

Markscheme

May 2026

Biology

Higher level

Paper 2

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Subject Details: Biology HL Paper 2 Markscheme

Candidates are required to answer **all** questions in Section A and **two** out of **three** questions in Section B. Maximum total = **80 marks**.

1. A markscheme often has more marking points than the total allows. This is intentional.
2. Each marking point has a separate line and the end is shown by means of a semicolon (;).
3. An alternative answer or wording is indicated in the markscheme by a slash (/). Either wording can be accepted.
4. An alternative answer is indicated by “**OR**”. Either answer can be accepted.
5. An alternative markscheme is indicated under heading **ALTERNATIVE 1** etc. Either alternative can be accepted.
6. Words in brackets () in the markscheme are not necessary to gain the mark.
7. Words that are underlined are essential for the mark.
8. The order of marking points does not have to be as in the markscheme, unless stated otherwise.
9. If the candidate’s answer has the same “meaning” or can be clearly interpreted as being of equivalent significance, detail and validity as that in the markscheme then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by **OWTTE** (or words to that effect).
10. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
11. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking indicate this by adding **ECF** (error carried forward) on the script.
12. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the markscheme.

Section B

Extended response questions – quality mark

- Extended response questions for HLP2 each carry a mark total of **[16]**. Of these marks, **[15]** are awarded for content and **[1]** for the quality of the answer.
- **[1]** for quality is to be awarded when:
 - the candidate's answers are clear enough to be understood without re-reading.
 - the candidate has answered the question succinctly with little or no repetition or irrelevant material.
- It is important to judge this on the overall answer, taking into account the answers to all parts of the question. Although, the part with the largest number of marks is likely to provide the most evidence.
- Candidates that score very highly on the content marks need not necessarily automatically gain **[1]** for quality (and *vice versa*).

Section A

Question			Answers	Notes	Total
1.	a		5.8 days / -5.8 days / minus 5.8 days;	<i>Units required. Allow 'd' instead of 'days'.</i>	1
1.	b		a. mortality (55%) higher/more/increased (in 1×10^6); b. survival time (3.7 days) less/shorter/decreased (in 1×10^6); c. percentage of bark beetles infected (82 %) higher/more/increased (in 1×10^6);	<i>Do not award marks for stating values without a comparison such as 'more' or 'shorter'. 'Only' is not clear enough.</i> <i>Accept converse statements for the control.</i>	2 max
1.	c		Award one mark for stating that there is no advantage if this is supported by at least two of the following arguments: • no difference in mean mortality/same/both 100% • little difference in/similar survival times • little difference in % infected/similar percentages infected/slightly lower % infected with 1×10^8;	<i>Do not award the mark if the candidate answers 'yes and no' or 'yes' to whether there is an advantage.</i> <i>Allow 'neither an advantage nor a disadvantage'.</i>	1 max
1.	d		1×10^8 (spores ml^{-1});	<i>Mark the first concentration given in the answer only.</i>	1
1.	e		a. mortality was 100% for both in $1 \times 10^8 \text{ ml}^{-1}$ and in $1 \times 10^7 \text{ ml}^{-1}$; b. at <u>1×10^6</u> 100% mortality with <i>B. pseudobassiana</i> but only 93% with <i>B. bassiana</i> OR higher mortality at <u>1×10^6</u> with <i>B. pseudobassiana</i> than <i>B. bassiana</i> OR <i>B. pseudobassiana</i> kills all beetles at all concentrations but <i>B. bassiana</i> only killed 93% at <u>1×10^6</u> ; c. more vulnerable to <i>B. pseudobassiana</i> infection (at 14 days);	<i>Do not award mpc unless the answer refers to the difference in mortality at the lowest concentration. Ignore arguments based on survival time.</i>	2 max

Question			Answers	Notes	Total
1.	f		27;	Accept answers in the range from 26 to 27.	1
1.	g		(similarities) a. both 100%/same mortality on day 15; b. mortality increases in both (groups) over time/with number of days/between day 5 and 15/throughout the trial OR neither reached their peak/maximum/100% until day 15 OR lowest mortality for both on day 5; c. differences between the days may be <u>significant</u> in both groups; (differences) d. mortality is higher at 5/10 days in 75% group / lower in 25% group; e. increase in mortality between day 5 and 10 is more in 25% group/less in the 75% group;	2 marks maximum if only similarities or only differences are included.	3 max

