

Edexcel IGCSE(9-1) Biology

Specification Based Exam Questions

Part 5: Use of Biological Resources

This resource is to help you gain exam technique as well as understand what is needed to develop your answers to nearly all the points of the specification. You should use this in conjunction with other revision practices.

Good luck!

5 Use of biological resources

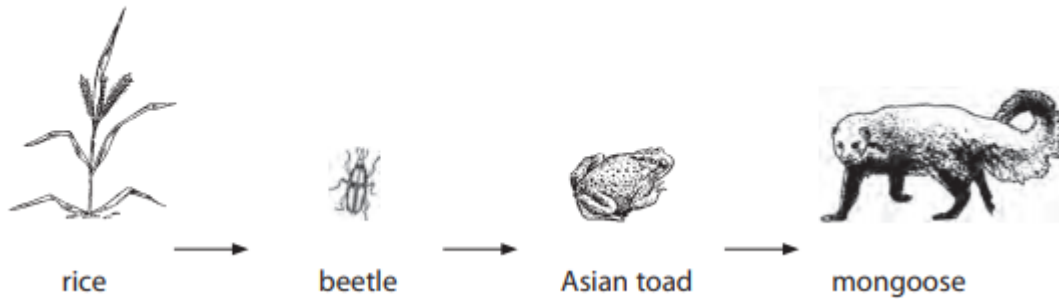
5.1 describe how glasshouses and polythene tunnels can be used to increase the yield of certain crops

5.2 understand the effects on crop yield of increased carbon dioxide and increased temperature in glasshouses

5.3 understand how the use of fertiliser can increase crop yield

5.4 understand the reasons for pest control and the advantages and disadvantages of using pesticides and biological control with crop plants

5 This food chain shows feeding relationships in paddy fields in Sri Lanka and India.



(b) Give **two** environmental factors that could affect the growth of the rice crop. (2)

- 1
- 2

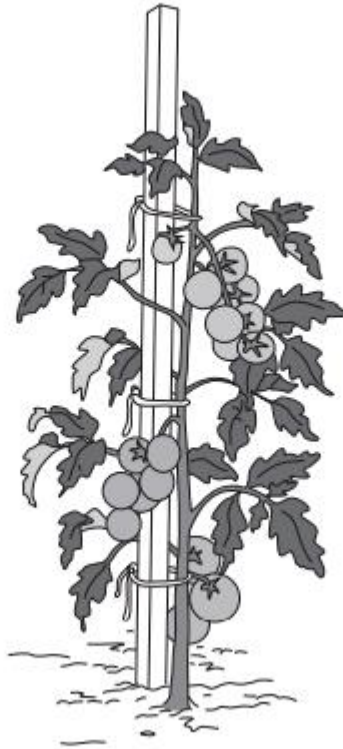
(c) Suggest why a farmer might choose to use a chemical pesticide in his paddy field. (2)

-
-
-

(d) Describe how the farmer could use biological control in his paddy field. (2)

-
-
-
-
-

2 The picture shows a tomato plant grown in a glasshouse.



The production of tomatoes is affected by an insect pest called the tomato leaf miner. The photograph shows a tomato leaf that has been damaged by the tomato leaf miner.



The adult female leaf miner lays eggs on tomato leaves that develop into maggots (larvae). These maggots feed on leaf mesophyll tissue inside the leaf.

(a) Explain how feeding on mesophyll tissue will affect tomato production.

(3)

(c) The release of an insect species called *Trichogramma* has been successful in controlling the leaf miner. *Trichogramma* feeds on the leaf miner.

Name this type of pest control.

(1)

(d) Suggest why the release of sterile male tomato leaf miners has also been successful in controlling the leaf miner.

(2)

5.5 understand the role of yeast in the production of food including bread

4 Some food products are made using microorganisms.

The table gives information about the production of two of these food products.

(a) Complete the table by giving the missing information.

