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## Mark Scheme (Results)

Summer 2022

Pearson Edexcel International GCSE  
In Science Double Award (4SD0) Paper 1B

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## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
<b>1(a)(i)</b>	<p>The only correct answer is</p> <p><b>A</b> is the pancreas</p> <p><b>B</b> is not the answer as B is not the pancreas</p> <p><b>C</b> is not the answer as C is not the pancreas</p> <p><b>D</b> is not the answer as D is not the pancreas</p>	<b>1</b>

Question Number	Answer	Mark
<b>1(a)(ii)</b>	<p>The only correct answer is</p> <p><b>D</b> structure produces progesterone</p> <p><b>A</b> is not correct as it does not produce progesterone</p> <p><b>B</b> is not correct as it does not produce progesterone</p> <p><b>C</b> is not correct as it does not produce progesterone</p>	<b>1</b>

Question Number	Answer	additional guidance	Mark
<b>1(b)(i)</b>	<p>Calculation method <b>not marking points</b></p> <p>convert hormonal speed to m / min</p> <p>= 4.2 m per min</p> <p>convert hormonal speed to m / sec</p> <p>= <math>4.2 \div 60</math> m per sec</p> <p>= 0.07 m per sec</p> <p>division</p> <p><math>55 \div 0.07</math></p> <p>= <b>786 :1</b> scores 3</p> <p>allow 2 sig figs so allow 790:1 scores 3</p>	<p>Calculation method</p> <p>conversion of nerve speed to cm per min</p> <p>= 5500 cm per sec</p> <p>= <math>5500 \times 60</math> cm per min</p> <p>= 330 000 cm per min</p> <p>division</p> <p><math>330\ 000 \div 420</math></p> <p>= 786 : 1 scores 3</p> <p>Allow 785.7 to 1 for full marks and all versions of 785.7142857142857 score 3</p> <p>allow <b>1 mark for</b> <math>\div 60</math> or <math>\times 60</math> <b>or evidence of multiplying by or dividing by 60</b></p> <p>allow <b>1 mark for</b> <math>\div 0.07</math> or <math>:0.07</math> or <math>\div 420</math> or <math>:420</math></p> <p><b>allow 2 marks</b> for 1 to 786 or just number 786 etc</p> <p>any rounding errors such as 785:1 scores 2</p>	<b>3</b>

Question Number	Answer	Additional guidance	Mark
<b>1 (b) (ii)</b>	<p>A description that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>• uses neurones / nerve <u>cells</u> (1)</li> <li>• <u>electrical</u> (1)</li> <li>• goes to target cells only / specific (locus) / eq (1)</li> <li>• (response) is usually short (term) (1)</li> </ul>	<p>allow converse for hormones  uses plasma/ blood  ignore impulse</p> <p>chemical</p> <p>all around body/ different organs</p> <p>(response) longer (lasting)</p> <p>ignore ref to speed</p>	<b>3</b>

total 8 marks

Question Number	Answer	Mark
<b>2(a)</b>	<ul style="list-style-type: none"> <li>• hyphae (1)</li> <li>• chitin (1)</li> <li>• enzymes(1)</li> <li>• saprotrophic / saprophytic (1)</li> </ul>	<b>4</b>

Question Number	Answer	Mark
<b>2(b)(i)</b>	<ul style="list-style-type: none"> <li>• carbon dioxide / CO<sub>2</sub> (1)</li> </ul>	<b>1</b>

Question Number	Answer	Mark
<b>2(b)(ii)</b>	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• increasing (kinetic) energy / molecules move more (1)</li> <li>• more collisions/ more enzyme substrate complexes formed / eq (1)</li> <li>• above 37 / 40°C /optimum / eventually / at higher temperature <u>enzyme</u> denatures / change in active site / substrate and enzyme can no longer bind /fit /eq (1)</li> </ul>	<b>3</b>