Question			Answers	Notes	Total
1.	h		<i>Arguments for</i> a. <i>Beauvaria</i>/the fungi/both (species) infected/killed beetles; b. <i>B. pseudobassiana</i> is effective/kills 100% of beetles at all concentrations/even at low concentrations/even at 1×10^6 OR at a high enough dose <i>B. bassiana</i> kills 100% of beetles; c. <i>B. pseudobassiana</i>/<i>Beauvaria</i> is contagious/is transmitted (from infected to non-infected); d. mortality is equal to or higher than the <u>percentage infected</u> at all concentrations in <i>B. bassiana</i>, OR <i>B. bassiana</i> kills every beetle <u>that it infects</u>; <i>Arguments against</i> e. <i>B. bassiana</i>/<i>B. pseudobassiana</i> is not immediately effective/takes 4 days on average to kill (at highest dose) OR <i>B. pseudobassiana</i> is only fully effective by the 8th/9th/10th/15th day; f. tests need to be performed on more species of beetles OR tests need to be performed to check there is no harm to other species/to the food web;	Do not accept general terms such as "more testing is needed". Award mark for a statement anywhere in the answer that beetles are killed the fungus. No mark for an overall conclusion that <i>Beauvaria</i> are or are not a possible biological control.	3 max

Question			Answers	Notes	Total
2.	a		RNA / ribonucleic acid;	<i>Allow mRNA or messenger RNA.</i>	1
2.	b		a. chemical mutagen; b. high energy radiation/ionizing radiation/X-rays/UV/gamma rays; c. (copying) errors during replication; d. replication errors not corrected by proofreading; e. genetic recombination between viruses (within a host cell);	<i>Mark the first answer only in each numbered section of the answer box, or the first two answers only if only the first section of the answer box has been used.</i> <i>Accept named chemical mutagens.</i> <i>Allow answers referring to mutations in DNA rather than RNA.</i> <i>Do not award a mark for spontaneously or randomly.</i>	2 max
2.	c		a. natural selection/selection pressure due to immune defences/antibodies/vaccination; b. high reproductive rate / viruses reproduce quickly OR short generation time/life cycle OR large numbers of viruses produced from one virus (in a host cell); c. different virus strains (in a host cell) can combine RNA/DNA/genetic material (to make new genes/alleles) OR genetic recombination/reassortment (can occur in viruses);	<i>Mp a: Do not accept evolution due to immune defences/vaccination - there must be reference to natural selection/selection pressure or WTTE.</i> <i>Do not accept high mutation rate.</i> <i>The answer should explain the causes of rapid evolution and not just explain evolution by natural selection.</i>	2 max

Question			Answers	Notes	Total
3.	a		temperature OR water (availability) / rainfall OR oxygen OR (concentrations of) mineral ions / salinity OR pH/acidity (of soil/water);	<i>Mark the first answer only. Do not accept biotic factors.</i> <i>Do not accept natural disasters such as fire, storms, hurricanes, volcanic eruptions, or geographical features such as mountain ranges or seas.</i> <i>Do not accept light/light intensity or sunlight as it is not a principal factor affecting animal distributions.</i> <i>Do not accept heat instead of temperature.</i>	1 max
3.	b		a. fundamental is the potential/possible whereas the realized is the actual/real (niche/mode of life/role); b. realized is with (interspecific) competition and fundamental is without OR fundamental restricted by adaptations/tolerance/limiting factors whereas realized restricted by (interspecific) competition OR realized is smaller than fundamental due to (interspecific) competition;	<i>Do not allow terms such as ‘perfect’ and ‘ideal’ for fundamental.</i>	2

Question			Answers	Notes	Total
3.	c		a. response to (global) warming/increased greenhouse effect/hotter temperatures; b. bird (populations) move/migrate/shift (further) up (the mountain) / inhabit higher altitudes; c. higher altitudes are cooler OR to stay within (the species) tolerance range of temperatures (by moving higher) OR birds able to survive/reproduce (better) at higher altitudes OR prey species moving to higher altitudes; d. may result in reduced population size(s) (because of smaller habitable area) OR possible extinctions due to limited height of mountains; e. temperatures in tropics not very variable so birds not adapted to a wide range;	<i>Do not award mp a for greenhouse effect without increased/enhanced/WTTE.</i> <i>Do not award mp b for restating ‘shift upslope’ from the question.</i> <i>Do not award mp b for answers relating to pole-ward/northward/southward shifts in distribution, unless higher altitude is also stated.</i>	2 max

