AQA GCSE Biology | 8461

SPECIFICATION POINT 4.1.2.3

Stem cells

Past-paper questions

Tier	**Higher**
Question groups	**11**
Available paper years	**2008–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

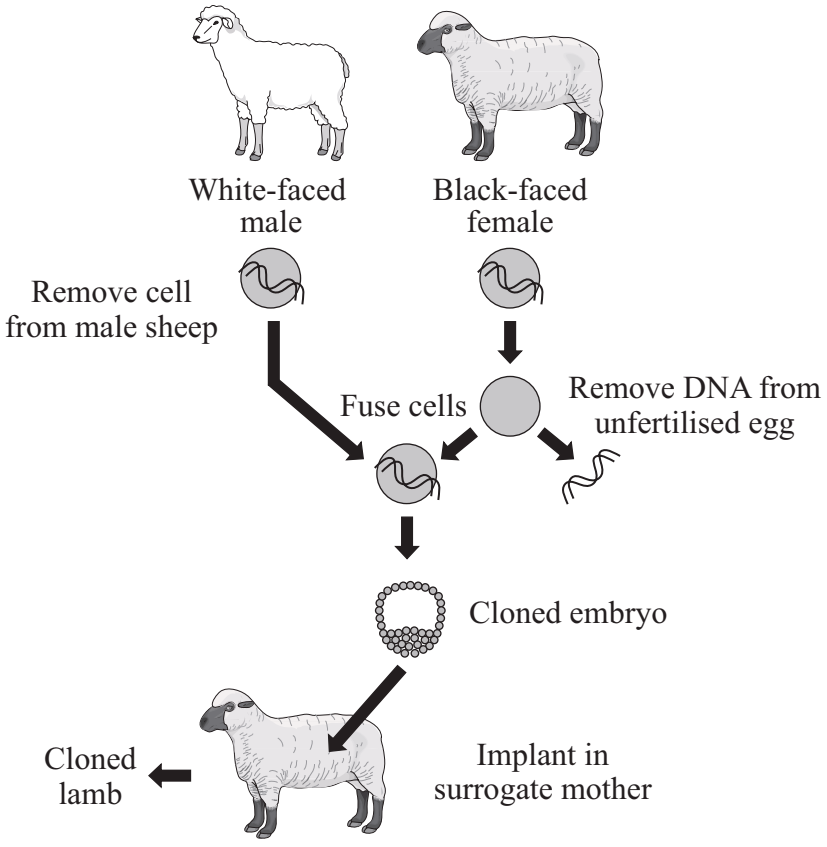
4.1.2.3 Stem cells

Question 01

November 2008 | BLY1BP | Original Q8 | Legacy

QUESTION EIGHT

The diagram shows the method used to clone sheep.



8A This method of cloning sheep involves . . .

1 fertilisation of an egg by a sperm.

2 sexual reproduction.

3 asexual reproduction.

4 fusion of male and female gametes.

8B The clone produced would be . . .

1 a black-faced male.

2 a white-faced female.

3 a black-faced female.

4 a white-faced male.

4.1.2.3 Stem cells

Question 01 · continued

8C Proposals have been made to clone human embryos.

Which of the following is a reason why cloning human embryos might be allowed?

1 The cloned embryos could be used to create a 'super-race'.

2 The embryos could be stored for long periods.

3 Cloning will produce surplus embryos.

4 Cells from the embryos could be used to cure human diseases.

8D Clones are produced naturally when . . .

1 two eggs are fertilised.

2 two eggs are fertilised by two separate sperm.

3 one egg is fertilised by one sperm and the embryo splits into two.

4 two eggs are fertilised by one sperm and the embryo splits into two.

