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|----|---|-----|
| 1) | <ol style="list-style-type: none"> 1. glucose ; 2. cellulose ; 3. hydrogen / H ; 4. pits ; 5. plasmodesmata/ plasmodesma ; | (5) |
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|-----------|--|-----|
| 2) | | |
| (a) (i) | <p>Idea of removing genetic variation e.g. same genotype OR fibres {grown in same conditions / same composition / same age} OR to give {comparison/ results} that are valid ;</p> | (1) |
| (a) (ii) | <ol style="list-style-type: none"> 1. (fibre) length / eq ; 2. (fibre) diameter / width/ thickness / circumference / SA of cross section / eq ; 3. (fibre) mass / weight ; 4. age (fibre) / collected at same time / eq ; 5. idea that came from same region of the plant / eq ; | (2) |
| (a) (iii) | the idea that temperature is a variable e.g. results reliable, same effect on structure of fibre; | (1) |
| (b) | idea that protect eyes from fibre when it breaks ; NOT just to protect eyes – must state what they are protected from. | (1) |
| (c) (i) | <ol style="list-style-type: none"> 1. idea that (mean) force needed to break wet fibres was greater (than dry fibres) / eq ; 2. correct manipulation of the mean data for example 1100 au difference / 40% (39.8%) more force needed to break wet fibres compared to dry fibres/ 28.5% less to break dry fibres compared with wet fibres / 1.4 times more force required to break wet fibres ; | (2) |

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| [c] (ii) | <ol style="list-style-type: none"> 1. wet (fibres) / eq ; 2. wet fibre data has a wide range / eq ; 3. correct manipulation of data e.g. 1100 (au) for wet AND 300 (au) for dry OR wet range is 800 (au) more than dry ; 4. wet {sample 5 / 3100} may be {anomalous / outlier} ; | (3) |
| [d](i) | Idea of lower values for 3 AND 4 compared to 1 AND 2 ; | (1) |
| [d](ii) | idea that sample 1 (without a knot) was the same as sample 5 ; | (1) |

3)

| (a) (i) | B ; | (1) | | | | | | | | |
|-------------------------------------|--|-----------|--------------------------|-----------------------------|-----|-------------------|-----|-------------------------------------|-----|-----|
| (a) (ii) | A ; | (1) | | | | | | | | |
| (b) | <ol style="list-style-type: none"> 1. C ; 2. largest group / <u>most</u> people involved / eq ; | (2) | | | | | | | | |
| (c) | <ol style="list-style-type: none"> 1. mean (improvement of) drug P greater than drug Q / drug P has the highest mean (improvement) / eq ; 2. credit correct manipulation of the data e.g. 3% greater improvement with drug P compared to drug Q ; 3. narrower range of data (for drug P); 4. idea that this range suggests better {reliability / consistency} for drug P ; | (4) | | | | | | | | |
| (d) | <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Statement</th> <th style="text-align: center;">Tick (✓) or cross (x)</th> </tr> </thead> <tbody> <tr> <td>Correct dosage investigated</td> <td style="text-align: center;">✓ ;</td> </tr> <tr> <td>Tested on animals</td> <td style="text-align: center;">x ;</td> </tr> <tr> <td>A double blind trial was undertaken</td> <td style="text-align: center;">x ;</td> </tr> </tbody> </table> | Statement | Tick (✓) or cross (x) | Correct dosage investigated | ✓ ; | Tested on animals | x ; | A double blind trial was undertaken | x ; | (3) |
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| 4) (a) | <p>1. idea of a {group / number / collection / eq} of cells ;</p> <p>2. idea of working together to carry out the {same / specific / one / eq} function ;</p> | (2) |
| (b) (i) | C ; | (1) |
| (b) (ii) | B ; | (1) |
| (c) (i) | <p>1. idea of preventing {microbes / bacteria / fungi} FROM {contaminating / escaping / entering / eq} ;</p> <p>2. reference to {harmful / pathogenic / eq} {micro-organisms / eq} ;</p> | (2) |
| c) (ii) | idea of allowing light in (for photosynthesis) / reducing water loss / prevent entry of organisms (that would affect plant growth) ; | (1) |
| (c) (iii) | <p>1. (tissue R) is xylem ;</p> <p>2. (tissue R) is dead / eq ;</p> <p>3. no genetic material / DNA /genes / no nucleus present ;</p> <p>4. (tissue R) is not totipotent / eq ;</p> <p>5. it is already {differentiated / specialised} ;</p> <p>6. unable to {divide / undergo mitosis} / eq ;</p> | (3) |
| 5) (a) (i) | (7mm / largest seed size) because has greatest germination success ; | (1) |