Question			Answers	Notes	Total
4.	a		primary consumer;	<i>Do not allow trophic level 2 or herbivore.</i>	1
4.	b	i	competition between individuals/members of a species/population OR competition within a species/population;	<i>Do not allow 'competition between the same species'.</i>	1
4.	b	ii	a. (mean) fitness of population increases/becomes greater (on average over time); b. better adapted/fittest (individuals)/stronger competitors (more likely to) survive /survival of the fittest; c. better adapted/fittest (individuals)/stronger competitors can reproduce/pass on useful/advantageous alleles/genes (to offspring); d. frequency of alleles that are useful/advantageous (in intraspecific competition) increases (in the population//species);	<i>Do not award marks for statements referring only to athletic fitness, strength, health or physical condition. However, credit responses where these ideas are clearly linked to biological fitness, for example through greater ability to compete for resources, increased survival, reproductive success, or passing on genes.</i> <i>Do not award mp b for 'strongest beetles survive or equivalent statements.</i>	2 max
4.	c		a. energy is lost (from organisms) as <u>heat</u> ; b. energy losses due to (cell) respiration/metabolism/movement; c. (energy is lost because) parts of the food/prey are not eaten/consumed/ingested OR (energy is lost because) not all organisms/individuals are eaten/consumed; d. (energy is lost with) partial/incomplete digestion of the (ingested) food / faeces; e. energy not recycled;	<i>Mp c: accept relevant examples of uneaten parts e.g. bones.</i> <i>Mp d: accept relevant examples of undigestible parts e.g. cellulose/chitin.</i>	3 max

Question			Answers	Notes	Total
5.	a		humidity; temperature/heat/cold; wind; light (intensity) / sunlight / day versus night;		1 max
5.	b		(ψ_w) decreases/becomes more negative with transpiration/as transpiration rate increases OR (ψ_w) increases/becomes less negative as transpiration rate decreases/transpiration stops;	<i>Do not allow “transpiration rate increases as water potential decreases”. The question asks about the effect of transpiration rate on water potential, not vice versa.</i>	1
5.	c		a. water potential is solute potential plus pressure potential/ $\psi_w = \psi_s + \psi_p$; b. higher/less negative water potential (with higher/less negative solute potential) OR increasing the solute <u>concentration</u> decreases the water potential; c. solutes bind to water molecules so water molecules less likely to leave (solution) OR water is attracted to solutes so moves to areas of higher solute concentration OR water moves by osmosis to an area with a high solute concentration/low solute potential/more negative solute potential OR energy released as water forms intermolecular interactions with solutes;	<i>Accept symbols for potentials throughout.</i>	2 max
5.	d		a. active transport of ions into <u>xylem</u> (vessels of the root); b. by endodermis; c. xylem is hypertonic/decreased water potential/decreased solute potential/more negative solute potential; d. water moves into xylem by <u>osmosis</u> (increasing hydrostatic pressure);		2 max

Question			Answers	Notes	Total
6.	a		adenosine triphosphate;		1
6.	b		a. ATP provides energy (required by proteasomes); b. (ATP/energy used) to unfold lysozyme/proteins/enzymes (for breakdown); c. (ATP/energy used) to tag/feed lysozyme/proteins/enzymes into the proteasome;	Do not award a mark if the answer states explicitly that ATP/energy is needed for hydrolysis.	1 max
6.	c		amino acids;		1
6.	d		a. supplies/recycles <u>amino acids</u> to make new/other proteins/polypeptides; b. proteins become denatured/damaged/misfolded (over time so must be replaced); c. damaged/misfolded proteins do not function properly/could damage cell; d. cells need different proteins over time/as they differentiate/at different stages of the cell cycle; e. proteins/enzymes/lysozyme no longer needed/in excess must be broken down;	For mp a the idea of making new/other proteins/polypeptides must be included.	3 max

