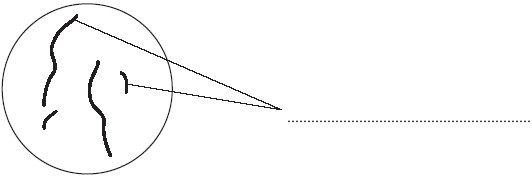
**Q1.**          **Diagram 1** shows the nucleus of a body cell as it begins to divide by mitosis.

**Diagram 1**

****

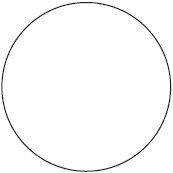
(a)     Use a word from the box to label **Diagram 1**.

|  |
| --- |
| **alleles**             **chromosomes**             **gametes** |

**(1)**

(b)     Complete **Diagram 2** to show what the nucleus of one of the cells produced by this mitosis would look like.

**Diagram 2**



**(1)**

(c)     Stem cells from a recently dead embryo can be grown in special solutions.

          Some facts about stem cells are given below.

•    Stem cells from an embryo can grow into any type of tissue.

•    Stem cells may grow out of control, to form cancers.

•    Large numbers of stem cells can be grown in the laboratory.

•    Stem cells may be used in medical research or to treat some human diseases.

•    Patients treated with stem cells need to take drugs for the rest of their life to prevent rejection.

•    Collecting and growing stem cells is expensive.

          Use **only** the information above to answer these questions.

(i)      Give **two** advantages of using stem cells.

1 ........................................................................................................................

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2 ........................................................................................................................

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**(2)**

(ii)     Give **two** disadvantages of using stem cells.

1 ........................................................................................................................

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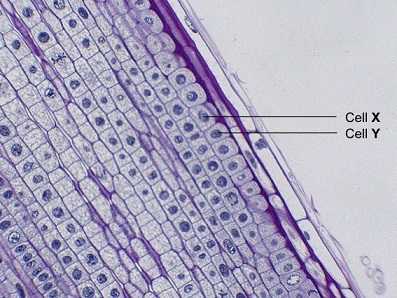
2 ........................................................................................................................

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**(2)**

**(Total 6 marks)**

**Q2.**         The photograph shows some cells in the root of an onion plant.



By UAF Center for Distance Education [CC BY 2.0], via Flickr

(a)      Cells **X** and **Y** have just been produced by cell division.

(i)      Name the type of cell division that produced cells **X** and **Y**.

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**(1)**

(ii)     What happens to the genetic material before the cell divides?

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**(1)**

(b)     A gardener wanted to produce a new variety of onion.

Explain why sexual reproduction could produce a new variety of onion.

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**(3)**

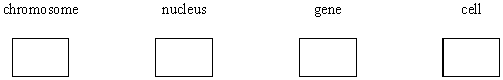
**(Total 5 marks)**

**Q3.**          (a)     How many pairs of chromosomes are there in a body cell of a human baby?

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**(1)**

(b)     Place the following in order of size, **starting with the smallest,** by writing  
numbers **1** – **4** in the boxes underneath the words.



**(1)**

(c)     For a baby to grow, its cells must develop in a number of ways.

          Explain how each of the following is part of the growth process of a baby.

(i)      Cell enlargement

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**(1)**

(ii)     The process of cell division by mitosis

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**(3)**

(d)     Why is cell specialisation (differentiation) important for the development and growth of a healthy baby from a fertilised egg?

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**(2)**

**(Total 8 marks)**

**Q5.**         Stem cells can be collected from human embryos and from adult bone marrow.  
Stem cells can develop into different types of cell.

The table gives information about using these two types of stem cell to treat patients.

|  |  |
| --- | --- |
| **Stem cells from human embryos** | **Stem cells from adult bone marrow** |
| It costs £5000 to collect a few cells. | It costs £1000 to collect many cells. |
| There are ethical issues in using embryo stem cells. | Adults give permission for their own bone marrow to be collected. |
| The stem cells can develop into most other types of cell. | The stem cells can develop into only a few types of cell. |
| Each stem cell divides every 30 minutes. | Each stem cell divides every four hours. |
| There is a low chance of a patient’s immune system rejecting the cells. | There is a high chance of a patient’s immune system rejecting the cells. |
| More research is needed into the use of these stem cells. | Use of these stem cells is considered to be a safe procedure. |

Scientists are planning a new way of treating a disease, using stem cells.

Use **only** the information above to answer these questions.

(a)     Give **three** advantages of using stem cells from embryos instead of from adult bone marrow.

1 .....................................................................................................................

2 .....................................................................................................................

3 .....................................................................................................................

**(3)**

(b)     Give **three** advantages of using stem cells from adult bone marrow instead of from embryos.

1 .....................................................................................................................

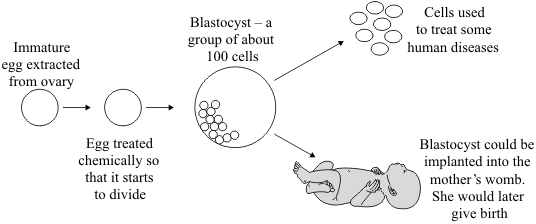
2 .....................................................................................................................

3 .....................................................................................................................

**(3)**

**(Total 6 marks)**

**Q6.**          The diagram shows how an immature egg could be used either to produce cells to treat some human diseases or to produce a baby.



          Scientists may be allowed to use this technique to produce cells to treat some human diseases, but not to produce babies.

          Using information from the diagram, suggest an explanation for this.

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**(Total 4 marks)**