

<p>1) (a)</p>	<ol style="list-style-type: none"> 1. non-identical twins are genetically different / eq ; 2. identical twins {are genetically the same / have the same genotype / same genes / same alleles ; 3. so difference (in height / mass / phenotype) is due to {environment / named environmental factor / eq} ; 4. greater difference in traits for non-identical twins / eq ; 5. idea of difference due to genetic effects e.g. genes have a bigger effect ; 	<p>max (3)</p>
<p>(b)(i)</p>	<ol style="list-style-type: none"> 1. (laboratory) rats of reduced genetic variability / eq ; 2. rats have {a similar / well known} metabolism ; 3. no harm to human / eq ; 4. idea of looking for potential {toxicity / adverse effect / eq} ; 5. ref to legal / ethical issues ; 	<p>max (2)</p>
<p>(b)(ii)</p>	<p>Phase 1:</p> <ol style="list-style-type: none"> 1. idea of drug tested on {a small number / healthy} individuals ; 2. ref to low concentration / monitor safety / eq ; <p>Phase 2:</p> <ol style="list-style-type: none"> 3. idea that drug tested on small number of patients ; 4. monitor effectiveness of treatment / eq ; 	<p>max (3)</p>

2)

(a) (i)	xylem (tissue/vessels) / eq ;	(1)
marker		
*(a)(ii) MC	<p>(QWC - Spelling of technical terms (<i>shown in italics</i>) must be correct and the answer must be organised in a logical sequence)</p> <p>Allow any pair for each of the following</p> <p>Water transport:</p> <ol style="list-style-type: none"> 1. hollow tubes / no living contents / end walls broken down / eq ; 2. idea of allow movement of water e.g. columns of water / vertical movement 3. ref to waterproof material / eq ; 4. idea that keeps water in the vessel e.g. less water lost 5. (pores / eq) ; 6. to allow sideways movement of water / eq ; <p>Support:</p> <ol style="list-style-type: none"> 7. ref. to {lignin / extra cellulose} ; 8. for strength ; 9. ref to {rings / spirals / eq} ; 10. for strength / flexibility ; 	max (4)
(b)	<ol style="list-style-type: none"> 1. ref to correct stimulus e.g. chemical ; 2. some genes {switched off / switched on / eq} ; 3. mRNA from {switched on / eq} genes ; 4. mRNA translated / eq ; 5. idea of {protein synthesised / different proteins produced} ; 6. which (permanently) modify cell (to become specialised) /description of a modification / eq ; 	maxi (3)
(c)	<ol style="list-style-type: none"> 1. ref to {sample / explants} from both (tissues) ; 2. ref to aseptic conditions / named example ; 3. grow cells into a callus / eq ; 4. ref to growth regulators / eq ; 5. ref to {cells / tissue} can differentiate / cells can become {whole plants / eq} ; 6. ref to details of procedure e.g. agar / leave for a suitable length of time / suitable controlled variable ; 	maxi (4)

3)		
(a)(i)	idea that a lower ant diversity indicates a {high copper / poor / eq } environment ;	(1)
(a)(ii)	<ol style="list-style-type: none"> 1. idea that amount of vegetation affects the number of ants ; 2. idea that the amount of vegetation is affected by copper level ; 3. vegetation to copper is direct link / eq ; 	max (2)
(b)(i)	<ol style="list-style-type: none"> 1. inhibits germination / eq ; 2. idea of slowing down {enzymes / biochemical reactions} ; 3. slows down rate of { decay / microbial activity / eq } ; 4. (therefore) prolongs seed survival / eq ; 5. idea that drying reduces freezing effect ; 	max (2)
(b)(ii)	<ol style="list-style-type: none"> 1. idea that checking {seed viability / germination success / eq } ; 2. allows new seeds to be produced / eq ; 3. idea that stored seeds may need replacing e.g. due to decay / death ; 	max (2)
(c)	<ol style="list-style-type: none"> 1. maintaining the endangered species e.g. protection from poachers/ predation ; 2. (captive) breeding programmes /eq ; 3. reintroduction into the wild / eq ; 4. scientific research / example given / eq ; 5. education / example given / eq ; 	max (2)

4)

(a) (i)	<ol style="list-style-type: none"> 1. both increase / eq ; 2. qualification of increase e.g. both increase most rapidly between 0 and 100 mg dm⁻³ / converse / gradient decreases with increase in calcium / eq ; 3. dry mass {equal / 10.6 g} in both at 150 mg dm⁻³ ; 4. increase in mass very similar in both after 150 mg dm⁻³ / increase higher in pods after 150 mg dm⁻³ / eq ; 5. change in pod mass greater (than shoot) / eq ; 6. correct comparative manipulation of the data e.g. shoot increased by {8.1 g to 8.3 g} whilst pod has increased by 11 g ; 	maxi (3)
(a)(ii)	{more / larger} cells / more {cell walls / calcium pectate / middle lamella} / helps uptake of other ions / eq ;	(1)
(b)(i)	<ol style="list-style-type: none"> 1. positive (relationship / correlation) / as calcium ion concentration increases so does total nitrogen uptake by pods [not other way round] / eq ; 2. {non-regular /greatest increase in total nitrogen uptake occurs between 0 and 75 mg dm⁻³ of calcium / eq ; 	(2)