Question			Answers	Notes	Total																		
7.	a		haemoglobin/hemoglobin;	<i>Ignore any references to ‘red blood cell’.</i>	1																		
7.	b		<table><thead><tr><th></th><th><i>fish</i></th><th><i>mammals</i></th></tr></thead><tbody><tr><td>a.</td><td>single circulation in bony fish OR blood flows once through the heart (with each circuit) OR heart>gills>other organs>heart</td><td>double circulation OR blood flows twice through the heart (with each circuit) OR heart>lungs>heart>other organs>heart;</td></tr><tr><td>b.</td><td>blood is oxygenated/gas exchange in gills OR blood carried away from gills in an artery/aorta</td><td>blood is oxygenated/gas exchange in alveoli/lungs; OR blood carried away from lungs in a vein;</td></tr><tr><td>c.</td><td>fish heart a single pump/has one ventricle/two chambers</td><td>mammal heart is double/left and right sides/has two ventricles/four chambers;</td></tr><tr><td>d.</td><td>deoxygenated blood passes through heart</td><td>oxygenated and deoxygenated through heart;</td></tr><tr><td>e.</td><td>deoxygenated blood brought to the heart in the cardinal vein</td><td>deoxygenated blood brought to the heart in the vena cavae;</td></tr></tbody></table>		<i>fish</i>	<i>mammals</i>	a.	single circulation in bony fish OR blood flows once through the heart (with each circuit) OR heart>gills>other organs>heart	double circulation OR blood flows twice through the heart (with each circuit) OR heart>lungs>heart>other organs>heart;	b.	blood is oxygenated/gas exchange in gills OR blood carried away from gills in an artery/aorta	blood is oxygenated/gas exchange in alveoli/lungs; OR blood carried away from lungs in a vein;	c.	fish heart a single pump/has one ventricle/two chambers	mammal heart is double/left and right sides/has two ventricles/four chambers;	d.	deoxygenated blood passes through heart	oxygenated and deoxygenated through heart;	e.	deoxygenated blood brought to the heart in the cardinal vein	deoxygenated blood brought to the heart in the vena cavae;		2 max
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Question			Answers	Notes	Total
7.	c		a. small/narrow lumen to maintain high (blood) pressures; b. thick wall to help withstand high (blood) pressure; c. elastic tissue (in artery wall) to store potential energy/maintains(high) pressure/smooth out blood flow/pump blood on along the artery (during ventricular diastole); d. collagen (in artery wall) to give support/strength / to prevent bursting/rupture; e. smooth endothelium/lining to reduce friction/make blood flow easier/prevent blood clotting; f. (smooth) muscle (in wall) to vasoconstrict and vasodilate/control blood flow/pressure OR muscle (in wall) to pump blood (on along the artery);	<i>Mark first two answers only.</i>	2 max

Section B

Clarity of communication: [1]

The candidate's answers are clear enough to be understood without re-reading. The candidate has answered the question succinctly with little or no repetition or irrelevant material.

Question			Answers	Notes	Total
8.	a		a. lack of free oxygen (in the atmosphere) / reducing atmosphere; b. high/higher concentrations of carbon dioxide (in the atmosphere); c. high/higher concentrations of methane (in the atmosphere); d. high/higher temperatures (than current); e. high/higher ultraviolet light penetration (through atmosphere); f. lightning/electric discharge (in the atmosphere); g. hydrothermal vents / volcanic activity; h. no ozone layer;	<i>Allow 'much' or 'lots of' instead of high or higher.</i> <i>Accept warmer or hotter instead of higher temperatures.</i>	4 max

Question			Answers	Notes	Total
8.	b		a. reduce/prevent soil erosion; b. reduce/avoid tillage/ploughing/bare soil/avoid overgrazing; c. use direct drilling/cover crops/contour ploughing; d. reduce/avoid leaching/run-off of nutrients / promote recycling of nutrients; e. increase soil carbon/soil organic matter; f. crop rotation / avoid monocultures OR use legumes/nitrogen-fixing plants/crops; g. apply manure/compost/biochar OR reduce use of/stop using (synthetic/chemical) fertilizers/NPK; h. reduce/avoid use of pesticides/insecticides/herbicides/fungicides; i. reduce/avoid antibiotic use with livestock; j. encourage/protect pollinators/bees; k. reduce/avoid use of fossil fuels/emission of greenhouse gases/carbon footprint OR use renewable energy (resources/methods)/example given; l. reduce methane emissions from cattle/sheep/ruminants; m. conserve water/reduce use of water for irrigation/promote the water cycle;	<i>Mp d is for the idea that loss of nutrients from soils should be prevented and not for the harm that nutrients or manure can cause elsewhere after run-off.</i>	4 max