4.1.2.3 Stem cells

Question 02

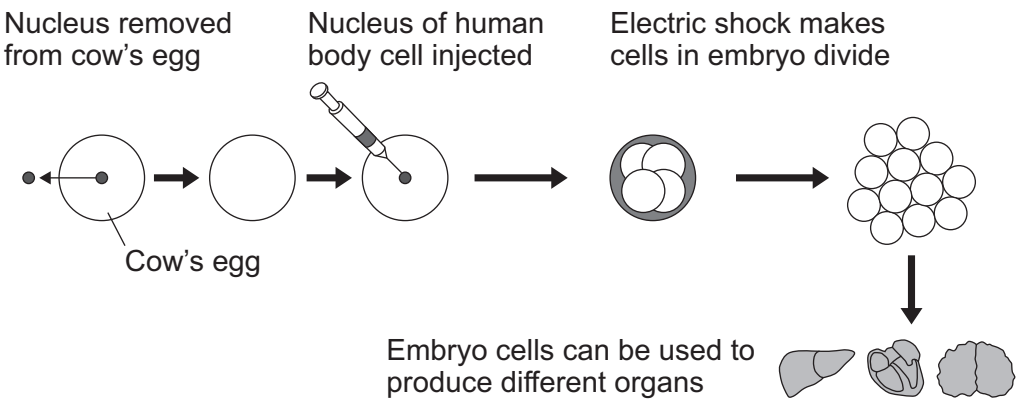
June 2010 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

'Human-animal' Embryo Given Green Light

Regulators have agreed in principle to allow human-animal embryos to be created and used for research.

The diagram shows how a human-animal embryo can be created.



9A The technique shown in the diagram is an example of . . .

1 adult cell cloning.

2 embryo transplanting.

3 taking cuttings.

4 tissue culture.

9B The genetic information in each embryo cell nucleus is . . .

1 identical to that of the cow's egg nucleus.

2 identical to the human cell nucleus.

3 a mixture of genetic information from the nuclei of the cow and the human.

4 different from one embryo cell nucleus to another.

4.1.2.3 Stem cells

Question 02 · continued

Scientists want to create hybrid embryos so that they can extract cells which are able to become any tissue. The embryos would then be destroyed within 14 days.

At the moment, scientists have to rely on human eggs left over from fertility treatment. These new cells are in short supply and are not always of good quality.

A scientist said: 'The creation of hybrid embryos is excellent news. It is a positive outcome not just for our work but for the progress of British science in general. We hope that this will lead to new technologies to benefit everyone. It's not our intention to create any bizarre cow–human hybrid.'

9C What was the main motive for the scientists to create the hybrid cells?

1 The embryos can be destroyed within 14 days.

2 The egg cells left over from fertility treatment are in short supply.

3 The creation of the hybrids is a positive outcome for British science.

4 The scientists are interested in the difference between hybrid cells and human cells.

9D Many people are opposed to this technique for ethical reasons.

Which of the following is an ethical reason for opposition to the technique?

1 Humans with some cow features will be produced.

2 The scientists are proud of their work.

3 The embryos created are destroyed.

4 There needs to be an increase in women to supply the eggs.

END OF TEST

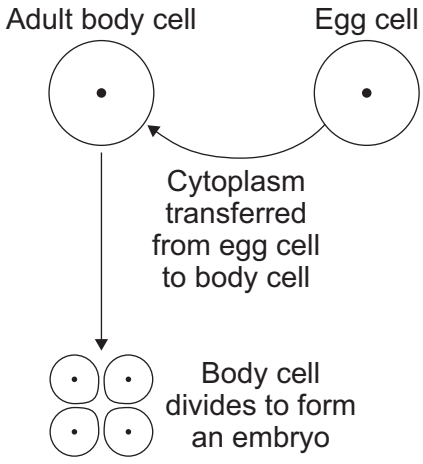
4.1.2.3 Stem cells

Question 03

November 2010 | BLY1BP | Original Q7 | Legacy

QUESTION SEVEN

The diagram shows one method of cloning animals.



7A This method of cloning is called . . .