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(b)(ii)	nitrate / ammonium / ammonia ;	(1)
(b)(iii) QWC	<p>(QWC - Spelling of technical terms (<i>shown in italics</i>) must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. {greater / eq} (protein content) ; 2. greater nitrogen uptake / eq ; 3. nitrogen is {part / used in synthesis} of {amino acids / protein} / eq ; 4. (amino acids) used to synthesise protein / eq ; 	maxi (3)
5) (a)	<ol style="list-style-type: none"> 1. ref. to agar / eq ; 2. idea that bacteria need to be distributed ; 3. idea of {single / named} bacterial strain / eq ; 4. appropriate microbiological technique employed e.g. aseptic / sterile plates ; 	maxi (2)

(b)(i)	to allow a comparison with the other discs / to show that any difference between the discs is due to the treatment given to those discs / eq ;	(1)
(b)(ii)	1. (tea tree oil) { diffused / eq } (out of disc) ; 2. killed the bacteria / inhibits bacterial growth / eq ;	(2)
(b)(iii)	1. record several measurements / eq ; 2. divide by number of measurements (to obtain mean) ;	(2)
(c)	1. 3 (or more) dilutions of tea tree oil / eq ; 2. from 50% downwards / eq ; 3. looking for minimum strength when diameter is same as original strength / eq ; 4. one other named variable kept constant ;	maxi (3)
(d)	1. 37°C is (human) body temperature ; 2. (this temp) allows growth of {pathogenic / eq} bacteria / encourages more rapid {growth / reproduction/ eq} ;	(2)

6)

(a)(i)	C ;	(1)
(a)(ii)	B ;	(1)
(a)(iii)	far right-hand box ;	(1)
(a)(iv)	Bacteria / Eubacteria / Archaeobacteria / Archaea ;	(1)

(b)(i) QWC	<p>(QWC - Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. cellulose ; 2. as microfibrils ; 3. (cellulose molecules) held together by hydrogen bonds / eq 4. detail of microfibril (e.g. {bundle /correct stated number of}) cellulose molecules) ;; 5. correct reference to arrangement of microfibrils (in primary cell wall) ; 6. reference to {matrix / hemicelluloses / pectins / eq} ; 7. reference to primary and secondary cell walls ; 8. detail of different laying down arrangement (in secondary cell wall) /reference to lignin ; 	max (4)
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(b)(ii)	<table border="1" style="width: 100%;"> <tr> <th style="width: 50%;">Feature described</th> <th style="width: 50%;">Name of feature</th> </tr> </table>	Feature described	Name of feature		(2)
	Feature described	Name of feature			
	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">site where there was no cell wall and the cytoplasm linked the two adjacent cells</td> <td style="width: 50%;">plasmodesmata / plasmodesma ;</td> </tr> </table>	site where there was no cell wall and the cytoplasm linked the two adjacent cells	plasmodesmata / plasmodesma ;		
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<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">dark line that is the boundary between one cell and the next cell</td> <td style="width: 50%;">middle lamella ;</td> </tr> </table>	dark line that is the boundary between one cell and the next cell	middle lamella ;			
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7) (a)	<p>Niche:</p> <ol style="list-style-type: none"> 1. the {role / function / eq} (of a species / organism) ; 2. {within the community / ecosystem /habitat / environment / eq} ; <p>Species richness:</p> <ol style="list-style-type: none"> 3. number of (different) species ; 4. in a {habitat / eq} / at any one time ; 	max (3)
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(b)(i)QWC	<p>(QWC - Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. (cheetah has) {lowest genetic diversity / least genetic variation } (of the listed cats) ; 2. correct reference to lack of adaptation / example / no selective advantage (when environment changes) ; 3. (therefore) less likely to survive / eq ; 4. (therefore) more at risk of {extinction / eq} ; 	<p>max (3)</p>
(b)(ii)	<ol style="list-style-type: none"> 1. {greater / eq} genetic diversity (amongst the litter) / eq ; 2. greater chance that will {survive / eq} ; 3. increased chance of fertilisation / pregnancy / eq ; 4. increase in population size / eq ; 	<p>max (2)</p>
(c)	<ol style="list-style-type: none"> 1. increases genetic diversity /eq ; 2. (because it) allows {outbreeding / mating / eq} with (genetically) different individuals / eq ; 3. stop/reduces {inbreeding / mating with parents / siblings} ; 4. (which) reduces genetic diversity / eq ; 	<p>max (2)</p>
(d)	cheetahs that are exclusive to one continent ;	(1)