Question Number	Answer	additional guidance	Mark
<b>2(b)(iii)</b>	<p>A description that makes reference to two of the following</p> <ul style="list-style-type: none"> <li>• use (collect gas in) measuring cylinder / (gas) syringe / eq (1)</li> <li>• measure <u>volume / cm<sup>3</sup></u> in <u>time / or time</u> to produce <u>volume / eq</u> (1)</li> </ul>	<p>no credit for counting bubbles or time for limewater as stem states in this experiment.</p> <p>allow ref to capillary tube and scale</p> <p>ignore gas cylinder</p> <p>must refer to volume <b>and</b> time for mp 2</p>	<b>2</b>

total 10 marks

Question Number	Answer	Mark
<b>3(a)(i)</b>	<ul style="list-style-type: none"> <li>• the middle value / eq (1)</li> </ul>	<b>1</b>

Question Number	Answer	additional guidance	Mark
<b>3(a)(ii)</b>	<ul style="list-style-type: none"> <li>• median used as each age has wide / high range /not (influenced by) affected by / any reference to / reduces effect of extreme values / data is skewed / less affected by anomalies / eq</li> </ul>	allow converse for mean	<b>1</b>



Question Number	Answer	additional guidance	Mark
<b>3(a)(iii)</b>	<p>A description that makes reference to two of the following</p> <ul style="list-style-type: none"> <li>• increases (steeply) up to <b>20-25</b> years (1)</li> <li>• levels off / peaks <b>20-25</b> years (1)</li> <li>• decreases (steadily at constant rate) from <b>20-25</b>_years (1)</li> </ul>	<p>to score two marks must have <b>one</b> correct numerical ref</p> <p>allow one mark for increases then decreases</p>	<b>2</b>

Question Number	Answer	Mark
<b>3(a)(iv)</b>	<p>An explanation that makes reference to two of the following</p> <ul style="list-style-type: none"> <li>• (increases) (up to 20 years) as body / size / mass / chest cavity / lungs / muscle increases / grows / develops / eq (1)</li> <li>• no / little change (from 20) no further growth / stop growing / eq (1)</li> <li>• (decreases) (from 25 years) as <u>diaphragm</u> / <u>intercostal</u> muscle weaker / lungs less elastic / less recoil / eq (1)</li> </ul>	<b>2</b>

Question Number	Answer	additional guidance	Mark
<b>3(a)(v)</b>	<p>An answer that makes reference to two of the following</p> <ul style="list-style-type: none"> <li>• smoking (1)</li> <li>• lung disease / infection / condition / asthma / bronchitis / emphysema / eq (1)</li> <li>• fitness / how active you are / eq (1)</li> <li>• body size/ height / mass / genetics / eq (1)</li> <li>• sex /eq (1)</li> <li>• altitude at which you live / eq (1)</li> <li>• pregnancy (1)</li> <li>• pollution / eq(1)</li> </ul>	ignore illness / health	<b>2</b>

Question Number	Answer	additional guidance	Mark
<b>3(b)</b>	<p>A description that makes reference to three of the following</p> <ul style="list-style-type: none"> <li>• count number of breaths per minute / number of breaths in stated time (at rest)/ eq (1)</li> <li>• breathing rate count per minute / number of breaths in stated time <u>after / during exercise</u>/eq (1)</li> <li>• repeat / using more participants /use group/ eq (1)</li> <li>• control age / sex / fitness of subjects / amount / period of exercise / eq (1)</li> </ul>	<p>allow use spirometer at rest for mp 1</p> <p>use spirometer after exercise for mp 2</p> <p>allow running increasing distances or durations of exercise for mp 1 and mp 2</p> <p>if measure heart rate can score mp 3 and 4 only</p>	<b>3</b>

total 11 marks

Question Number	Answer	additional guidance	Mark
<b>4(a)(i)</b>	<ul style="list-style-type: none"> <li>• correct order of names (1)</li> <li>• correct shape (1)</li> </ul>	(bottom) starting with producer / primary consumer/ secondary consumer / tertiary consumer ignoring shape  pyramid shape ignoring order allow triangle pyramid	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>4(a)(ii)</b>	an answer that makes reference to three of the following <ul style="list-style-type: none"> <li>• quadrat / use grid /eq (1)</li> <li>• random sample (1)</li> <li>• count (all) plants / producers / eq (1)</li> <li>• repeat / divide total sum of plants by area (1)</li> </ul>	ignore organisms allow quadrats as ref to repeat mp 4	<b>3</b>