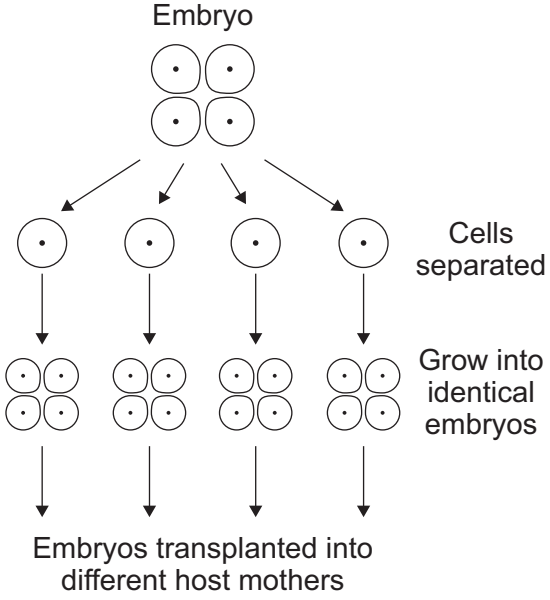
1 sexual reproduction.

2 embryo transplantation.

3 fusion cell cloning.

4 tissue culture.

The cells of the embryo can be separated and allowed to grow into identical embryos.
The embryos are then implanted into different host mothers.



4.1.2.3 Stem cells

7B The offspring would . . .

1 all look like the animal from which the egg cell was taken.

2 all look like the animal from which the adult body cell was taken.

3 look like the host mother that they developed inside.

4 not look like any of the other animals.

Scientists are carrying out research on human cell cloning to produce unspecialised embryonic cells. Unspecialised embryonic cells could be used to treat incurable diseases. One incurable disease is Parkinson's disease. Parkinson's disease affects the nervous system.

7C Unspecialised embryonic cells are useful in the search for cures for different diseases.

This is because unspecialised embryonic cells . . .

1 are nerve cells.

2 can grow into human beings.

3 are easy to produce.

4 can be made to grow into many different types of cell.

7D An ethical argument **against** this type of research is that . . .

1 this research will probably not be successful for a long time.

2 the research will help only a small number of people.

3 embryos are made, and then some of these embryos are destroyed.

4 God would not like this research.

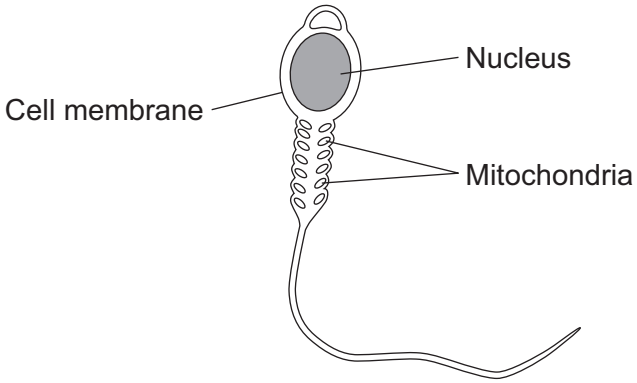
4.1.2.3 Stem cells

Question 04

June 2011 | BLY2H | Original Q4 | Legacy

4 Cells in the human body are specialised to carry out their particular function.

4 (a) The diagram shows a sperm cell.



The sperm cell is adapted for travelling to, then fertilising, an egg.

4 (a) (i) How do the mitochondria help the sperm to carry out its function?

.....

.....

(1 mark)

4 (a) (ii) The nucleus of the sperm cell is different from the nucleus of body cells.

Give **one** way in which the nucleus is different.

.....

.....

(1 mark)

4 (b) Stem cells from human embryos are used to treat some diseases in humans.

Explain why.

.....

.....

.....

.....