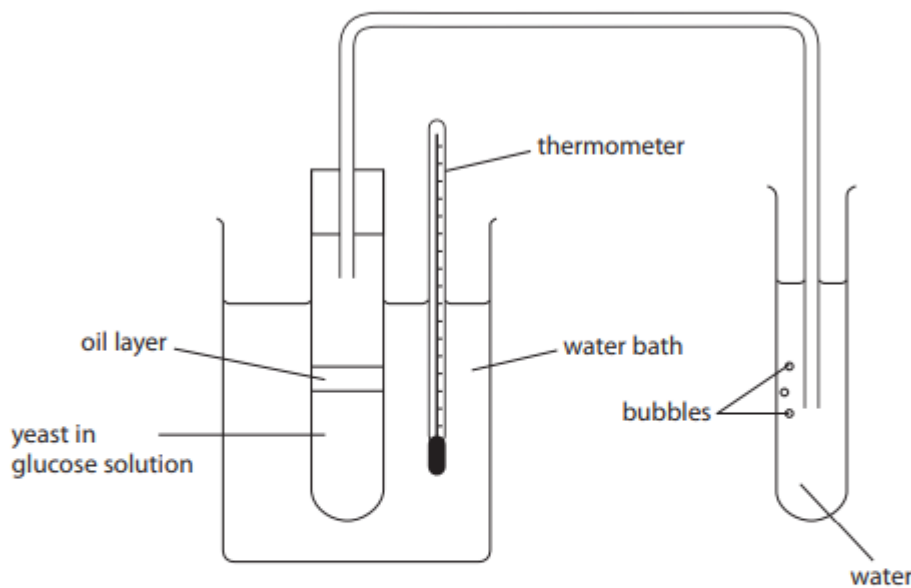
(5)

Food product	Name of organism used	Group organism belongs to	Substrate used	Type of respiration	Chemical product
	<i>Saccharomyces</i> (yeast)	fungus	glucose		ethanol
yoghurt		bacteria		aerobic	

5.6 practical: investigate the role of anaerobic respiration by yeast in different conditions

6 John wanted to investigate the effect of temperature on the rate of carbon dioxide production by yeast.

He set up this apparatus.



(a) The oil layer prevents the entry of air into the glucose solution.

Explain why this is necessary.

(2)

.....

.....

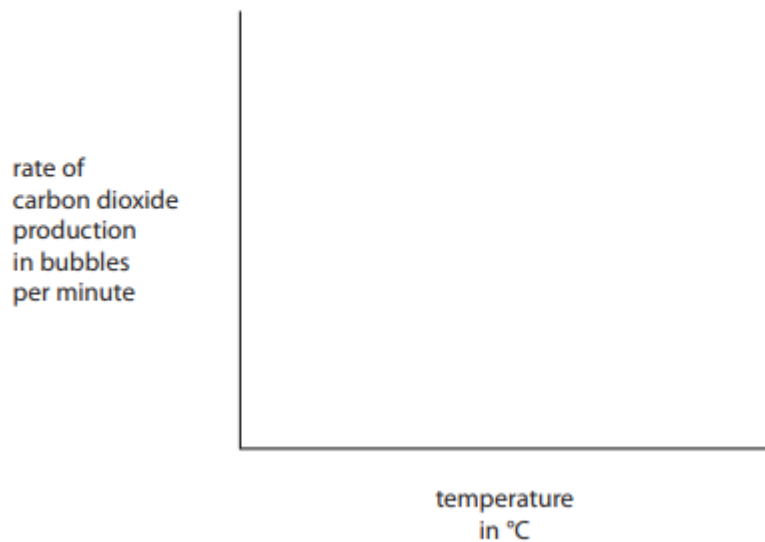
.....

.....

(b) John varied the temperature of the water bath between 15 °C and 65 °C. He measured the rate of carbon dioxide production by counting the number of bubbles per minute.

(i) Sketch the shape of the graph that John would obtain on the axes below.

(3)



(ii) Give the dependent variable in this experiment.

(1)

(iii) Give the independent variable in this experiment.

(1)

(c) Give **two** variables that John would need to keep the same in his experiment.

(2)

1

2

(d) Suggest **one** way that John could improve the reliability of his experiment.