Question Number	Answer	Additional guidance	Mark
<b>4(b)(i)</b>	calculation  $2.40 \div 10.60 \times 100$  $= 22.6\% / 23\% (1)$	allow 22.64 /22.642/22.6415 22.64151 etc	<b>1</b>

Question Number	Answer	additional guidance	Mark
<b>4 (b) (ii)</b>	<p>An answer that makes reference to four of the following:</p> <ul style="list-style-type: none"> <li>• fewer organisms at top of pyramid / eq (1)</li> <li>• less biomass/ dry mass at top of pyramid/ eq (1)</li> <li>• energy / biomass lost (at each transfer) / less energy / biomass transferred / not all energy/ biomass transferred/ eq (1)</li> <li>• most energy lost from producer to primary consumer / less energy/ less biomass transferred from producer to primary consumer /eq (1)</li> <li>• allow any <b>two</b> causes of energy loss (2)</li> <li>• movement / heat loss / respiration / metabolism</li> <li>• not all material digested / cellulose not digested / energy lost in faeces / energy present in faeces</li> <li>• not all organism eaten /eq</li> <li>• some energy excreted / in urine / eq</li> <li>• some organisms die / decomposed / eq</li> </ul>	<p>allow converse</p> <p><b>allow two from</b></p>	<b>4</b>

total 10 marks

Question Number	Answer	Mark
<b>5 (a)(i)</b>	<p>A description that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>• W or stigma / feathery / large surface area / W stigma outside flower / exposed ( to catch pollen )/eq (1)</li> <li>• X or anther outside flower/ exposed (to disperse pollen) / eq (1)</li> <li>• Y or filament long / hinged / not rigid / can move (to disperse pollen)/eq (1)</li> </ul>	<b>3</b>

Question Number	Answer	additional guidance	Mark
<b>5 (a)(ii)</b>	<p>An answer that refers to two of the following</p> <ul style="list-style-type: none"> <li>• smaller / dull / green flowers /petals / no petals / eq (1)</li> <li>• no nectar/ nectary (1)</li> <li>• no scent / eq (1)</li> <li>• smaller / lighter / smooth pollen grains / more pollen produced (1)</li> </ul>	<p>allow converse for insect pollinated</p> <p>larger/ coloured /eq</p> <p>nectar/nectary</p> <p>scent</p> <p>larger / sticky / have hooks pollen grains/ less pollen produced</p>	<b>2</b>

Question Number	Answer	additional guidance	Mark
<b>5 (b)</b>	<p>An answer that makes reference to five the following:</p> <ul style="list-style-type: none"> <li>• link between pollen number and symptoms /eq (1)</li> <li>• Person A allergic to tree pollen (only) / eq (1)</li> <li>• Person B allergic to (mainly) grass pollen / eq (1)</li> <li>• Person B <u>some / mild</u> allergy to tree <u>and</u> weed / eq (1)</li> <li>• Person C allergic to all pollen / tree <u>and</u> grass <u>and</u> weed/eq (1)</li> <li>• Person D no pollen allergy / eq (1)</li> <li>• Person E allergic to (mainly) grass <u>and</u> weed / eq (1)</li> <li>• Person E <u>some / mild</u> allergy to tree / eq (1)</li> <li>• no species level data / eq (1)</li> <li>• only one year / eq (1)</li> </ul>	allow hay fever/ allergic response/ for allergy	<b>5</b>