Question			Answers	Notes	Total
8.	c		a. <u>polysaccharide</u>; b. polymer of/made of <u>alpha-glucose/α-glucose</u> molecules; c. joined by/formed with condensation reactions/dehydration synthesis; d. C1 of one monomer joined to C4 of the next OR 1,4-<u>glycosidic</u> bonds; e. branching is due to 1,6 (-glycosidic) bonds; f. amylose is unbranched and amylopectin is branched OR only 1,4 bonds in amylose whereas 1,4 and 1,6 bonds in amylopectin; g. compact/much can be stored in a small space / high energy density; h. insoluble/forms granules so no osmotic effect/does not affect water potential/avoids water being attracted into a cell; i. too large/hydrophilic to pass through the (plasma) membrane (so not lost from a cell); j. composed of many glucoses so (one starch molecule) stores lots of energy; k. glucose (monomers) can be added or removed from a starch molecule; l. easily broken down / glucose easily removed / bonds easily broken / broken down by hydrolysis OR branched (chains) so easy to remove glucose (for respiration);		7 max

Question	Answers	Notes	Total
9. a	a. at least one nucleotide and at least one label each for phosphate, sugar/deoxyribose and base/named base; b. all phosphates/circles to represent phosphate linked to C5 on a deoxyribose and all bases linked to C1; c. two base pairs linked by two or three hydrogen bonds with at least one hydrogen bond labelled; d. deoxyribose/pentagons facing in opposite directions on the two strands and each strand with two nucleotides;	<i>For mp a, the base can be labelled as adenine, cytosine, guanine, thymine, A, C, G, T or base.</i> <i>Mp b can be awarded even if the components of the nucleotide are not labelled, if it is clear which is which, but a pentagon must be used to represent the sugar. If the two strands are not shown antiparallel, C5 will probably be upper-right rather than upper-left and mp b can still be awarded.</i> <i>For mp c the mark can be awarded even if the number of hydrogen bonds between A and T, and C and G is incorrect.</i>	4 max

Question			Answers	Notes	Total
9.	b		a. determine the entire/complete DNA/base sequence (of an organism) OR genome is the entire/complete DNA/base sequence; b. can be done very quickly/inexpensively; c. computers/FASTA/algorithms align/line up/pair up (DNA/base) sequences (from different organisms); d. (DNA/base) sequences can (then be) compared OR differences/similarities in (DNA/base) sequence (between organisms/species) can be identified; e. fewer differences (in base sequence) indicate that organisms/species are more closely related; f. analysis to identify species with a <u>common ancestor</u> OR estimate how long since species diverged from a <u>common ancestor</u> OR differences used as molecular clock (to find how long since divergence); g. cladograms/phylograms/evolutionary tree diagrams can be constructed;	<i>Mp d is for the idea that the differences between species/organisms in base sequence can be found, so there must be reference to sequence(s);</i> <i>Mp e is for stating the relationship between numbers of difference and relatedness.</i> <i>Mp f is for reference to a common ancestor/time since divergence.</i> <i>Allow converse of mp e or mp f.</i> <i>Mp e and/or mp f can be awarded for a clearly annotated cladogram.</i>	4 max