(2 marks)

4

4.1.2.3 Stem cells

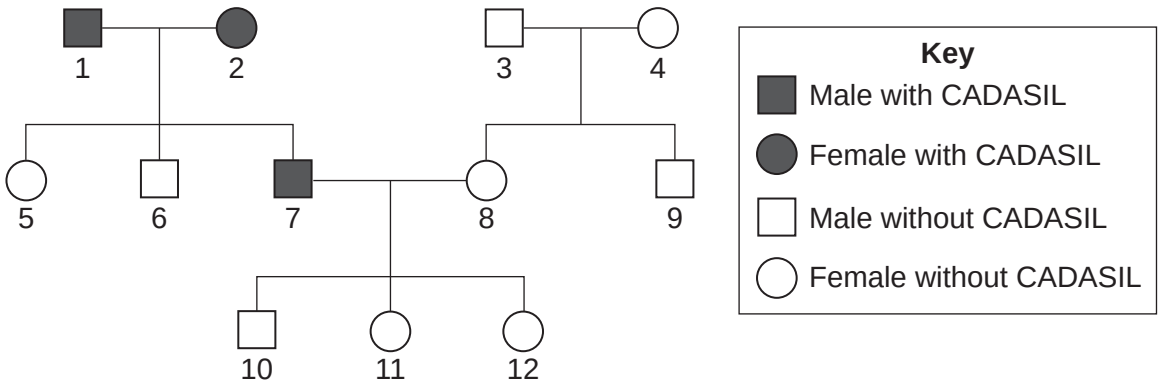
Question 05

January 2013 | BL2HP | Original Q6 | Legacy

6 CADASIL is an inherited disorder caused by a dominant allele.

CADASIL leads to weakening of blood vessels in the brain.

The diagram shows the inheritance of CADASIL in one family.



6 (a) CADASIL is caused by a *dominant allele*.

6 (a) (i) What is a *dominant allele*?

.....

.....

(1 mark)

6 (a) (ii) What is the evidence in the diagram that CADASIL is caused by a dominant allele?

.....

.....

(1 mark)

6 (a) (iii) Person **7** has CADASIL.

Is person **7** homozygous or heterozygous for the CADASIL allele?

Give evidence for your answer from the diagram.

.....

.....

(1 mark)

4.1.2.3 Stem cells

Question 05 · continued

6 (b) Persons **7** and **8** are planning to have another baby.
Use a genetic diagram to find the probability that the new baby will develop into a person with CADASIL.

Use the following symbols to represent alleles.

D = allele for CADASIL
d = allele for not having CADASIL

Probability = ...
(4 marks)

6 (c) Scientists are trying to develop a treatment for CADASIL using stem cells.

Specially treated stem cells would be injected into the damaged part of the brain.

6 (c) (i) Why do the scientists use stem cells?

.....

.....

.....

.....
(2 marks)

6 (c) (ii) Embryonic stem cells can be obtained by removing a few cells from a human embryo.

In 2006, scientists in Japan discovered how to change adult skin cells into stem cells.

Suggest **one** advantage of using stem cells from adult skin cells.

.....

.....
(1 mark)

10

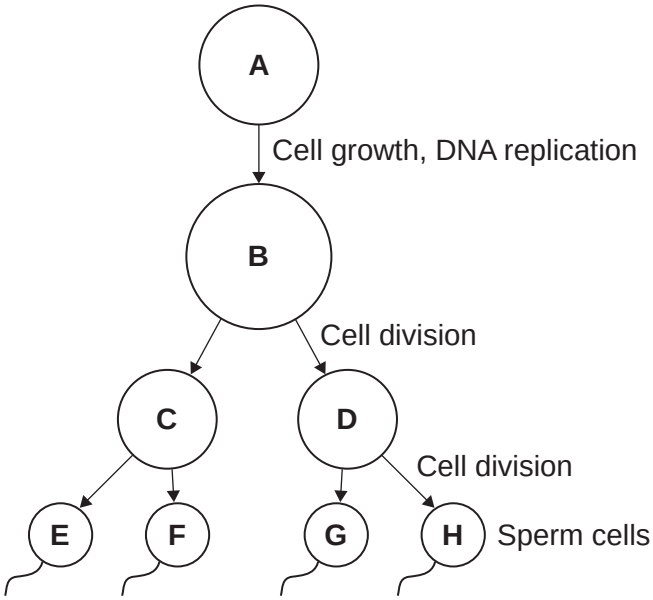
4.1.2.3 Stem cells

Question 06

June 2016 | BL2HP | Original Q5 | Legacy

5 **Figure 4** shows the production of human sperm cells.

