### B2 Summary questions

<table>
<thead>
<tr>
<th>Question number</th>
<th>Answer</th>
<th>Marks</th>
<th>Guidance</th>
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</thead>
<tbody>
<tr>
<td>1 a</td>
<td>controlled series of stages by which cells grow and divide in the body</td>
<td>1</td>
<td></td>
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<tr>
<td>1 b i</td>
<td><strong>early embryo</strong> &lt;br&gt;cell cycle very rapid with little time for growth &lt;br&gt;stage 1 as short as possible as embryo forming new cells [5-year-old child] &lt;br&gt;cell cycle rapid as child growing quickly but not as fast as early embryo &lt;br&gt;longer periods of growth between divisions</td>
<td>4</td>
<td>2 marks for early embryo, 2 marks for 5-year-old child.</td>
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<tr>
<td>1 b ii</td>
<td><strong>13-year-old student</strong> &lt;br&gt;cell cycle rapid as growth and development taking place during puberty &lt;br&gt;requiring new cells [70-year-old adult] &lt;br&gt;cell cycle slow as new cells still needed for repair &lt;br&gt;but not for growth &lt;br&gt;cell death beginning to overtake cell division</td>
<td>5</td>
<td>2 marks for 13-year-old student, 3 marks for 70-year-old adult</td>
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<tr>
<td>2 a</td>
<td>division of nucleus to form two identical nuclei &lt;br&gt;during cell division in the cell cycle of normal body cells &lt;br&gt;produces genetically identical daughter cells</td>
<td>1</td>
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<tr>
<td>2 b</td>
<td>sequence of diagrams similar to B2.1 Figure 3, suitable annotations</td>
<td>5</td>
<td></td>
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<tr>
<td>2 c</td>
<td><strong>Mitosis responsible for all cell divisions</strong> &lt;br&gt;from fertilised egg to development of baby &lt;br&gt;After birth, mitosis responsible for all cell divisions for growth repair &lt;br&gt;replacement of damaged tissues &lt;br&gt;Requirement for cell replacement and repair continues throughout life.</td>
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<td>2 d i</td>
<td>stage 1</td>
<td>1</td>
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<tr>
<td>2 d ii</td>
<td><strong>very rapid</strong></td>
<td>5</td>
<td>Maximum 2 marks for very rapid and 3 marks for relatively slow.</td>
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<td></td>
<td>• at any time when rapid growth is needed</td>
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<td></td>
<td>• examples (embryonic development, childhood, puberty, pregnancy, after injury)</td>
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<td><strong>relatively slow</strong></td>
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<td>• throughout adult life (excepting pregnancy or injury)</td>
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<td>• in sports training</td>
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<td></td>
<td>• cell cycle slows with age</td>
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<tr>
<td>3 a</td>
<td>unspecialised cells that can differentiate (divide and change into many different cell types) when needed</td>
<td>1</td>
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<tr>
<td>3 b</td>
<td>Stem cells may be used to create almost any different type of body cell. New cells grown from stem cells may be used to repair damaged body parts grow new organs for transplant restore eyesight</td>
<td>1</td>
<td>Credit any other valid suggestion.</td>
</tr>
<tr>
<td>3 c i</td>
<td>hope of new treatments can grow tissues to order could remove need for transplant donors organs would not be rejected</td>
<td>1</td>
<td>Credit any other valid suggestion.</td>
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<td>3 c ii</td>
<td>some believe use of embryonic stem cells breaches human rights</td>
<td>1</td>
<td>Credit any other valid suggestion.</td>
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<td></td>
<td>may cause cancer/virus transfer</td>
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<td>high cost and slow progress towards effective treatments</td>
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<td></td>
<td>may trigger immune response</td>
<td>1</td>
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<tr>
<td>4 a</td>
<td>meristems</td>
<td>1</td>
<td></td>
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<td></td>
<td>growing regions at tips of stems and roots</td>
<td>1</td>
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<td>4 b</td>
<td>Plant stem cells continue to form and differentiate throughout the life of the plant. Differentiated plant cells can differentiate again if necessary.</td>
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<tr>
<td>4 c</td>
<td><strong>Any two from:</strong></td>
<td>6</td>
<td>Maximum of 3 marks for each suggested example. Credit any other valid suggestion.</td>
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<tr>
<td></td>
<td><strong>horticulture</strong></td>
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<td></td>
<td>cloning allows production of large numbers of genetically identical plants with known desirable characteristics more economically and quickly than by normal plant reproduction</td>
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<td></td>
<td><strong>rare plants</strong></td>
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<td></td>
<td>cloned to conserve them and prevent extinction</td>
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<td>cannot be guaranteed by normal plant reproduction</td>
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<td><strong>research</strong></td>
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<tr>
<td></td>
<td>production of large numbers of genetically identical plants for research more economical and quicker than by normal plant reproduction effects of different variables can be seen more quickly</td>
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<td>5 a</td>
<td>stem cells can grow and divide rapidly&lt;br&gt;can differentiate into any required cell type</td>
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<tr>
<td>5 b</td>
<td><strong>Any six from:</strong>&lt;br&gt;- limited success (patient cannot walk unaided)&lt;br&gt;- the limited success is a huge benefit over paralysis&lt;br&gt;- effective in very specific circumstances (immediately after very clean spinal injury)&lt;br&gt;- nerves transplanted to give framework for transplanted cells (recovery may not be entirely due to new cells)&lt;br&gt;- intensive physiotherapy given (recovery may not be entirely due to new cells)&lt;br&gt;- not necessarily feasible for all patients&lt;br&gt;- stem cells may work more effectively than olfactory lobe cells if they can be directed&lt;br&gt;- reliability of treatment must be proven&lt;br&gt;- treatment process must be streamlined (extracting cells from brain and growing on before injecting is complex undertaking)&lt;br&gt;- complete restoration of walking and all functions should ideally be achieved&lt;br&gt;- long-term effects must be demonstrated</td>
<td>6</td>
<td>Credit any other valid suggestion.</td>
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<tr>
<td>6 a</td>
<td>Stem cells divide and differentiate, which tendon cells do not do easily.&lt;br&gt;Stem cells could produce new tendon cells to replace the injured tissue and restore its function relatively quickly.&lt;br&gt;Without stem cells tendon would either heal very slowly or not at all.</td>
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<td>6 b</td>
<td>Fewer ethical considerations in veterinary treatments.</td>
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<td>Credit any other valid suggestion.</td>
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<td>Testing less stringent for veterinary treatments than for human</td>
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<td></td>
<td>treatments.</td>
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<td>Owners will pay for trial veterinary treatments.</td>
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<td>Human trials take many years and must show long-term gains (cannot</td>
<td>1</td>
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<td></td>
<td>be introduced as rapidly as veterinary treatments).</td>
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