Question			Answers	Notes	Total
9.	c		a. genes code for proteins/enzymes; b. <u>phenotype</u> is the observable trait/traits of an organism; c. gene expression/genotype/DNA sequence/alleles determine/influence phenotype/traits; d. dominant (alleles) determine the trait/phenotype even if only one dominant allele is present / mask recessive alleles / only the dominant allele is expressed in a heterozygote / dominant (alleles) give the same phenotype in homozygotes or heterozygotes; e. recessive (alleles) only expressed in homozygotes/with two copies of the allele; f. (some alleles show) incomplete dominance/codominance; g. polygenic inheritance/many/several genes influencing the same trait; h. <u>phenotypic plasticity</u> is capacity to develop traits/change traits (without changes to genes/genome); i. different traits/phenotypes/phenotype in response to <u>environment/environmental factors</u>; j. (phenotypic plasticity due to) changing/varying which genes are switched on/off OR phenotypic plasticity possible because gene expression can be changed/altered/varies; k. epigenetics/epigenetic tags/methylation (of DNA/histones) affects phenotype/gene expression OR epigenetic (changes/tags) do not change the genome/DNA/base sequence OR phenotypic plasticity not due to change in the genome/DNA/base sequence; l. changes due to phenotypic plasticity are reversible; m. skin tanning/other suitable example of phenotypic plasticity;	<i>Do not accept 'genes' instead of gene expression/genotype/DNA sequence/alleles in mpc.</i> <i>For mp l and mp m, the answer must refer to phenotypic plasticity.</i>	7 max

Question			Answers	Notes	Total
10.	a		a. (signalling) molecule/ligand/autoinducer secreted/released/moves between cells; b. more (signalling molecules) released/secreted as population increases OR concentration (of signalling molecules) increases as population (density) increases; c. (signalling molecule) binds to receptor (inside cells); d. genes expressed if threshold is achieved/enough receptors are occupied/enough chemical accumulates; e. (signalling molecules) diffuse away with low population density/with low concentration of molecules; f. bioluminescence/production of luciferase/enzymes that produce light (in <i>Vibrio fischeri</i>)/other verified example;	<i>For mp a, the idea that the molecule is released must be included.</i> <i>Accept other verified example.</i> <i>Do not allow mp f if the answer refers to animals such as squid producing the light.</i>	4 max
10.	b		a. calcium (ions)/Ca²⁺ (ions) have a (signalling) role in synaptic transmission; b. arrival of action potential at/depolarization of pre-synaptic membrane causes uptake of Ca²⁺ (ions) OR arrival of action potential at neuromuscular junction/motor end plate causes release of Ca²⁺ (from sarcoplasmic reticulum); c. diffuse/move through channel proteins/ion channels; d. cause vesicles containing neurotransmitter to move to/fuse with (pre-synaptic) membrane/ exocytosis; e. causes release of neurotransmitter from (presynaptic) membrane/into synapse; f. calcium removed from the (presynaptic) neuron by active transport; g. has a role in muscle contraction; h. (binds to troponin) causing a change in shape of troponin/tropomyosin/sarcomere OR (binds to troponin) causing myosin binding sites to be exposed/so myosin can bind to actin;	<i>Do not award mp a for statements about action potentials/nerve impulses or their propagation.</i>	4 max

Question		Answers	Notes	Total
10.	c	a. phytohormone/auxin/other example of phytohormone produced/secreted/released (by plant cells) and transported (within plants); b. auxin promotes cell growth/elongation / promotes stem/shoot growth; c. auxin promotes hydrogen ion/H⁺ secretion into cell wall/apoplast; d. acidification of cell wall breaks/loosens (bonds between) cellulose molecules/chains; e. <u>efflux</u> carriers/<u>efflux</u> pumps move auxin/phytohormone OR carriers/pumps move auxin/phytohormone out of cell; f. auxin pumped out of one end of cell and diffuses into adjacent/next cell; g. concentration gradients (of auxin) cause bending/tropism/phototropism/growth responses; h. auxin produced in shoot (tips/apices) and cytokinin in root (tips/apices); i. auxin and cytokinin (interact to) regulate/balance root and shoot growth; j. cytokinin promotes cell division; k. auxin inhibits growth of axillary buds/lateral buds/side shoots OR cytokinin promotes growth of axillary buds/lateral buds/side shoots/growth of stem branches; l. gibberellin promotes germination/shoot/stem growth; m. abscisic acid/ABA inhibits shoot growth/germination;	<i>For mp i, accept a correct example of this interaction e.g. auxin promotes but cytokinin inhibits development/branching of roots Ignore references to ethylene and fruit ripening</i> <i>For mp g, do not accept 'more carriers on one side of the shoot'.</i> <i>In mp i, mp j, and mp k penalise once for 'cytokine' instead of cytokinin.</i>	7 max