Figure 4



5 (a) Name the organ where the processes shown in **Figure 4** take place.

[1 mark]

_____

5 (b) (i) Not every cell in **Figure 4** contains the same amount of DNA.

Cell **A** contains 6.6 picograms of DNA (1 picogram = 10^{-12} grams).

How much DNA is there in each of the following cells?

[2 marks]

Cell **B** _____ picograms

Cell **C** _____ picograms

Cell **E** _____ picograms

5 (b) (ii) How much DNA would there be in a fertilised egg cell?

[1 mark]

_____ picograms

5 (b) (iii) A fertilised egg cell divides many times to form an embryo.

Name this type of cell division.

[1 mark]

_____

4.1.2.3 Stem cells

Question 06 · continued

5 (c) After a baby is born, stem cells may be collected from the umbilical cord. These can be frozen and stored for possible use in the future.

5 (c) (i) What are stem cells?

[2 marks]

5 (c) (ii) Suggest why it is ethically more acceptable to take stem cells from an umbilical cord instead of using stem cells from a 4-day-old embryo produced by In Vitro Fertilisation (IVF).

[1 mark]

5 (c) (iii) Stem cells taken from a child's umbilical cord could be used to treat a condition later in that child's life.

Give **one** advantage of using the child's own umbilical cord stem cells instead of using stem cells donated from another person.

[1 mark]

5 (c) (iv) Why would it **not** be possible to treat a genetic disorder in a child using his own umbilical cord stem cells?

[1 mark]

10

4.1.2.3 Stem cells

Question 07

June 2016 | BL3HP | Original Q9 | Legacy

9 **Figure 8** shows some information about 'stem cell burgers'.

Figure 8

The first laboratory burger has now been cooked

In July 2013 the first burger grown from cow stem cells was cooked.

Muscle stem cells from cows were grown into strands of beef in a laboratory. About 20 000 strands of beef were then made into a burger. The burger can be cooked and eaten by humans. This type of meat is called cultured meat.

The cultured meat is exactly the same as normal cow muscle tissue and the cells are not genetically modified.

9 (a) (i) Some scientists think using cultured meat instead of traditionally-produced meat will help reduce global warming.

Suggest **two** reasons why using cultured meat may slow down the rate of global warming.

[2 marks]

1 _____

_____

2 _____

_____

9 (a) (ii) Suggest **two** other possible advantages of producing cultured meat instead of farmed meat.

Do **not** refer to cost in your answer.

[2 marks]

1 _____

_____

2 _____

_____

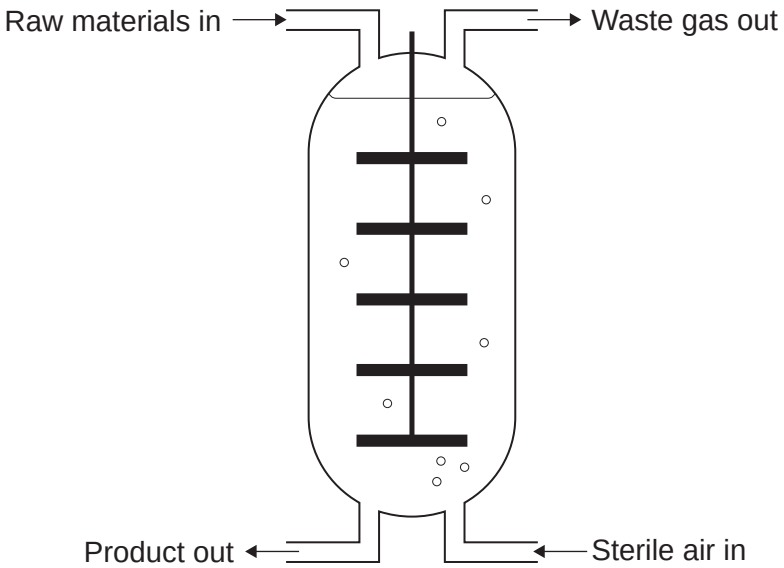
4.1.2.3 Stem cells

Question 07 · continued

9 (b) Mycoprotein is one type of food that is mass-produced.

