.5) / 0.5 (conc 0.5 to 5), times more germination ;</p>	4 max	<p><b>2 DO NOT CREDIT</b> ‘inhibits germination’ (as this is a conclusion not a description)</p> <p><b>3 ACCEPT</b> 91% (± 2%) for 90%</p> <p><b>4 EITHER</b> compare <b>A</b> and <b>B</b> at the same GA conc <b>OR</b> two points on same line <b>with units for both</b></p> <table border="1"> <thead> <tr> <th>GA conc (mol dm<sup>3</sup>)</th> <th>A (%)</th> <th>B (%)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>10 ± 2</td> <td>0</td> </tr> <tr> <td>0.05</td> <td>22 ± 2</td> <td>0</td> </tr> <tr> <td>0.5</td> <td>66 ± 2</td> <td>0</td> </tr> <tr> <td>5</td> <td>91 ± 2</td> <td>0</td> </tr> </tbody> </table>	GA conc (mol dm <sup>3</sup> )	A (%)	B (%)	0	10 ± 2	0	0.05	22 ± 2	0	0.5	66 ± 2	0	5	91 ± 2	0
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Question			Expected Answers	Marks	Additional Guidance
6	(b)	(ii)	<p>1 so temperature doesn't affect results / so only desired variable(s) changed / to show just the effect of plant hormones ;</p> <p>2 since temperature affects enzyme activity ;</p> <p>3 suitable / optimum, temperature for (lettuce) germination ;</p>	2 max	<p>1 <b>ACCEPT</b> fair test <b>IGNORE</b> to control temperature / temperature is a limiting factor / temperature is a controlled variable</p> <p>2 <b>CREDIT</b> "optimum temperature for enzyme activity" or "this is the temperature when enzymes work best"</p> <p>3 <b>ACCEPT</b> 'these' seeds</p>
6	(b)	(iii)	<p>1 <u>volumes</u> of liquid(s) ;</p> <p>2 ABA concentration ;</p> <p>3 oxygen availability ;</p> <p>4 age of seeds ;</p> <p>5 previous storage of seeds / viability idea ;</p> <p>6 genotype / variety, of seeds ;</p> <p>7 size / type of, petri dish / filter paper ;</p> <p>8 length of time experiment left for (before recording results) ;</p> <p>9 space between seeds ;</p> <p>10 AVP ;</p>	3 max	<p><b>Mark the FIRST suggestion on each numbered line</b> <b>DO NOT CREDIT</b> conc, GA / giberrellin (as this is the independent variable) <b>IGNORE</b> number of seeds (as given in the question)</p> <p>1 <b>DO NOT CREDIT</b> amounts / levels <b>CREDIT</b> volume of, water / GA / ABA</p> <p>3 <b>IGNORE</b> carbon dioxide</p> <p>6 <b>CREDIT</b> "from same batch of seeds" or "seeds from same plant"</p> <p>10 e.g. <ul style="list-style-type: none"> <li>● light qualified (duration / intensity / wavelength)</li> <li>● use of distilled water</li> <li>● all lids, off / on</li> </ul> </p>



Question		Expected Answers	Marks	Additional Guidance
6	(c)	<p>1 seedless, fruits / grapes ;</p> <p>2 weedkillers ;</p> <p>3 rooting powder / to grow cuttings / used in tissue culture ;</p> <p>4 control fruit ripening ;</p> <p>5 controls fruit drop ;</p> <p>6 restrict hedge growth ;</p> <p>7 preserve, cut flowers / green vegetables ;</p> <p>8 specific example of improved fruit quality ;</p> <p>9 producing malt / in brewing ;</p> <p>10 AVP ;</p> <p>11 AVP ;</p>	2 max	<p><b>Mark the FIRST TWO suggestions</b>  <b>IGNORE</b> the names of plant growth regulators</p> <p>4 could be used to speed up or slow down</p> <p>8 e.g. <ul style="list-style-type: none"> <li>• longer stalks on grapes</li> <li>• longer apples</li> </ul> </p> <p>10 &amp; 11 e.g. <ul style="list-style-type: none"> <li>• promoting sexual maturity in conifers</li> <li>• promoting latex flow in rubber plants</li> <li>• promoting sexual maturity in female cucumber plants</li> <li>• longer nodes in sugar cane</li> <li>• restricting growth in, chrysanthemums / other e.g.</li> </ul> </p>
<b>Total</b>			<b>13</b>	

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