Question Number	Answer	additional guidance	Mark
<b>5(c)</b>	<p>An explanation that makes reference to two of the following</p> <ul style="list-style-type: none"> <li>• response to antigens / pathogen / allergen / bacteria / virus /eq (1)</li> <li>• by white blood cells/ phagocytes / lymphocytes /eq (1)</li> <li>• antibodies produced / phagocytosis / engulf / eq (1)</li> </ul>	<p>if put phagocytes produce antibodies scores mp 2 only or lymphocytes engulf scores mp 2 only</p>	<b>2</b>

total 12 marks

Question Number	Answer	Mark
<b>6(a)(i)</b>	<p>The only correct answer is</p> <p><b>B</b> M is the cell wall.</p> <p>A is not the answer as M is not the cell membrane</p> <p>C is not the answer as M is not the nucleus</p> <p>D is not the answer as M is not the vacuole</p>	<b>1</b>

Question Number	Answer	Mark
<b>6(a)(ii)</b>	<p>The only correct answer is</p> <p><b>C</b> N is the cytoplasm.</p> <p>A is not the answer as N is not the cell membrane</p> <p>B is not the answer as N is not the cell wall</p> <p>D is not the answer as N is not the vacuole</p>	<b>1</b>

Question Number	Answer	Mark
<b>6(b)(i)</b>	<ul style="list-style-type: none"> <li>sodium chloride (solution) / salt solution / bathing solution / eq (1)</li> </ul>	<b>1</b>



Question Number	Answer	additional guidance	Mark
<b>6(b)(ii)</b>	<p>An explanation that makes reference to four of the following</p> <p>in distilled water</p> <ul style="list-style-type: none"> <li>• water enters cell / eq(1)</li> <li>• by osmosis (1)</li> <li>• from dilute solution to more concentrated solution / from high(er) water potential to low(er) water potential / water / outside has a higher water potential / eq (1)</li> <li>• cytoplasm pushed against cell membrane/ cell wall / eq (1)</li> <li>• cell is turgid / (1)</li> </ul>	<p>allow converse for cell in salt solution</p> <p>water exits</p> <p>allow as salt soln / outside has lower water potential</p> <p>allow <b>high conc of water to low conc of water</b></p> <p>.cytoplasm /cell membrane shrinks away</p> <p>. cell plasmolysed / flaccid</p>	<b>4</b>

Question Number	Answer	additional guidance	Mark
<b>6(c)</b>	<p>A description that makes reference to four of the following</p> <ul style="list-style-type: none"> <li>• (immerse) onion epidermis /rhubarb epidermis / named suitable plant tissues / leaf epidermis / eq (1)</li> <li>• same volume of solutions / stated volume of solutions /eq (1)</li> <li>• <u>at least two</u> different concentrations of salt solution / eq (1)</li> <li>• leave cells for stated time / same time / eq (1)</li> <li>• (observe / draw / photograph under) <u>microscope</u> / eq (1)</li> </ul>	<p>allow 'layer of onion' 'onion skin cells' 'rhubarb stem' <i>Cladophora</i> / / toadflax /eq</p> <p>not just leaf</p> <p>not just water and salt solution</p> <p>if describe potato discs expt can score mp 2 3 4 so 3 max</p>	<b>4</b>

total 11 marks

Question Number	Answer	Mark
<b>7(a)(i)</b>	<p>The only correct answer is</p> <p>A vessel U brings deoxygenated blood to heart</p> <p>B is not correct as V does not bring deoxygenated blood C is not correct as W does not bring deoxygenated blood D is not correct as X does not bring deoxygenated blood</p>	<b>1</b>

Question Number	Answer	Mark
<b>7(a)(ii)</b>	<p>The only correct answer is</p> <p>D chamber Z pumps oxygenated blood away from heart</p> <p>A chamber S does not pump oxygenated blood away B chamber T does not pump oxygenated blood away C chamber Y does not pump oxygenated blood away</p>	<b>1</b>

Question Number	Answer	additional guidance	Mark
<b>7 (a)(iii)</b>	<p>An explanation that makes reference to three the following:</p> <p>S</p> <ul style="list-style-type: none"> <li>• thinner /eq (1)</li> <li>• less muscle /eq (1)</li> </ul> <p>(muscle thinner scores MP 1 and MP 2)</p> <ul style="list-style-type: none"> <li>• (generates) low / less pressure force /eq (1)</li> <li>• pumps blood to lungs / eq (1)</li> </ul>	<p>converse for Z</p> <p>chamber Z / left ventricle thicker /eq</p> <p>more muscle /eq</p> <p>( muscle thicker scores MP 1 and MP 2)</p> <p>(generates) high(er) pressure / force /eq</p> <p>ignore withstands high pressure</p> <p>pumps blood all around the body /eq</p>	<b>3</b>

