

Question	Expected Answers	Marks	Additional Guidance									
6 (a)	<p>1 to cope with changing conditions / AW ;</p> <p>2 avoid <u>abiotic</u> stress ;</p> <p>3 to maximise photosynthesis or to obtain more, light / water / minerals ; ora</p> <p>4 avoid, herbivory / grazing ;</p> <p>5 to ensure, germination in suitable conditions / pollination / seed set / seed dispersal ;</p>		<p>1 Looking for a general statement DO NOT CREDIT "adapt to change"</p> <p>3 CREDIT named elements / ions IGNORE nutrients</p> <p>4 methods of preventing grazing could include producing more toxins / more spines / encouraging stinging ants IGNORE predation</p> <p>5 DO NOT CREDIT 'maximise reproduction' without further qualification</p>									
6 (b)	<p>(i)</p> <p>1 in water / in A / with no abscisic acid, germination increases as conc. GA increases ;</p> <p>2 when abscisic acid present / in B, no germination ;</p> <p>3 maximum germination 90% with 5 mol dm⁻³ GA, in water / without abscisic acid ;</p> <p>4 2 comparative figures (x and y refs. plus units) ;</p> <p>5 GA concentration increases, logarithmically / by a factor of 10, on x axis ;</p> <p>6 10 times more GA gives, 3 (conc 0.05 to 0.5) / 0.5 (conc 0.5 to 5), times more germination ;</p>	max 2	<p>2 DO NOT CREDIT 'inhibits germination' (as this is a conclusion not a description)</p> <p>3 ACCEPT 91% ($\pm 2\%$) for 90%</p> <p>4 EITHER compare A and B at the same GA conc OR two points on same line with units for both</p> <table border="1" data-bbox="1200 212 1337 763"> <thead> <tr> <th>GA conc (mol dm⁻³)</th> <th>A (%)</th> <th>B (%)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>10 \pm 2</td> <td>0</td> </tr> <tr> <td>0.05</td> <td>22 \pm 2</td> <td>0</td> </tr> </tbody> </table>	GA conc (mol dm ⁻³)	A (%)	B (%)	0	10 \pm 2	0	0.05	22 \pm 2	0
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6 (b) (ii) 1	so temperature doesn't affect results / so only desired variable(s) changed / to show just the effect of plant hormones ;		1 ACCEPT fair test IGNORE to control temperature / temperature is a limiting factor / temperature is a controlled variable
2	since temperature affects enzyme activity ;		2 CREDIT "optimum temperature for enzyme activity" or "this is the temperature when enzymes work best"
3	suitable / optimum, temperature for (lettuce) germination ;	2 max	3 ACCEPT 'these' seeds
6 (b) (iii) 1 2 3 4 5 6 7 8 9 10	<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>Mark the FIRST suggestion on each numbered line</p> <p>DO NOT CREDIT conc, GA / gibberellin (as this is the independent variable)</p> <p>IGNORE number of seeds (as given in the question)</p> <p>1 DO NOT CREDIT amounts / levels CREDIT volume of, water / GA / ABA</p> <p>3 IGNORE carbon dioxide</p> <p>6 CREDIT "from same batch of seeds" or "seeds from same plant"</p> <p>10 e.g. <ul style="list-style-type: none"> • light qualified (duration / intensity / wavelength) • use of distilled water • all lids, off / on </p>

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0 (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>		<p>Mark the FIRST TWO suggestions</p> <p>IGNORE the names of plant growth regulators</p> <p>4 could be used to speed up or slow down</p> <p>8 e.g. • longer stalks on grapes • longer apples</p> <p>10 & 11 e.g. • promoting sexual maturity in conifers • promoting latex flow in rubber plants • promoting sexual maturity in female cucumber plants • longer nodes in sugar cane • restricting growth in, chrysanthemums / other e.g.</p>
	Total	13	
		2 max	