| | | |
|-------------------------|---|-------------------|
| <p>a) (ii)</p> | <ol style="list-style-type: none"> 1. correct values from graph, i.e. 4 (au) and 20 (au) ; 2. correct subtraction e.g. $20 - 4 = 16$; 3. $(\text{change} \div \text{original}) \times 100$ to give correct answer, e.g. $(16 / 4) \times 100 = 400\%$; <p>For correct answer of 400% - 3 marks</p> | <p>(3)</p> |
| <p>(a) (iii)</p> | <ol style="list-style-type: none"> 1. idea of maintaining or increasing {genetic diversity / size of gene pool / genetic variation} ; 2. idea of more chance of having beneficial alleles / eq ; 3. increases chance of future survival {if environment changes / due to higher adaptability } / eq ; 4. less chance of all being susceptible to a disease / eq ; | <p>(3)</p> |
| <p>(b)</p> | <ol style="list-style-type: none"> 1. details of assessment of seed viability e.g. only select seeds with a living embryo, use of X ray (to detect embryo presence) / eq ; 2. idea of {cleaning seeds / surface sterilisation / eq} ; 3. idea of drying (of the seed) ; 4. idea of storing at low temperatures ; 5. idea of regularly testing viability (during storage of seed) ; 6. idea of what to do if viability decreases, e.g. if less than 75% germinate collect fresh seed for storage ; | <p>(4)</p> |

6)

| <p>(a)</p> | <table border="1"> <thead> <tr> <th data-bbox="363 1585 770 1671">Description of stage</th> <th data-bbox="770 1585 916 1671">Tick / cross</th> </tr> </thead> <tbody> <tr> <td data-bbox="363 1671 770 1756">He tried to isolate digitalis from foxglove plants.</td> <td data-bbox="770 1671 916 1756">✓ ;</td> </tr> <tr> <td data-bbox="363 1756 770 1841">He tested digitalis on healthy humans.</td> <td data-bbox="770 1756 916 1841">× ;</td> </tr> <tr> <td data-bbox="363 1841 770 1926">He used a placebo to make sure digitalis worked.</td> <td data-bbox="770 1841 916 1926">× ;</td> </tr> </tbody> </table> | Description of stage | Tick / cross | He tried to isolate digitalis from foxglove plants. | ✓ ; | He tested digitalis on healthy humans. | × ; | He used a placebo to make sure digitalis worked. | × ; | <p>No marks for blank spaces. No mark for hybrid x/✓</p> <p>(3)</p> |
|---|---|----------------------|--------------|---|-----|--|-----|--|-----|--|
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| (b)(i) | <ol style="list-style-type: none"> 1. inactive substance / no drug / eq ; 2. idea that it is used as a control e.g. comparison with the actual drug ; 3. idea of psychological effect of taking either a drug or a placebo ; | <ol style="list-style-type: none"> 1. ACCEPT dummy pill, sugar pill, fake pill 3. e.g. patient believes they will improve and ALLOW reference to placebo effect | (2) |
| (b)(ii) | <ol style="list-style-type: none"> 1. idea of one set of patients being given the (new) drug and one set a placebo ; 2. neither patient nor { doctor / scientist / eq } knows if the treatment contains the (new) drug or not ; 3. removal of bias from results / eq ; | <ol style="list-style-type: none"> 1. ACCEPT pre-existing / old drug instead of placebo | (2) |

7)