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Question Number	Answer	additional guidance	Mark
<b>7 (b)</b>	<p>An explanation that includes 3 of</p> <ul style="list-style-type: none"> <li>• carbohydrate for energy / energy store / respiration /eq (1)</li> <li>• protein for growth / repair / enzymes / eq (1)</li> <li>• fat / lipid for energy / energy store / insulation / respiration/ eq (1)</li> <li>• one named mineral and function (1)</li> <li>• one named vitamin and function (1)</li> <li>• fibre for peristalsis / move food through gut / eq (1)</li> <li>• water for solvent / medium for chemical reactions /constituent of cells / eq</li> </ul>	<p>eg Vitamin C develops connective tissue / prevents scurvy</p>	<b>3</b>

Question Number	Answer	additional guidance	Mark
<b>7 (c)</b>	<p>An explanation that includes 5 of</p> <ul style="list-style-type: none"> <li>• large study / reliable / eq (1)</li> <li>• long term study / eq (1)</li> <li>• only in one place / country / population / eq (1)</li> <li>• (across all ages) increasing mass increases CHD/ eq (1)</li> <li>• heart attacks / CHD more common in older groups / eq (1)</li> <li>• if obese under 40 3 times as likely to have heart attack / CHD / greatest effect under 40 / eq (1)</li> <li>• up to 60 most likely to have heart attack if obese / eq (1)</li> <li>• in over 60 group more likely to have heart attack / CHD if normal or overweight / eq (1)</li> <li>• over 60 obese less likely to have heart attack / CHD/ eq (1)</li> <li>• other factors smoking / diet / exercise / stress / blood pressure / eq (1)</li> <li>• other factors genetics / sex / family / eq (1)</li> </ul>	allow converse	<b>5</b>

total 13 marks

Question Number	Answer	additional guidance	Mark
<b>8 (a)(i)</b>	<ul style="list-style-type: none"> <li>• agouti (1)</li> <li>• all offspring are agouti / no offspring are black / as allele always expressed / shown / visible in all phenotype / expressed in heterozygous / black allele not expressed / /eq (1)</li> </ul>	<p>allow</p> <p>ignore passed on as black allele also passed on</p> <p>otherwise, all the black parents would need to be heterozygous and even then only 0.5 probability that each is black / eq (1)</p>	<b>2</b>

Question Number	Answer	additional guidance	Mark
<b>8 (a)(ii)</b>	<p>An answer that makes reference to two the following:</p> <ul style="list-style-type: none"> <li>• parent genotypes Aa and Aa (1)</li> <li>• parent gametes (1) A or a      A or a</li> <li>• offspring genotypes AA Aa aa (1)</li> <li>• offspring phenotypes labelled or ratio 3 : 1 (1)</li> </ul>	<p>allow from Punnett square</p> <p>allow other letters allow A and b</p> <p>eg</p> <p>Ab x Ab</p> <p>A or b A or b</p> <p>AA Ab bb</p> <p>ignore X and Y</p> <p>ECF max 2 for mp 2 gametes and mp 3 genotypes of offspring</p>	<b>4</b>

Question Number	Answer	additional guidance	Mark
<b>8 (a)(iii)</b>	<ul style="list-style-type: none"> <li>probability of agouti / probability of male</li> <li>multiplied</li> </ul> <p><math>\frac{3}{8}</math> or 0.375 or 37.5% (2)</p>	<p>allow full marks for correct answer no working</p> <p>1 mark for 0.5 or <math>\frac{1}{2}</math> or 50%</p> <p>or 0.75 or <math>\frac{3}{4}</math> or 75%</p>	<b>2</b>

