**TYPE:** Extended Response

**TASK 12: Stem Cells and Stem Cell Research (66 marks)**

Task is a combination of text questions and information, as well as research-based questions followed by an in-class extended answer. The extended answer will be written in class under exam conditions (ie without notes)

**Time for the tasks (1 hour)**

* Research and answering questions – 1 session
* Validation extended answer in class – 5 minutes reading time and 55 minutes working time

**What you need to do:**

* Follow the instructions provided very carefully to complete the test.
* Draw any results in pencil and answer all questions given.
* It is your responsibility to organise your time effectively.
* There is to be no discussion between you or any of your class mates.
* No sharing of any equipment or answers at all.

|  |  |  |
| --- | --- | --- |
| Question | Possible Mark | Mark achieved |
| 1 | 18 |  |
| 2 | 4 |  |
| 3 | 24 |  |
| 4 | 20 |  |
| TOTAL | 66 |  |

**DO NOT TURN THIS PAGE OVER UNTIL YOU ARE TOLD TO**

**STUDENT NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**TEACHER: Mrs Cunningham YEAR: 11**

**Stem Cells and Stem Cell Research**

In-class extended answer component (66 marks)

1. Types of Stem Cells [18 marks]

2 marks per box

Complete the table below with information about different types of stem cells.

|  |  |  |  |
| --- | --- | --- | --- |
| Stem Cell | Produced by | Gives rise to what type of cells? | Example |
| Totipotent | Fertilised egg / zygote 1  Undergoes mitotic divisions 1  Produces identical totipotent cells | All cell types that make up - human body 1  –membranes that surround developing embryo (inc placenta)1 | The early embryo1 before the formation of the inner cell mass 1 |
| Pluripotent | Inner cell mass 1  From totipotent cells - Several rounds of cell division – (specialisation begins after about 5 days)- forms blastocyst1 – part of this is the inner cell mass | All cell types that make up the body – but **not** cell types that make up the embryonic membranes 1  (Can give rise to most, but not all tissues of an organism)  Give rise to foetal tissue but not placental tissue1 | Inner cell mass 2 |
| Multipotent | Pluripotent cells then undergo further specialisation 1 and make multipotent cells 1  (Able to give rise to – cells that have a specific function eg. Red blood cells from blood stem cells) | Can develop into more than one of the cell types that make up the body, 1  but not all cell types1  Able to give rise to – cells that have a specific function | Blood stem cells 2  (or some other example) |



[4 marks]

Cultured stem cells

2

a. What type of stem cells are being demonstrated in the picture above ADULT or

multipotent\_1\_\_\_\_\_

b. Explain what is happening in the three pictures: - adult stem cells taken from bone marrow 1; grown/ cultured 1; differentiated into blood cells 1

3. Complete the table below about sources of stem cells for research and therapy. [24 marks]

|  |  |  |  |
| --- | --- | --- | --- |
|  | 2 marks per box Stem Cells Source | | |
|  | Umbilical cord blood and placental stem cells | Embryonic stem cells | Adult stem cells |
| Describe origins of this type of stem cell | -present in blood in the umbilical cord and placenta 1  obtained after the baby is born and are multipotent.1 | Source - 3-5 day old embryo1 – at blastocyst stage, the inner cell mass1 is transferred to a culture dish  Cultured from frozen embryos – obtained from IV clinics 1  (Give rise, through differentiation to the different types of cells in the body) | Pluripotent cells undergo more specialization to produce multipotent adult stem cells 1 …these can give rise to cells of many tissues1 |
| Advantages of using this type of stem cell. | can be extracted from discarded tissue 1and used for the benefit of children and adults who suffer from1  bone marrow and blood disease  can be stored1 in case baby needs replacement tissues or organs later in life1  no harm to mother or child 1 | These stem cells are pluripotent 1–therefore can become any of the cell types of the body1, making them more versatile than adult stem cells1  Unused embryos from IV fertilisation may be donated to research1  (2 points) | Can use patient’s own cells for treatment of disease 1  Reduces risk…1 of rejection  Body would not reject its own cells.1  Can be used for research so no need to destroy human embryos 1 |
| Disadvantages of using this type of stem cell | As multipotent only able to result in limited type of cell1, i.e. red blood cells from cord blood and cells of the immune system1 | Come from an embryo not derived from the patient’s own cells 1 and so may be rejected.1  Governments have strict regulations in place for controlling this type of technology – red tape -1 | Cells are pre-specialized 1– e.g. blood stem cells only make blood/brain stem cells only make brain cells -1 |
| Ethical Issues?  Explain any potential or actual ethical issues | As there is no harm to mother or child -1, unlikely to be any (no) ethical issues 1 | Significant ethical issues1 as obtaining embryonic stem cells requires the destruction of an embryo1 - brings into play views on when life begins.1 (2 points) | No particular ethical issues1  as can use own cells, or can give to another with consent 1 |

4. Write an extended response about two examples of current research into the use of stem cells. [20 marks]

For each example:

* describe the aim of the research - i.e. What do the researchers hope to be able to do with stem cells?
* explain how stem cells are actually being used in the research study
* include any advantages, disadvantages or ethical issues for the example being researched.

For each example: 10 marks each

Aim of research: (3 marks)

(name the problem and briefly describe the problems it can cause )

What problem do they wish to solve?

What made them want to do this research?

What are they aiming to be able to do? – in broad stem cell terms

How are the stem cells being used ? (4 marks)

– a description giving type of stem cell used;

- how and where the stem cells are harvested

- what happens to them (cultured)

- any results so far?

Well explained for each below –( if there happens to be no ethical issue, for example, then they must say this and explain why there is none, not just ‘leave it blank’ )

Advantages -1

Disadvantages - 1

Ethical issues - 1