Question	Expected Answer	Mark	Additional Guidance
3 (a) (i)	<p><i>seedlings / coleoptiles have same</i></p> <p>S1 age ; S2 height / length ; S3 mass ; S4 genotype / genome ; S5 species ;</p> <p><i>procedure has same</i></p> <p>P1 same volume of solution applied ;</p> <p>P2 (named) feature of growth medium ;</p> <p>P3 watering regime ;</p> <p>P4 light , intensity / wavelength / duration ;</p> <p>P5 temperature ;</p>	3 max	<p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>S2 IGNORE size / surface area / width S3 IGNORE size / weight S4 ACCEPT same genetic makeup IGNORE same genes</p> <p>For all P points IGNORE light <i>direction</i> (as this is an independent variable)</p> <p>P1 IGNORE ref to concentration of solution ACCEPT <i>idea of consistency</i> in application of J and K</p> <p>P2 e.g. type / pH / fertiliser (applied) / minerals / ions IGNORE nutrients</p> <p>P3 e.g. volume of water / time of watering</p> <p>P4 e.g. distance from light source</p>

Question	Expected Answer	Mark	Additional Guidance
3 (a) (ii)	idea that shows the response without treatment or idea that allows the , effect of the treatment / results / groups , to be , compared ;	1	IGNORE improves validity / fair test (as an explanation is required) 'to show the effects of J and K' is not enough CREDIT 'observations' for treatments
3 (a) (iii)	ONLY CREDIT mark points in context of results, and not in context of general roles of auxin and gibberellin <i>J is auxin because</i> A1 inhibition of development of (lateral) buds (in group 2) ; A2 <u>growth</u> of , coleoptiles / group 5 , towards light ; <i>K is gibberellin because</i> G1 greater increase in , height / stem length (in group 3) ; G2 causes growth of (lateral) buds (in group 3) ;	3 max	J must be identified correctly for A marks to be awarded K must be identified correctly for G marks to be awarded A1 CREDIT (group2) results show apical dominance A2 CREDIT (group 5) results show positive phototropism IGNORE plant (as all are plants) G1 CREDIT greater elongation G2 CREDIT (group 3) results do not show apical dominance
3 (b) (i)	protein ;	1	ACCEPT glycoprotein IGNORE polypeptide / channel / carrier / transport
3 (b) (ii)	(synaptic) <u>cleft</u> ;	1	IGNORE gap IGNORE neuromuscular
3 (b) (iii)	acetylcholine esterase / ACh esterase ;	1	ACCEPT phonetic spelling and ignore upper/lower case IGNORE AChE

Question	Expected Answer	Mark	Additional Guidance
3 (c)	<p>mitochondria ;</p> <p>oxidative phosphorylation ;</p> <p>lactate ;</p> <p>creatine phosphate / phosphocreatine ;</p> <p>(cross-)bridge / (cross-)link ;</p> <p>myosin (head) ;</p>	6	<p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT mitochondrion DO NOT CREDIT mitochondrial matrix</p> <p>IGNORE electron transport chain (as not a stage)</p> <p>ACCEPT lactic acid</p> <p>DO NOT CREDIT creatinine</p> <p>DO NOT CREDIT bond ACCEPT phonetic spelling</p>
	Total	16	

Question	Answer	Marks	Guidance
6 (a) (i)	<p>1 (hormone) binds to <u>receptor</u> ;</p> <p>2 causing , cascade of events / enzyme reactions ;</p> <p>3 may involve switching , on / off, genes ;</p> <p>4 only , present / needed , in small , concentrations / quantities (to have an effect) ;</p> <p>5 may have effect on more than one , location / target tissue ;</p> <p>6 <i>idea that</i> effect may involve interaction of more than one hormone ;</p>	2 max	<p>IGNORE prompt lines and mark as prose</p> <p>1 ACCEPT (hormone) complementary shape to <u>receptor</u></p> <p>1 ACCEPT attach</p> <p>1 IGNORE fit</p> <p>3 CREDIT ref to changing gene expression</p>
6 (a) (ii)	<p>1 (most) plant cells retain ability to differentiate / <u>totipotent</u> ;</p> <p>2 plants have , meristems / meristematic tissue ;</p> <p>3 <i>idea that</i> plant cells can de-differentiate and then differentiate into a different cell type;</p> <p>4 (most) animal cells are , differentiated / not totipotent / not pluripotent / only able to differentiate into the same type(s) of cell / are multipotent;</p>		<p>2 ACCEPT named meristematic tissue e.g. shoot apex / root apex / cambium</p> <p>4 ACCEPT 'stem cells found in few (named) tissues' 'bone marrow cells only differentiate into blood cells'</p>