Question Number	Answer	Mark
<b>8 (b)(i)</b>	polygenic (1)	<b>1</b>

Question Number	Answer	additional guidance	Mark
<b>8 (b)(ii)</b>	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>more <u>adrenaline</u> produced / affects amount of <u>adrenaline</u> produced / eq (1)</li> <li>affects heart rate / fear response / fight or flight idea /eq (1)</li> <li>neurotransmitter levels affects <u>synapses</u> / eq (1)</li> <li>quicker reflex / reaction time / quicker response / more responsive / eq (1)</li> </ul>	allow converse for smaller adrenal and less neurotransmitter	<b>3</b>



Question Number	Answer	additional guidance	Mark
<b>8 (c)</b>	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>iris does not block / blocks less light / eq (1)</li> <li>so pupil change / dilate / constrict has little / no effect / (iris) cannot regulate / control amount of light entering eye / eq (1)</li> <li><u>too much</u> light / <u>more light</u> enters eye / falls on retina / eq (1)</li> <li>poor vision / damages retina / (goes) blind / eq (1)</li> </ul>	not just iris lets light through	<b>3</b>

total 15 marks

Question Number	Answer	additional guidance	Mark
<b>9 (a)</b>	<p>A description that makes reference to three of the following points</p> <ul style="list-style-type: none"> <li>cross / breed / mate / allow to self- pollinate parent plant(s) with (grains) with highest mass / yield / desired characteristics / eq (1)</li> <li>select <u>offspring</u> plants with (grains) with highest mass / yield / desired characteristics / eq(1)</li> <li>repeat for more / many generations / eq (1)</li> </ul>		<b>3</b>

Question Number	Answer	additional guidance	Mark
<b>9 (b)(i)</b>	<ul style="list-style-type: none"> <li>• Scale half grid and linear (1)</li> <li>• Lines straight and through all points (1)</li> <li>• Axes correct way round (1)</li> <li>• Points correctly plotted within half a small square (1)</li> <li>• Units (yield in) tonnes per hectare (1)</li> </ul>	<p>allow y axis starting at 1 or 2 etc</p> <p>yield on y</p> <p>No P if extrapolate yield to 0</p> <p>bar chart just loses L</p>	<b>5</b>

Question Number	Answer	additional guidance	Mark
<b>9 (b)(ii)</b>	$6.7 - 2.8 = 3.9$ $3.9 \div 2.8 \times 100 = 139.3\% \text{ in } 60 \text{ years}$  $139.3 \div 60 = 2.3\% \text{ per year (3)}$	<p>1 mark for 3.9 / 1.39 / 139 / 139.3 / 139.29 / etc</p> <p>1 mark for <math>\div 60</math></p> <p>3 marks for correct answer no working</p> <p>allow 2.32 2.321 2.3214 2.32143 etc</p>	<b>3</b>

Question Number	Answer	Mark
<b>9(b)(iii)</b>	<p>An explanation reference to three of the following points:</p> <ul style="list-style-type: none"> <li>• less energy used to grow tall / eq (1)</li> <li>• more energy available for grain/ eq (1)</li> <li>• higher yield / harvest / more grain(s) / grains heavier / eq (1)</li> <li>• less likely to fall over / less likely to be damaged by wind and rain / eq (1)</li> <li>• easier to harvest / eq (1)</li> </ul>	<b>3</b>

total 14 marks

Question Number	Answer	additional guidance	Mark
<b>10</b>	<p>C use plants with different coloured flowers / (1)</p> <p>O of same species / size / shape / (of flower) eq (1)</p> <p>R repeat each colour (1)</p> <p>M1 count / see how many insects land on / visit flower / eq (1)</p> <p>M2 in a <b>stated</b> time / eq (1)</p> <p>S1 same scent / nectar / use paper flowers / same location/ temperature /sunlight / same season /same time of day /eq (1)</p> <p>S2 same number of / same insects / bees / pollinators / same distance from hive / eq (1)</p>	<p>ignore colour of <u>plant</u> <b>once</b></p>	<b>6</b>

total 6 marks

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