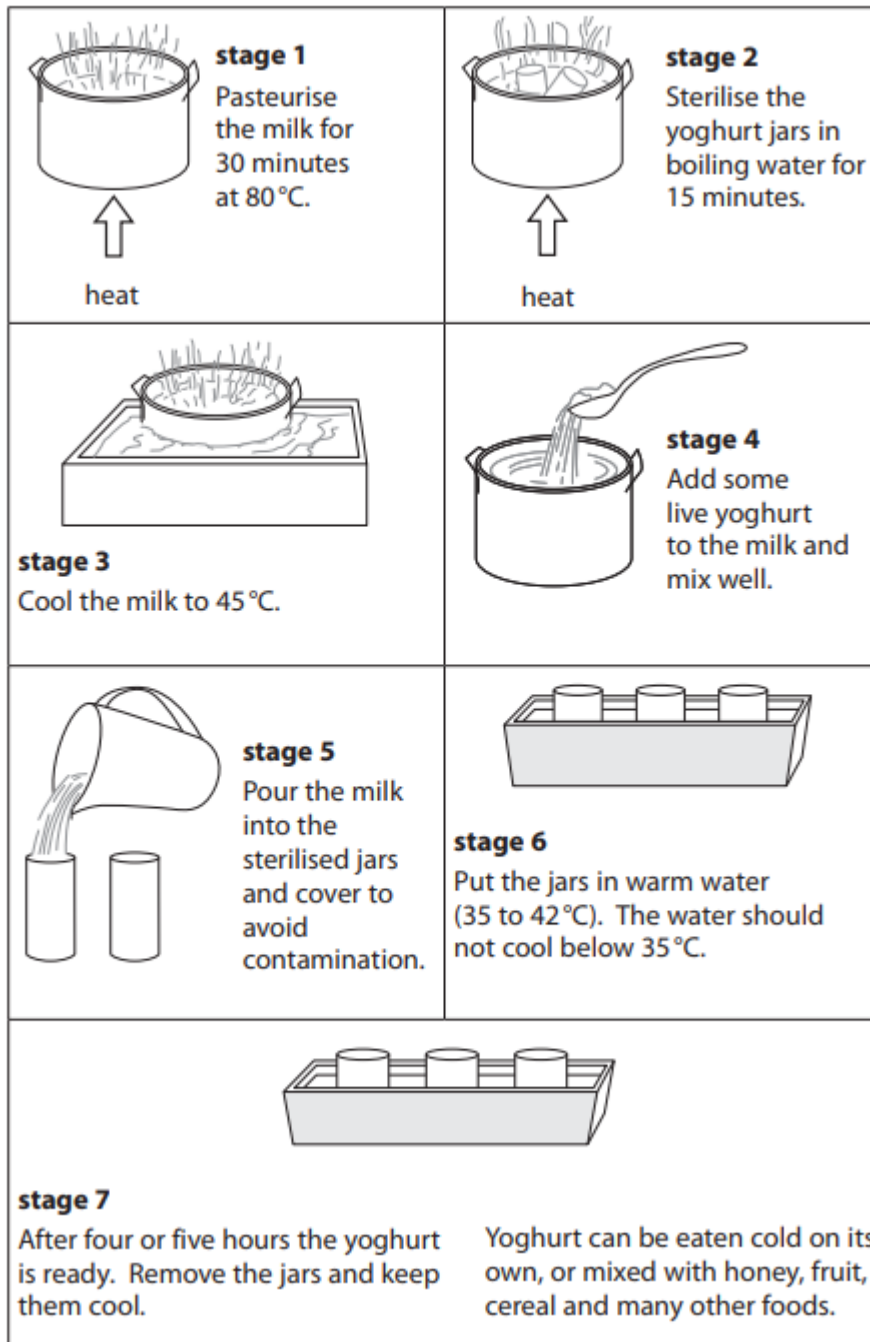
(1)

(e) Suggest how John could improve the accuracy of his measurement of the rate of carbon dioxide production.