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| | | | |
|----------------|---|--|------------|
| (a) (i) | <ol style="list-style-type: none"> 1. increasing mass increased the distance up to 150 (g) ; 2. 150 (g) to 200 (g) / after 150 (g) the distance did not change ; 3. relationship is linear to 100(g) and non-linear above 100 (g) ; 4. greatest change in 0 to 100 (g) range ; | <p>IGNORE UNITS</p> <ol style="list-style-type: none"> 1. ACCEPT weights instead of masses | (2) |
| a) (ii) | <ol style="list-style-type: none"> 1. add smaller masses / add 10 g or 5 g masses ; 2. from 200 g / between 200 and 250 g ; | <ol style="list-style-type: none"> 1. ACCEPT masses of any value less than 50g, e.g. 20g. Must state units. | (2) |
| (b) | <ol style="list-style-type: none"> 1. two different fibre variables taken into account e.g. length, width, age, mass, hydration level, part of plant extracted from ; 2. environmental variable controlled, e.g. temperature, humidity, ; 3. named procedural variable controlled, e.g. size of masses used, retting method used to extract fibres ; 4. idea of adding masses until fibre breaks /measure the mass [that breaks the fibre / that the fibre can hold before breaking / eq } ; 5. repeat and find the { mean / average } ; 6. reference to action taken in case of { anomalous result / outlier } ; 7. reference to safety procedure ; | <ol style="list-style-type: none"> 2. IGNORE light intensity 3. ALLOW descriptions of methodology, e.g. the way in which the masses are added to the fibre | (5) |

8)
(a)

| | | |
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| <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. idea that 18 individuals is a small population / small gene pool / low genetic diversity / may have been closely related / eq ; 2. captive breeding will increase population ; 3. studbooks /records kept of breeding programme / eq ; 4. (zoos) select mates ; 5. inter-zoo exchange of animals for breeding / eq ; 6. idea of the need to prevent inbreeding ; 7. idea of avoiding genetic drift ; 8. use of { IVF / AI / use of surrogates } ; 9. process for measuring genetic diversity described, e.g. DNA profiling / eq ; | <p>QWC emphasis is clarity of expression</p> <p>ACCEPT reference to 'species' instead of ferret which may arise due to the wording of question.</p> <p>4. Must refer to human intervention – not just the ferrets choosing their mates</p> <p>6. NOT 'interbreeding' in place of 'inbreeding'. ACCEPT 'encourage outbreeding' e.g. ferrets not mated with closely related ferrets</p> | <p>(5)</p> |
|---|---|------------|

| (b)(i) | <ol style="list-style-type: none"> (captive) population not large enough / number of births is low / eq ; individuals not mature enough / eq ; zoos preparing ferrets for release / eq ; idea of maintaining a population in zoos ; | | (2) | | | | | | | | | | | | |
|-----------------|--|---|------|------------|---|-----------------|-----------------|------------------|------------|------------------|-----------------------|-----------|------------------|------------------|-----|
| (b)(ii) | <ol style="list-style-type: none"> number of <u>births</u> is rising / eq ; increase in population ; idea that more are born than are released e.g. at least 200 births each year ; identification of years when number of <u>births</u> fell, i.e. 1994 or 2000 ; correct manipulation of data ; | <p>3. Or some understanding that the increases outweigh the decreases, e.g. between 1991-1999 it increased by 230, but only fell by 170 to 2000 from 1999</p> <p>5. Some examples are shown below</p> <table border="1" data-bbox="837 840 1173 1075"> <thead> <tr> <th>Year</th> <th>Difference</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>1991-2000 - mp3</td> <td>(220-280) 60</td> <td>(+) 27 / 27.3</td> </tr> <tr> <td>1991- 1999</td> <td>(220-450) 230</td> <td>(+) 105 / 104.5</td> </tr> <tr> <td>1999-2000</td> <td>(450-280) 170</td> <td>(-) 38 / 37.8</td> </tr> </tbody> </table> | Year | Difference | % | 1991-2000 - mp3 | (220-280) 60 | (+) 27 / 27.3 | 1991- 1999 | (220-450) 230 | (+) 105 / 104.5 | 1999-2000 | (450-280) 170 | (-) 38 / 37.8 | (2) |
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| (c) | <ol style="list-style-type: none"> idea of habitat as a factor, e.g. loss of habitat / wider range of habitats / eq ; availability of { prey / food / prairie dogs / eq }; competition with other ferrets (for resources) ; competition with other species (for resources) / eq ; effect of eating { poisoned prairie dogs / poison put out for prairie dogs } / eq ; presence of { predators / hunters } / eq ; preparation for living in the wild improves chance of survival / if reliant on humans would not survive ; idea of too few to be a viable breeding population ; idea of presence of disease ; | <p>Factors provided may either improve or reduce survival chances</p> <ol style="list-style-type: none"> climate change can be accepted here as a factor affecting availability of suitable habitat ACCEPT description of human activity that could lead to loss or gain of habitat Intraspecific competition Interspecific competition e.g. kept in semi-wild conditions initially and hunting behaviour encouraged | (3) | | | | | | | | | | | | |