Figure 9 shows a fermenter used to produce mycoprotein.

Figure 9



Describe how mycoprotein is produced.

[4 marks]

8

4.1.2.3 Stem cells

Question 08

June 2018 | 8461/1H | Original Q6

0 6 Cystic fibrosis (CF) is a genetic disorder caused by a change in a gene.

0 6 . 1 What molecule are genes made of?

[1 mark]

0 6 . 2 CF affects the cell membranes of cells in the lungs and digestive system.

What is the function of the cell membrane?

[1 mark]

0 6 . 3 In a person with CF, cells lining the lungs and digestive system create too much mucus.

The mucus can:

- block the duct leading from the pancreas to the small intestine
- block the tubes leading to the alveoli in the lungs.

Explain why children with CF grow more slowly than children without CF.

[6 marks]

4.1.2.3 Stem cells

Question 08 · continued

Table 6 shows information about people in the UK in 2015.

Table 6

	Median age in years
People with CF	19
Whole population	40

0 6 . 4 Describe how the median age of a group of people can be determined.

[2 marks]

0 6 . 5 Suggest **one** reason why the median age for people with CF is lower than the median age for the whole population.

[1 mark]

Question 08 · continued

0 6 . 6 People with a lung function below 30% may need a lung transplant.

Table 7 gives information about people with CF in 2015.

Table 7

Lung Function (%)	Percentage of people with CF
>75	22
51 – 75	72
30 – 50	4
<30	2

In 2015, the total number of people with CF in the UK was 10 800.

Calculate how many people with CF in the UK in 2015 would **not** need a lung transplant.

[2 marks]

Number of people = _____

4.1.2.3 Stem cells

Question 08 · continued

0 6 . 7 Lung transplants from donors have risks. One risk is organ rejection.

Scientists are researching how to solve the problem of organ rejection and hope to use stem cells to create healthy lungs.

The healthy lungs can then be transplanted into CF patients without the risk of organ rejection.

Describe how scientists may use stem cells to create healthy lungs that are **not** rejected by the CF patient.

[4 marks]

0 6 . 8 Some people disagree with the use of stem cells because of the risk of cancer.

Give **one** other reason why some people disagree with the use of stem cells to create new organs for transplants.

[1 mark]

18

4.1.2.3 Stem cells

Question 09

0 4 Plants and animals have many defence responses.

0 4 . 1 **Table 5** shows some plant defences.

Identify whether each defence is a chemical response or a physical response.

[2 marks]

Tick (✓) **one** box in each row.

Table 5

	Type of response	
Plant defence	**Chemical**	**Physical**
Thick, waxy layer on leaf surface		
Berries that are poisonous		
Bark on trees that falls off		

Mimicry is a mechanical adaptation seen in both plants and animals.

Figure 5 shows two insects.

Figure 5



Hornet **Hornet Moth**

0 4 . 2 Hornets are insects that sting other animals and cause pain.

Hornet moths do **not** sting other animals.

Suggest how mimicry helps the **hornet moth** survive.

[1 mark]

Question 4 continues on the next page

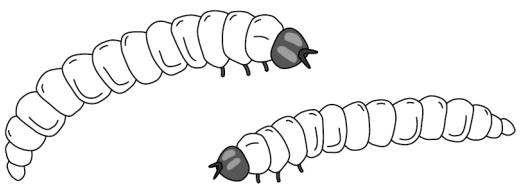
4.1.2.3 Stem cells

Question 09 · continued

Adult hornet moths lay eggs that hatch into larvae.

Figure 6 shows the larvae of a hornet moth.

Figure 6



0 4 . 3 The larvae of the hornet moth:

- live inside the roots of trees
- use the tree roots as a source of food
- cause damage to the tree roots.

Explain why a tree might die if the roots of the tree are damaged.

[6 marks]

4.1.2.3 Stem cells

Question 09 · continued

0 4 . 4 The larvae of the hornet moth form when fertilised eggs divide by mitosis.

Describe how mitosis produces two genetically identical cells.

[4 marks]

0 4 . 5 The cells which are first formed from the fertilised eggs of the hornet moth are stem cells.

Name the process by which these stem cells then form specialised cells.

[1 mark]

14

4.1.2.3 Stem cells

Question 10

June 2023 | 8461/1H | Original Q1

0 1 A root is a plant organ.

Plant roots contain many different types of tissue.

0 1 . 1 What is a tissue?

[1 mark]

0 1 . 2 Tissue in the tip of a plant root contains stem cells.

Stem cells can differentiate into any type of cell.

Name the type of tissue in plants that contains stem cells.

[1 mark]

In the past many drugs were extracted from plants.

0 1 . 3 Aspirin is a painkiller.

Which plant does aspirin originate from?

[1 mark]

Question 1 continues on the next page

4.1.2.3 Stem cells

Question 10 · continued

Scientists have extracted chemical **A** from the deadly nightshade plant.

Chemical **A** can be used as a painkiller.

Table 1 shows information about where chemical **A** is found.

Table 1

Part of deadly nightshade plant	Mass of chemical A in 100 g of plant tissue in grams
Roots	1.3
Leaves	1.2
Berries	0.7

0 1 . 4 The scientists usually extract chemical **A** from the berries of the deadly nightshade plant.

Suggest **one** reason why berries are used instead of leaves or roots.

[1 mark]

4.1.2.3 Stem cells

Question 10 · continued

A deadly nightshade plant has chlorosis (yellow leaves).

The mass of chemical **A** found in the **leaves** of the plant is 60% of the mass shown in **Table 1**.

0 1 . 5 Calculate the mass of chemical **A** in 200 g of the **leaves** with chlorosis.

Give your answer in mg.

[4 marks]

Mass of chemical **A** = _____ mg

0 1 . 6 Suggest **one** reason why the leaves of the deadly nightshade plant have chlorosis.

[1 mark]

Question 1 continues on the next page

4.1.2.3 Stem cells

Question 10 · continued

Chemical **A** has **not** been tested in large-scale clinical trials in the UK.

0 1 . 7 It is important for drugs to be tested in clinical trials before the drugs are approved for use by the public.

Give **two** reasons why.

[2 marks]

1 _____

_____

2 _____

_____

There are many online reports making claims about the effects of chemical **A**.

Some of these reports are biased.

0 1 . 8 Suggest **one** reason why a report making claims about the effects of chemical **A** may be biased.

[1 mark]

_____

_____

4.1.2.3 Stem cells

Question 10 · continued

0 1 . 9 How can scientists be sure that claims about new drugs are valid?

[1 mark]

Tick (✓) **one** box.

- Advertise the claims on social media. ☐
- Ask an international company to produce the drug. ☐
- Have the claims peer reviewed. ☐
- Publish the claims in a newspaper. ☐

13

Turn over for the next question

4.1.2.3 Stem cells

Question 11

June 2025 | 8461/1H | Original Q7

0 7 In people with severe liver disease the liver stops working correctly.

A person with severe liver disease can be treated with:

- an injection of embryonic stem cells
  or
- a liver transplant from a donor.

The person's body can reject embryonic stem cells and can reject a liver transplanted from a donor.

0 7 . 1 What property of embryonic stem cells makes them suitable to treat liver disease?

[1 mark]

0 7 . 2 Suggest **one ethical** reason why a person may **not** want an injection of embryonic stem cells.