Question	Answer	Marks	Guidance
6 (a) (iii)	<p>1 (inter-species / triploid) hybrids, are sterile / cannot reproduce sexually;</p> <p>2 polyploidy (in the hybrid) provides duplicate of each chromosome ;</p> <p>3 (polyploidy) allows the hybrid to, carry out meiosis / form gametes or (polyploidy) restores fertility / overcomes sterility ;</p> <p>4 (hybrids are) <u>reproductively isolated</u> (from other species);</p> <p>5 increased, cell size / grain size, increases yield;</p> <p>6 sterile hybrids expensive for farming (especially in developing countries);</p> <p>7 (plants) stronger/more vigorous/ healthier;</p>	2 max	<p>1 CREDIT hybrid from named examples e.g. einkorn (wheat) x, wild / goat, grass emmer (wheat) x wild grass</p> <p>2 IGNORE ref to 'more than two sets of chromosomes' as this is given in Q</p> <p>3 ACCEPT 'chromosome number doubling restores fertility'</p> <p>3 ACCEPT can reproduce sexually</p> <p>4 ACCEPT gametes incompatible with other species</p> <p>5 ACCEPT seed size</p> <p>7 must be a comparative statement 7 ACCEPT less prone to disease / greater hybrid vigour 7 IGNORE pest resistance</p>

Question	Answer	Marks	Guidance
6 (b)	<p><i>crec seedlings</i></p> <p>C1 apical cells / apex/ tip(of shoot), produce , auxin / IAA ;</p> <p>C2 diffusion / active transport (down shoot / through parenchyma) ;</p> <p>C3 greater auxin (concentration) on shaded side of stem ;</p> <p>C4 auxin causes cell <u>wall</u> loosening ;</p> <p>C5 auxin causes cell , elongation / expansion ;</p> <p>C6 further detail of changes in cell wall ;</p> <p><i>Human</i></p> <p>H1 retina / rods / receptors, detect light / AW ;</p> <p>H2 action potentials/ depolarisation/nervous impulse, along sensory neurone (membrane) ;</p> <p>H3 intermediate neurone (in brain) / (somatic) motor neurone / neuromuscular junction ;</p> <p>H4 correct ref to detail of synaptic transmission;</p> <p>H5 depolarisation / contraction, of muscle fibre(s);</p> <p>H6 correct ref to detail of muscle contraction;</p>	<p>C1 ACCEPT secretes /releases</p> <p>C2 CREDIT PIN (polar auxin transport)</p> <p>C3 ACCEPT auxin, moves to / collects on, shaded side</p> <p>C3 IGNORE found on shaded side</p> <p>C4 ACCEPT cell <u>walls</u> become, stretchy / less rigid</p> <p>C4 IGNORE weakened cell walls</p> <p>C6 e.g. H⁺ ions pumped into cell wall / low pH to allow enzymes to work / bonds broken within cellulose in wall</p> <p>H1 IGNORE ref to cones</p> <p>H2 / H3 DO NOT CREDIT signals / messages</p> <p>H2 IGNORE ref to optic nerve</p> <p>H3 CREDIT ref to relay neurone</p> <p>H5 ACCEPT muscle cell</p> <p>H6 e.g. actin and myosin slide over each other</p>	<p>7 max</p> <p>13</p>
	Total		

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Question Expected Answers

- 7 (a)**
- 1** (apical / terminal) bud is source of auxin;
 - 2** auxin inhibits growth of side shoot / ora;
 - 3** remove bud and auxin concentration drops;
 - 4** (this allows) cell division / elongation to take place;

ecf – marking points 2 and 3 if growth regulator or hormone used instead of auxin

- (b)** *award two marks if correct answer (80%) is given
award one mark for calculation if answer is not correct*

$(90 - 50 = 40) \quad 40 / 50 \times 100;$

80%;

- (c)** no growth until day, 8 / 10;
auxin moves out of paste / AW;
inhibits growth;
growth occurs after, 8 / 10, days;
because auxin, levels fall / 'used up';

[Total: