

WJEC (Wales) Biology GCSE
Topic 2.2 Cell Division and
Stem Cells
Questions by Topic

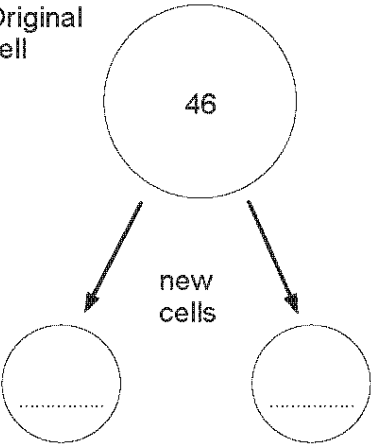
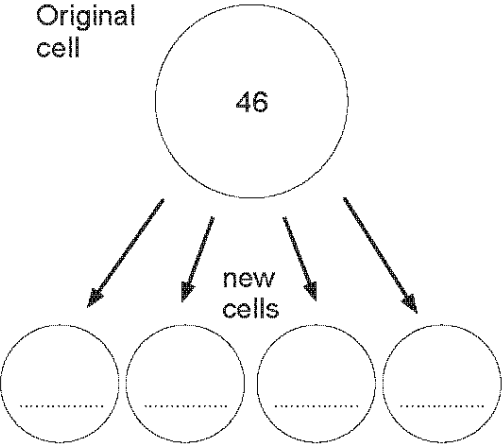
1.

(a) (i) Which part of a living cell contains chromosomes?

[1]

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(ii) Complete the table below about cell division in human cells by writing on the dotted lines. [4]

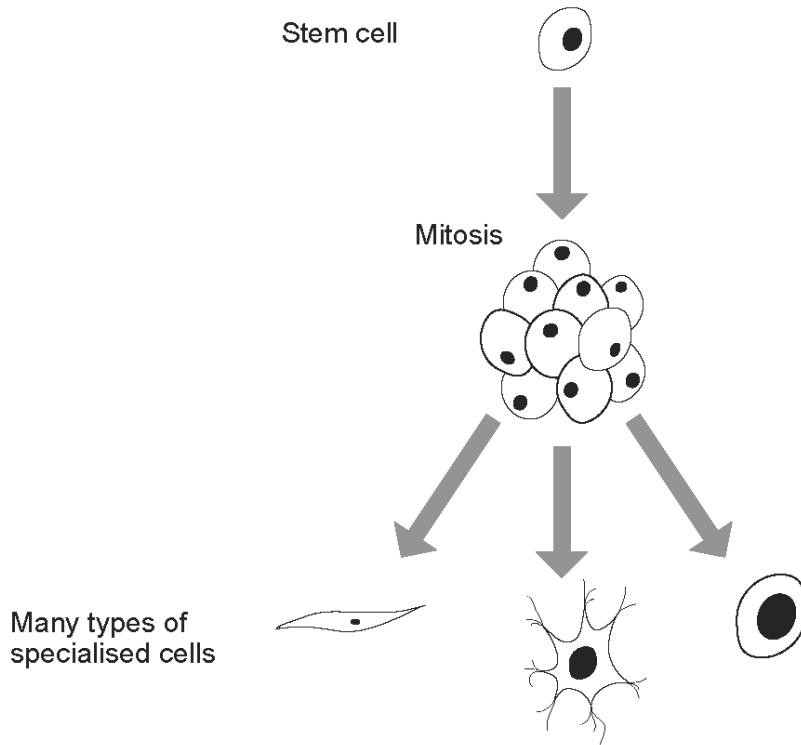
Type of division	MITOSIS	MEIOSIS
Number of chromosomes in cells	<p>Original cell</p> 	<p>Original cell</p> 
Function of division	formation of sex cells
Genes in new cells	identical

(iii) What is the scientific term used for sex cells such as sperm and eggs?

[1]

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(b) Stem cells divide by mitosis and new specialised cells develop.



Many types of specialised cells

(i) Suggest one way doctors can use stem cells to treat patients. [1]

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(ii) Stem cells from embryos can be used in medical research. Explain why some people object to this. [2]

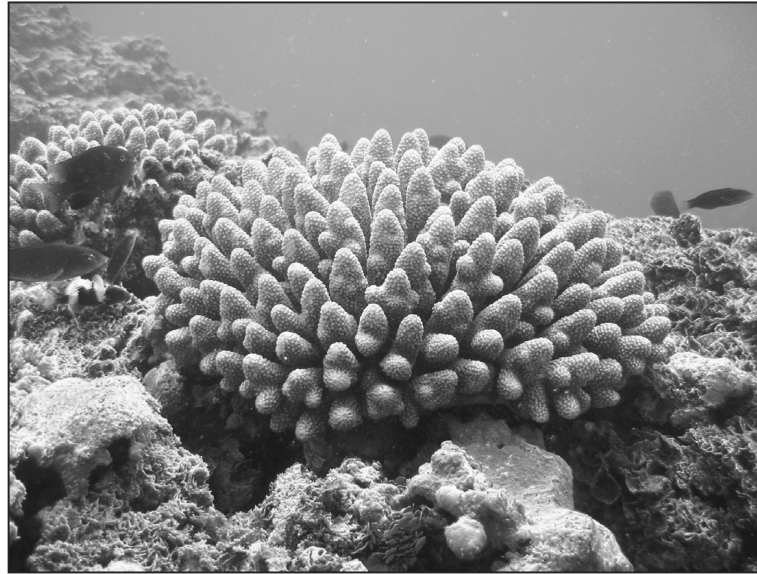
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2.

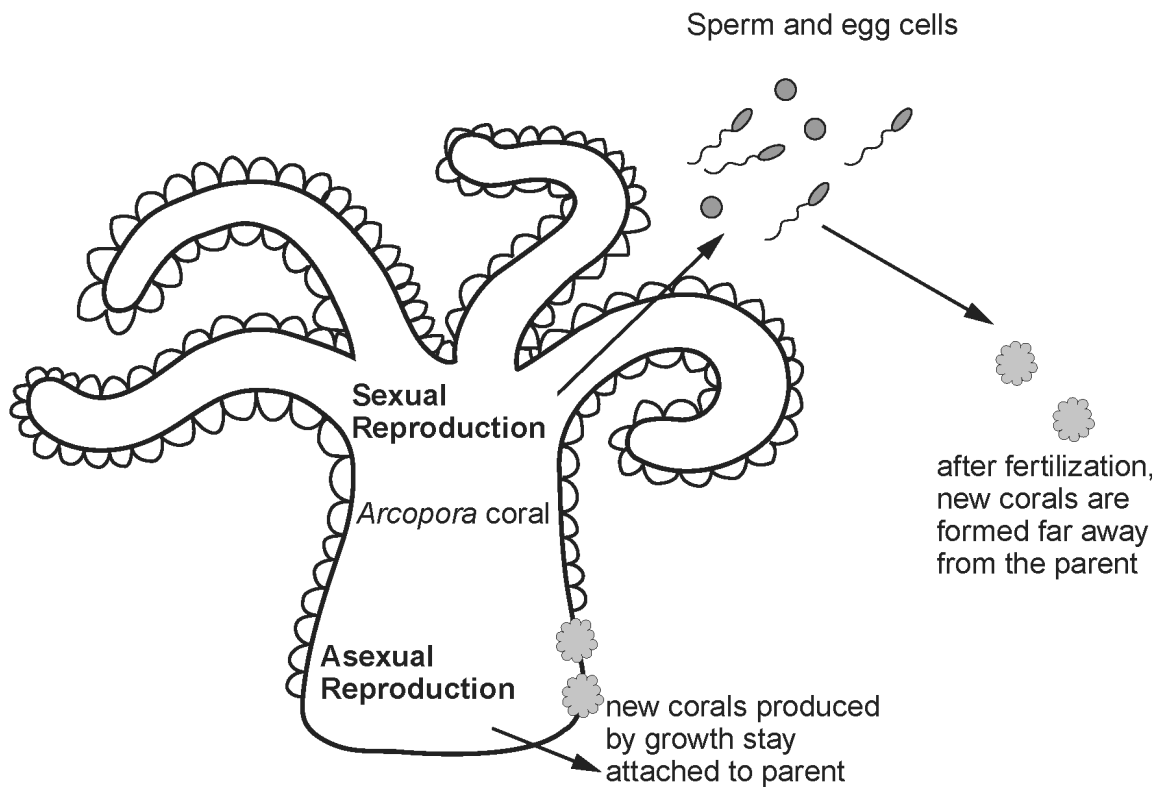
This question is about simple sea animals called corals.

Arcopora is a bushy coral which can grow into large colonies forming huge coral reefs.



Arcopora coral

Arcopora can reproduce by sexual and asexual reproduction as shown in the diagram below.



Use this information and your own knowledge to answer the following questions.

- (a) During asexual reproduction, cells of *Arcopora* divide by **mitosis**.

State **two** ways in which the new cells produced by mitosis are identical to those of the mother cell. [2]

1.

2.

- (b) (i) State the scientific term for the sex cells (sperm and egg cells) produced during sexual reproduction. [1]

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- (ii) Name the type of cell division which produces these sex cells and state how their chromosome number is different from the mother cell. [2]

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- (c) (i) Suggest a reason why large coral reefs of *Arcopora* result from **asexual** reproduction. [1]

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- (ii) Corals such as *Arcopora* increase in diameter by 8.5cm each year. If a coral had a diameter of 15cm in 2002, calculate the expected diameter in 2016, **giving your answer in metres**. [2]

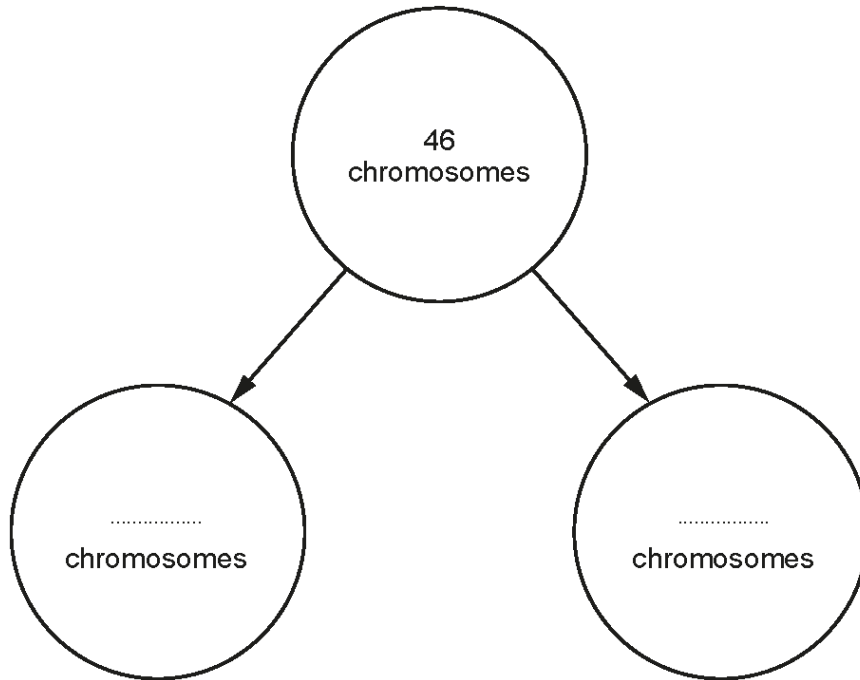
Diameter = m

3.

Describe and explain the differences between mitosis and meiosis.

[6 QWC]

4. The diagram below shows a human cell dividing by mitosis to form two new cells.



- (a) (i) Complete the diagram above by writing the number of chromosomes in each of the two new cells. [1]
- (ii) Mitosis enables organisms to grow. State one *other* function of mitosis. [1]

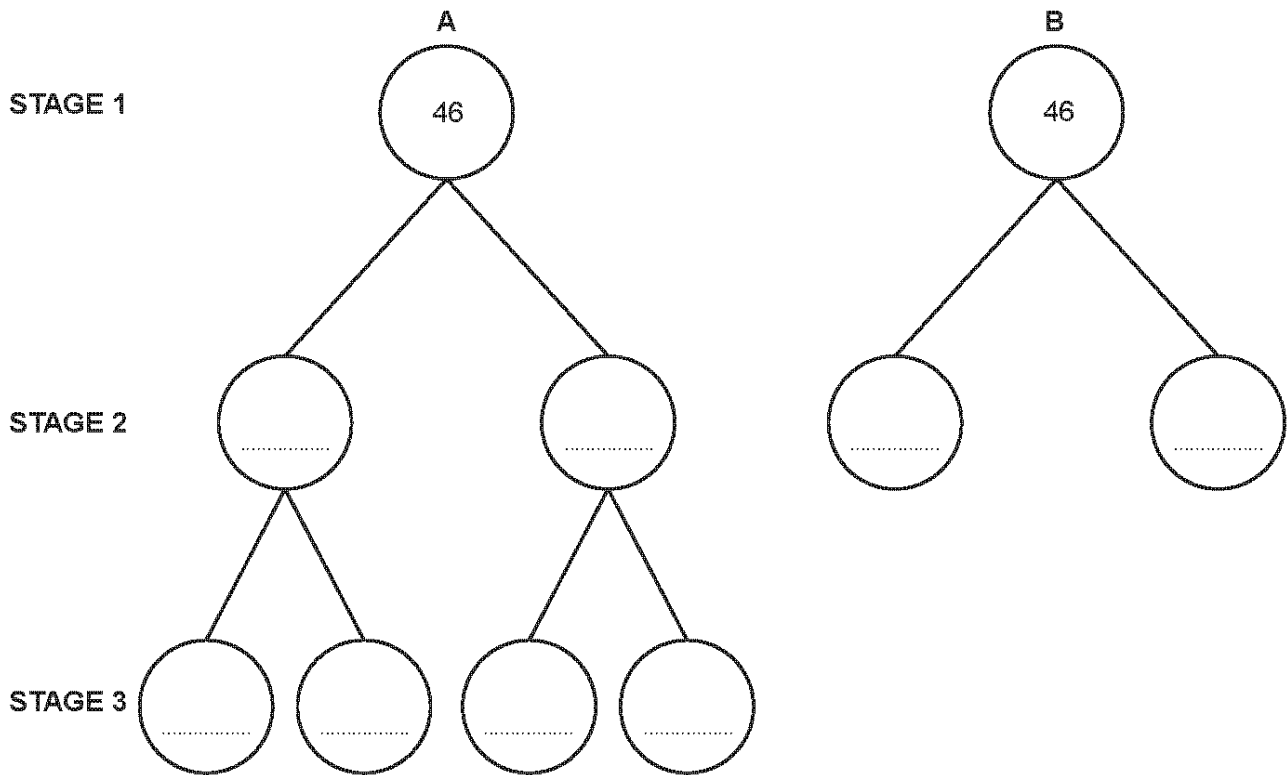
- (b) (i) Complete the table which compares mitosis with meiosis. [2]

	mitosis	meiosis
number of new cells from each division	two
genes in new cells compared to original cell	different

- (ii) What is the scientific term for the sex cells (eggs and sperm) which are produced by meiosis? [1]

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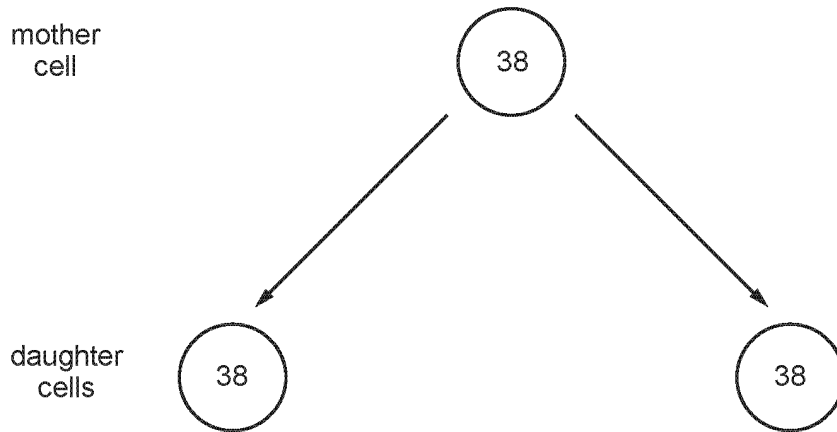
5. The diagram below shows the two different types of cell division **A** and **B**, which occur in the human body.



- (a) Name the type of cell division shown in diagram **A**. [1]
- (b) The cells in **STAGE 1** each contain 46 chromosomes. Complete the diagram by writing in the number of chromosomes found in *each* of the cells in **STAGE 2** and **STAGE 3**. [2]
- (c) The cells drawn in **STAGE 3** develop into specialised cells. What name is given to these cells? [1]
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- (d) Complete the sentence below by placing a circle around the correct word. [1]
- All the cells in **STAGE 3** are genetically identical / different.
- (e) Name one process during which the type of cell division shown in diagram **B** would occur. [1]

6.

The diagram below shows cell division of a cell from a cat. The number of chromosomes is shown.



- (a) What name is given to the type of cell division shown in the diagram?
Give a reason for your answer.

[2]

Type of cell division

Reason

- (b) The table shows the numbers of chromosomes in the cells of pigeons and humans before and after dividing by meiosis.

- (i) Complete the table.

[1]

	number of chromosomes	
	cell before meiosis	sex cells (sperm and egg cells) after meiosis
human	46	
pigeon		40

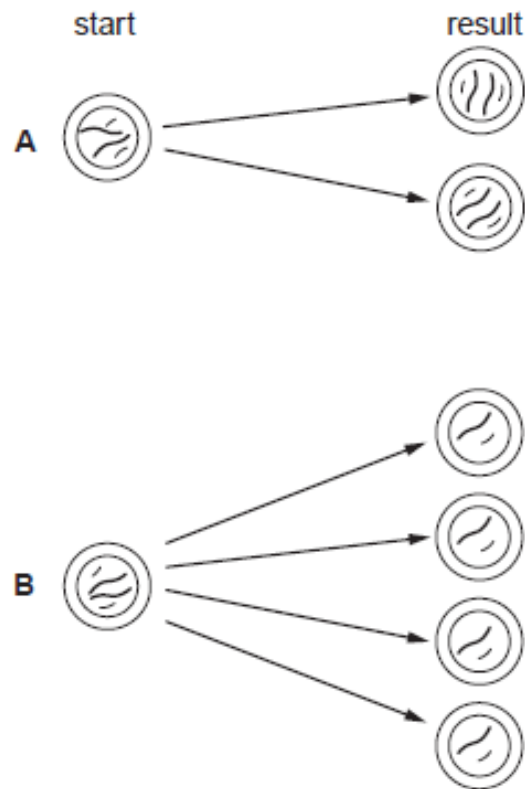
- (ii) State how many sex cells would be produced from one cell by meiosis and give the scientific term for these sex cells.

[2]

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7. Mitosis and meiosis are two types of cell division.

Diagrams A and B show the start and result of both types of cell division in a cell with four chromosomes.



Use the diagrams and your own knowledge to describe the two types of cell division.

You should:

- state which diagram shows mitosis and which shows meiosis
- describe what you can see at the start and the result for each type of cell division
- give **one** function for each type of cell division [6 QER]

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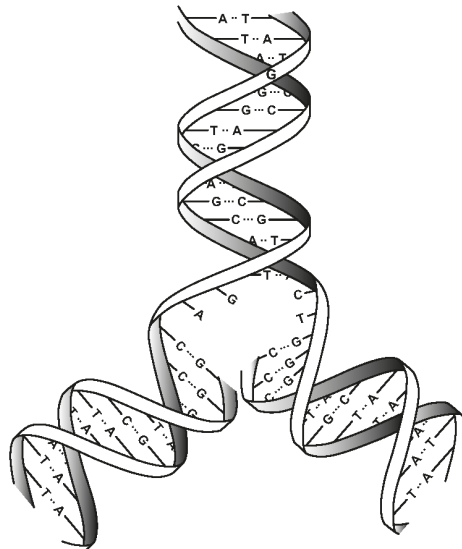
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8. The diagram shows part of a molecule of DNA during the process of cell division.



(c) During cell division the DNA molecule splits as shown.

- (i) In one type of cell division, the DNA is copied. The copied DNA molecules then separate and two genetically identical cells are formed. [1]

Name this type of cell division

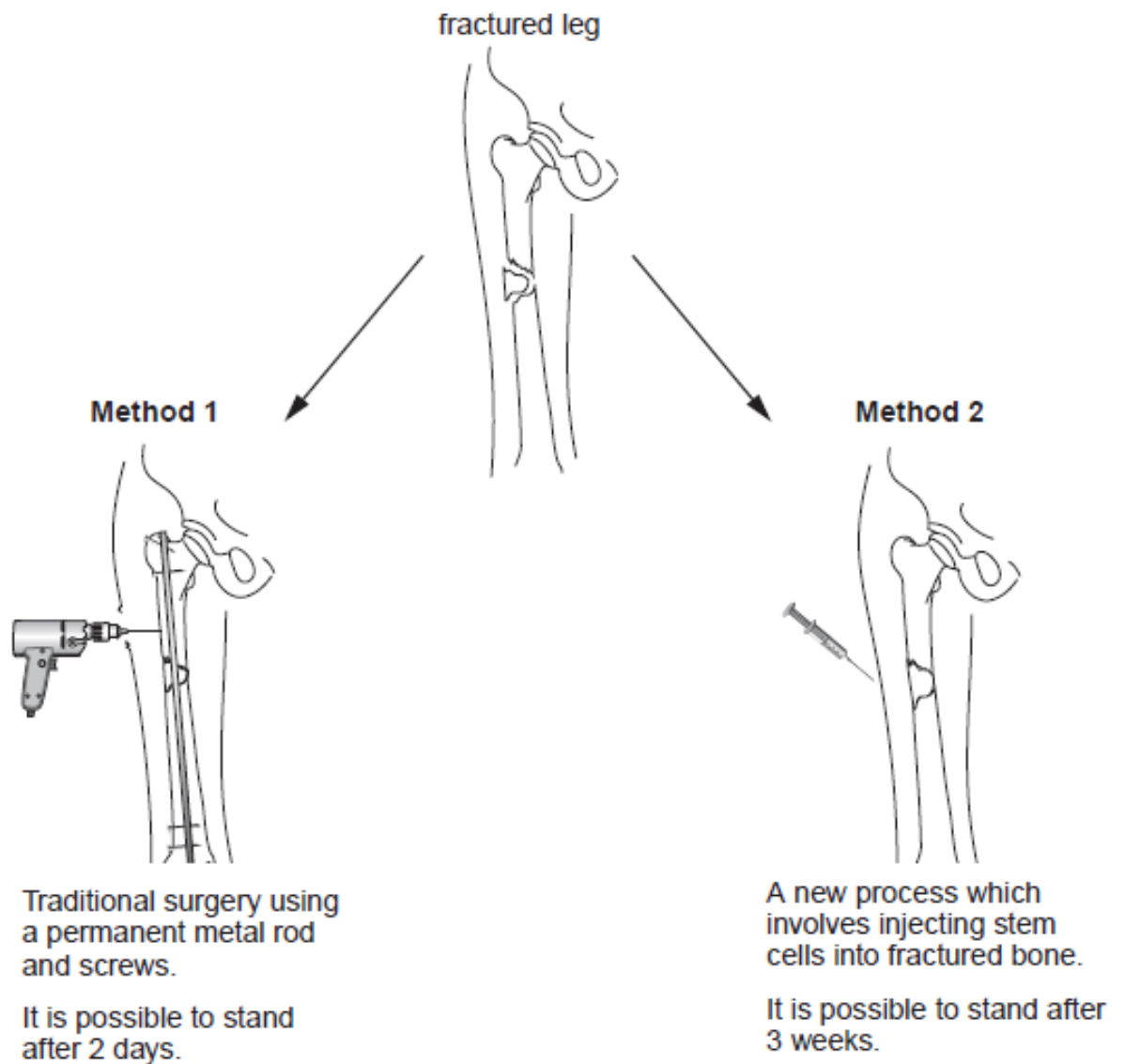
- (ii) During a different type of cell division, the DNA is copied but the copies break and re-join during the formation of genetically different cells. [1]

Name this type of cell division

9. The photograph below shows a young ice skater, Tracey, who falls and fractures her leg.



The diagram below shows two ways in which Tracey's fractured leg could be treated in a large modern hospital.



Expected results of treatment

Time after treatment (weeks)	Percentage of bone healing (%)	
	Traditional surgery	Injection of stem cells
10	10	12
20	14	25
30	19	38
40	28	55
50	41	70
60	59	82

- (a) Give **one** reason why Tracey might choose traditional surgery and **one** reason why, alternatively, she might prefer to be treated by an injection of stem cells. [2]

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- (b) (i) When fractured bones heal, cells divide and multiply by mitosis.

Complete the table below.

[2]

Mitosis in human cells	
chromosomes in mother cell	46
number of daughter cells produced after one division
number of chromosomes in daughter cells

- (ii) Following mitosis, what must happen to stem cells, in order for them to repair the fractured bone? [1]

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(iii) State the name of the disease that can occur if cell division by mitosis is uncontrolled. [1]

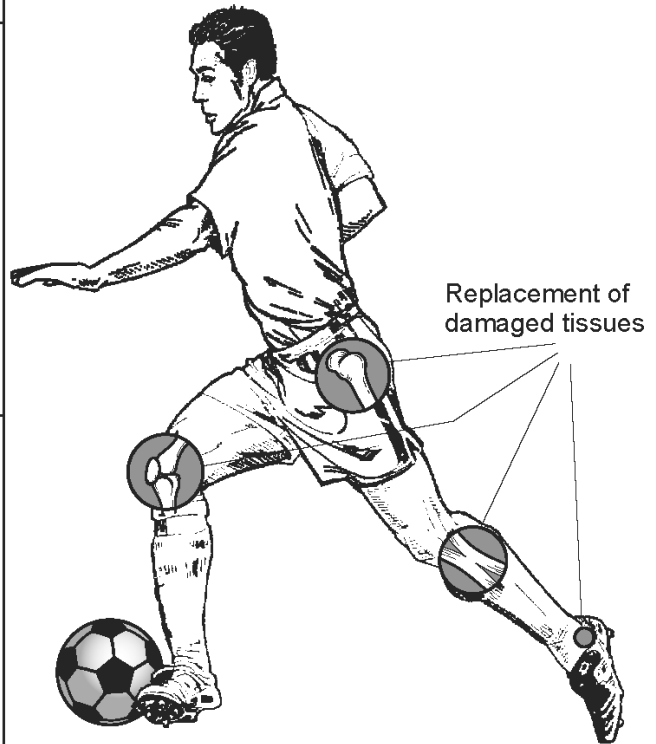
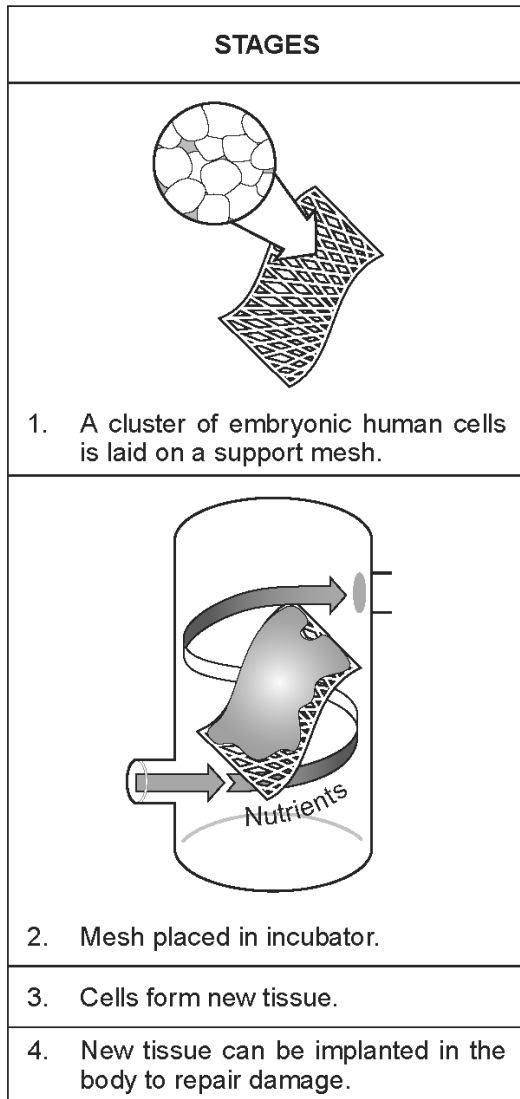
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(c) Stem cells can be obtained from both adults and embryos.

Give **one** reason why some people have a strong personal objection to the use of embryonic stem cells in medical research. [1]

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10. The diagram shows how some parts of joints can be replaced. The stages in the procedure are shown in the left hand column.



- (a) What general name is given to cells such as the embryonic human cells shown in **Stage 1** of the diagram? [1]

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- (b) Tick (✓) one box in each column in the table below to identify some features of cell division that would take place in **Stage 3** in the diagram. [3]

function of cell division	part of cell where control of cell division occurs	number of chromosomes in each cell
increases the number of cells <input type="checkbox"/>	cytoplasm <input type="checkbox"/>	twice as many as in the cells in Stage 1 <input type="checkbox"/>
increases the size of each cell <input type="checkbox"/>	nucleus <input type="checkbox"/>	same number as in the cells in Stage 1 <input type="checkbox"/>
keeps the number of cells the same <input type="checkbox"/>	cell membrane <input type="checkbox"/>	half as many as in the cells in Stage 1 <input type="checkbox"/>

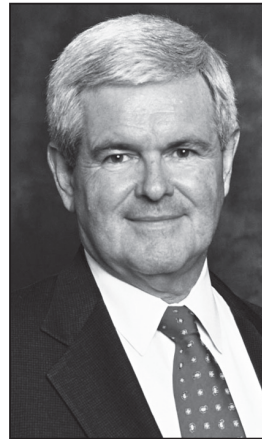
- (c) Suggest a possible ethical issue related to the technology shown in the diagram. [1]

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11. Barack Obama, the President of the United States of America, supports research into the use of embryonic stem cells. However Newt Gingrich, who was hoping to become President, said in February 2012, that he would *'ban embryonic stem cell research if he became President'*.



Barack Obama



Newt Gingrich

- (a) Suggest why some people support embryonic stem cell research, whereas others do not. [2]

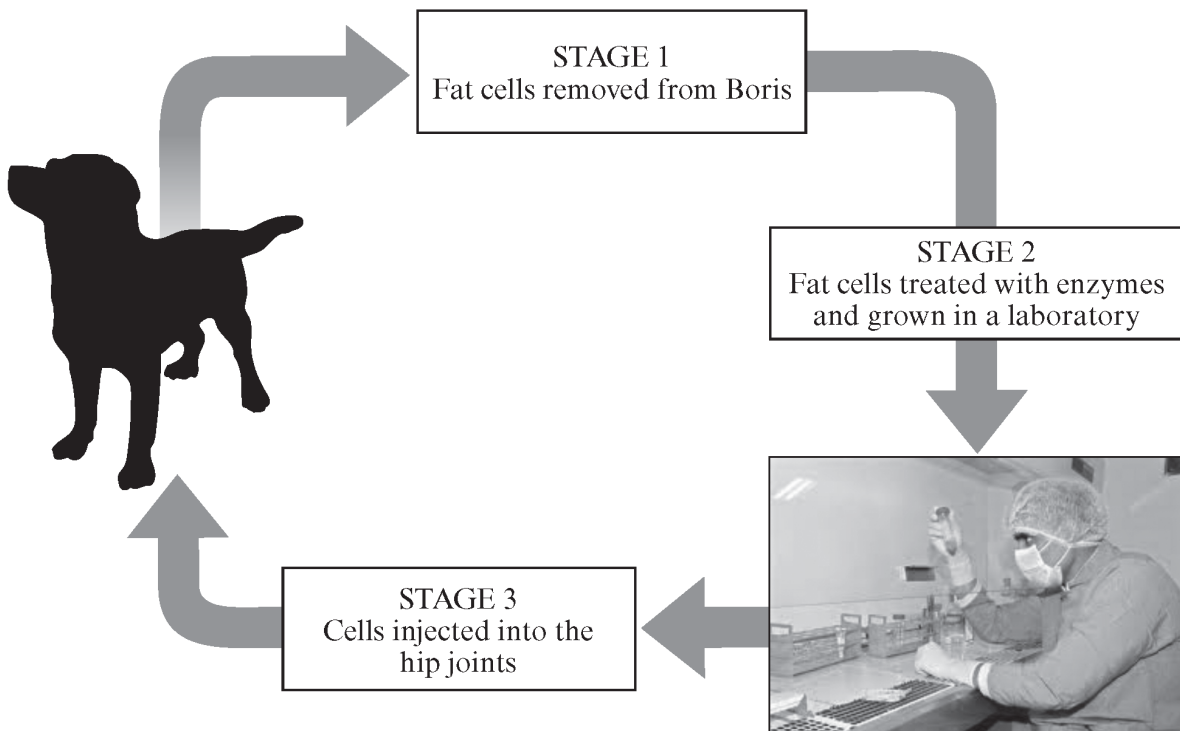
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(b) In December 2010, a dog named Boris was treated for severe arthritis of the hip joints in a veterinary clinic in West Michigan, USA. Some of the stages in the treatment are shown below.



Three months after treatment Boris was examined at the veterinary centre. His hips were found to have greatly improved and X-rays of the hip joints showed evidence of repair of the joint tissues.

(i) State what type of cells are injected in STAGE 3 in the diagram above. [1]

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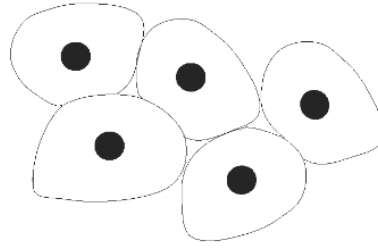
(ii) State **one** advantage of this method of treatment over the use of embryonic stem cells. [1]

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12.

(a) The drawing below shows human embryonic stem cells.



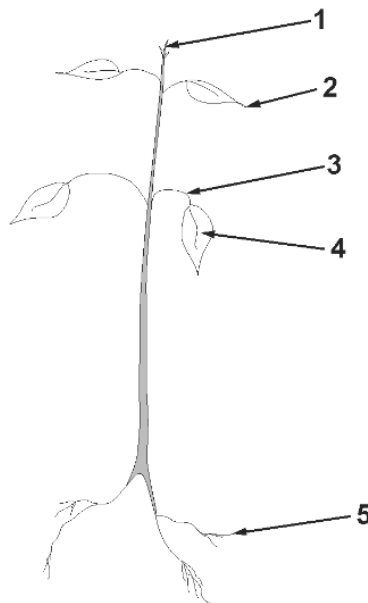
What features of stem cells could make them useful in treating many different medical conditions? [2]

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(b) A laboratory in Japan has recently developed stem cells from human adult skin cells. Suggest why using human adult stem cells might be preferred to using human embryonic stem cells. [1]

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(c) Plants also have stem cells.



Which **two** numbered parts (1 to 5) of the plant shown above contain stem cells? [1]

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