[1 mark]

4.1.2.3 Stem cells

Question 11 · continued

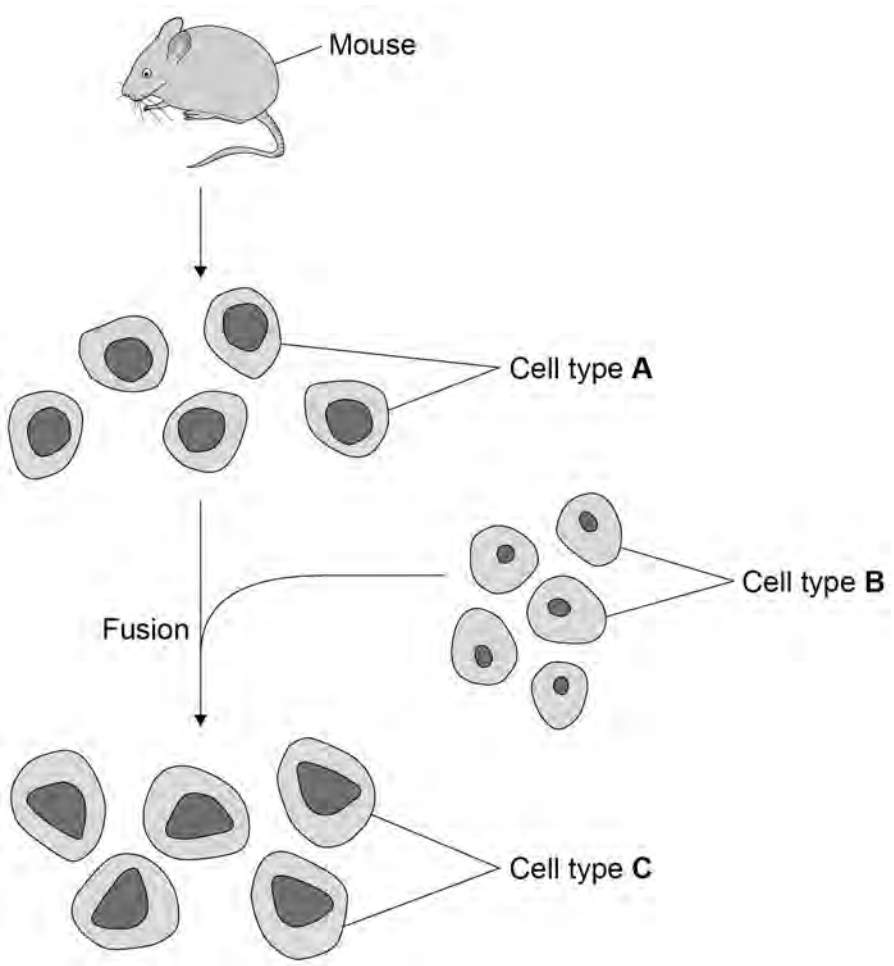
Drugs can be used to reduce the risk of liver rejection after a transplant.

One drug contains monoclonal antibodies.

The monoclonal antibodies are specific to an antigen on the surface of liver cells.

Figure 9 shows part of the process used to create the monoclonal antibodies.

Figure 9



0 7 . 3 Name the **three** types of cell in **Figure 9**.

[3 marks]

A _____

B _____

C _____

4.1.2.3 Stem cells

Question 11 · continued

0 7 . 4 How is the mouse stimulated to produce cell type **A**?

[1 mark]

0 7 . 5 A patient with severe liver disease was given a liver transplant.

The drug containing the monoclonal antibody is given to the patient.

Explain how the monoclonal antibody stops the patient's white blood cells from attacking the cells of the donor liver.

[3 marks]

0 7 . 6 Give **one** other use of monoclonal antibodies.

Do **not** refer to pregnancy tests.

[1 mark]

Question 7 continues on the next page

4.1.2.3 Stem cells

Question 11 · continued

The liver produces bile.

Bile is needed for efficient digestion.

0 7 . 7 Where is bile stored in the human body?

[1 mark]

Tick (✓) **one** box.

- Gall bladder ☐
- Kidney ☐
- Pancreas ☐
- Small intestine ☐

0 7 . 8 Explain why a person with severe liver disease has difficulty digesting fats.

[6 marks]

17