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B1 L7

B1 L7 Stem cells: Exam questions worksheet

Mark scheme · Total 20 marks

/ means alternative answers. ( ) words in brackets are not needed for the mark. **allow** = accept this answer. **ignore** = this does not lose or gain a mark. **do not accept** = this answer cannot score the mark. If a tick-box question has more than one box ticked, give 0 marks.

Question	Answers	Extra information	Mark	AO / Spec. ref.
01.1	Embryo → **Most types of human cell** (1) Adult bone marrow → **Many types of cell, including blood cells** (1) Plant meristem → **Any type of plant cell** (1)	1 mark for each source with one correct line. If more than one line is drawn from a source, that source scores 0.	3	AO1 4.1.2.3
01.2	**A** and **D** (1)	Both letters needed, in either order. A third letter written: 0 marks.	1	AO1 4.1.2.3
		Question 01 total	**4**	
02.1	18 ÷ 200 × 100 (1) = **9** (%) (1)	Correct answer with no working = 2 marks. **allow** 0.09 × 100 for the first mark. **do not accept** 0.09 as the final answer (no × 100) for the second mark.	2	AO2 4.1.2.3 (maths)
02.2	many more new plants (450 compared with 18) (1)	**allow** many plants from only one shoot tip / from a small piece of one plant. **ignore** "cheaper" (not in the table).	1	AO3 4.1.2.3
02.3	**They are all genetically identical.** (1)	More than one box ticked: 0 marks.	1	AO1 4.1.2.3
02.4	there is no (genetic) variation, so one new disease could kill them all (1)	**allow** no variation / they could all be killed by one disease / they could not adapt to a change in the environment. **do not accept** "they are all the same" with no link to variation, disease or change.	1	AO2 4.1.2.3
		Question 02 total	**5**	
03.1	**An embryo with the same genes as the patient** (1)	More than one box ticked: 0 marks.	1	AO1 4.1.2.3
03.2	the cells (from the cloned embryo) have the same genes as the patient (1) so they are not rejected by the patient's body / cells from another person may be rejected (1)	**allow** the body recognises the cells as its own. **do not accept** "because they are stem cells" / "because they are young".	2	AO1 AO2 4.1.2.3
		Question 03 total	**3**	
04	(embryonic) stem cells could be made to differentiate into nerve cells (1) these could replace the damaged nerve cells / repair the damage (1)	**allow** "turned into" for differentiate. **allow** so the person may be able to move again, for the second mark, if linked to new nerve cells. **ignore** "cure". **do not accept** "stem cells divide into nerve cells" for the first mark.	2	AO2 4.1.2.3
		Question 04 total	**2**	

Question	Answers	Extra information	Mark	AO / Spec. ref.
05	Level of response: see the level descriptors and indicative content below.	An answer about only one side (only benefits, or only objections) cannot reach Level 3. **ignore** “it is wrong” / “it is fine” with no reason.	6	AO1 AO3 4.1.2.3
		Question 05 total	**6**	
		TOTAL	**20**	

05 Level descriptors

Level	Marks	Descriptor
3	**5–6**	A detailed and balanced evaluation. Benefits, at least one practical risk and at least one ethical or religious issue are described, and a conclusion is given with a supporting reason.
2	**3–4**	Benefits and at least one risk or ethical issue are described, with some balance, or one side only is described in detail. A conclusion may be given without a clear reason.
1	**1–2**	Simple statements about benefits or objections, with little detail.
0	**0**	No relevant content.

05 Indicative content

- **Benefits:** embryonic stem cells can differentiate into most types of human cell; they may be able to help conditions such as diabetes and paralysis; they could replace damaged cells
- in therapeutic cloning the embryo has the same genes as the patient, so the cells are not rejected; research helps scientists understand how diseases develop
- **Risks:** a viral infection could be passed on with the cells; the cells might divide out of control (a tumour)
- treatments are new, still being researched, and long-term effects are not known; treatments may not work
- **Ethical and religious issues:** taking the stem cells destroys the embryo; some people, including some religious groups, believe an early embryo should have the same right to life as a person
- others think the benefits to patients matter more; spare embryos from fertility treatment would not be used anyway; in the UK, research is allowed only on embryos up to 14 days old, with consent
- **Conclusion:** any conclusion with a reason (for, against, or “only if ...”) scores the same as the one in the model answer

Model answers

01.1 Embryo: most types of human cell. Adult bone marrow: many types of cell, including blood cells. Plant meristem: any type of plant cell. **01.2** A and D. **02.1** 18 ÷ 200 × 100 = 9 %. **02.2** Cloning gave many more new plants: 450 from one shoot tip, compared with 18 from 200 seeds. **02.3** They are all genetically identical. **02.4** There is no variation, so one new disease could kill them all.

03.1 An embryo with the same genes as the patient. **03.2** The cells from the cloned embryo have the same genes as the patient, so they are not rejected by the patient’s body. Cells from another person may be rejected. **04** Stem cells could be made to differentiate into nerve cells. These new nerve cells could replace the damaged nerve cells and repair the damage.

05 (Level 3) Embryonic stem cells can differentiate into most types of human cell, so they may be able to help people with conditions such as diabetes or paralysis by replacing damaged cells. If the embryo is made by therapeutic cloning, the cells have the same genes as the patient, so they are not rejected. However, there are risks: a virus could be passed on with the cells, and the cells might divide out of control and form a tumour. The treatments are still being researched, so we do not know if they are safe in the long term. Taking the stem cells destroys the embryo. Some people, including some religious groups, believe an embryo has the same right to life as a person, so they object. Others think helping patients matters more, especially when spare embryos would not be used anyway. I think the research should continue, because it may help many people, but only with strict laws and careful testing.

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