(1)

5.7 understand the role of bacteria (*Lactobacillus*) in the production of yoghurt

3 A student wants to make yoghurt. The diagram shows what she did.



(a) Which two stages help to improve the production of yoghurt by killing bacteria that compete with *Lactobacillus*?

(2)

..... and

(b) Explain why the milk needed to be cooled to 45 °C in stage 3.

(2)

.....
.....
.....
.....

(c) Explain what could happen to the production of yoghurt if the jars used in stage 5 had not been sterilised in stage 2.

(2)

.....
.....
.....
.....

(d) Explain what would happen to the production of yoghurt if the water cooled below 35 °C in stage 6.

(2)

.....
.....
.....
.....

(e) The student added fruit to her yoghurt to improve the taste.

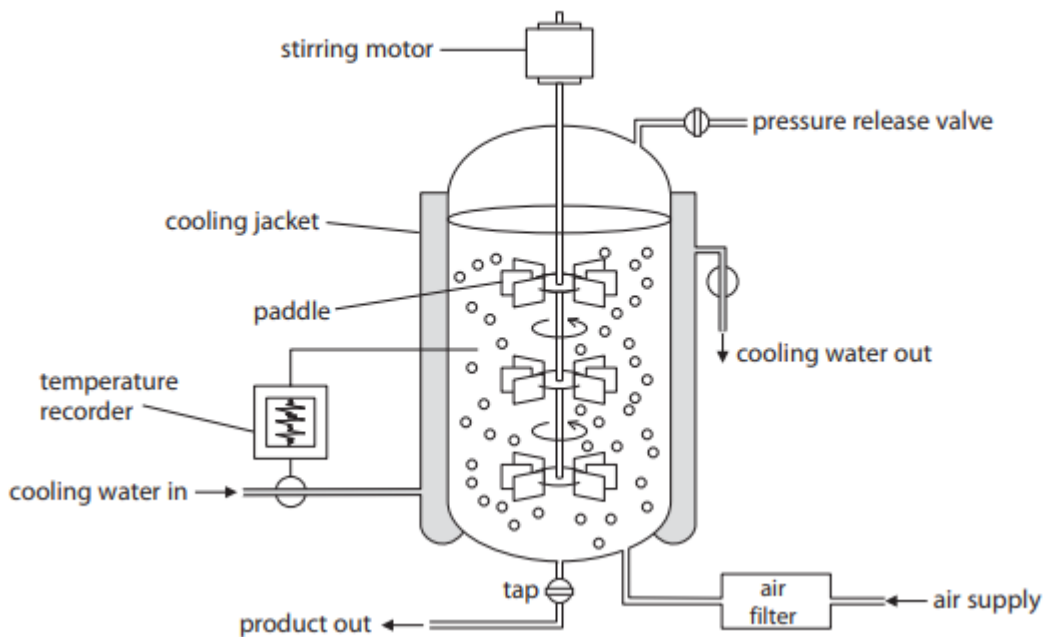
Suggest how adding fruit to yoghurt also helps to maintain healthy skin.

(1)

.....
.....

5.8 understand the use of an industrial fermenter and explain the need to provide suitable conditions in the fermenter, including aseptic precautions, nutrients, optimum temperature and pH, oxygenation and agitation, for the growth of microorganisms

1 The diagram shows a fermenter used for growing micro-organisms.



(a) (i) Explain the function of the paddles in the fermenter.

(2)

(ii) Explain why the pH in the fermenter needs to be controlled.

(2)

(iii) Name one useful product that can be made in this fermenter.

(1)

(b) Some micro-organisms grown in anaerobic conditions will produce a fuel called biogas.

Explain two changes that need to be made to the design of the fermenter so it can be used to produce biogas by anaerobic fermentation.

(2)

1

.....

.....

2

.....

.....

.....

Suggest why it is important to introduce air into the fermenter.

(2)

.....

.....

.....

.....

(d) Before being used the empty fermenter is cleaned using steam.

Suggest why.

(2)

.....

.....

.....

.....



5.9B understand the methods used to farm large numbers of fish to provide a source of protein, including maintaining water quality, controlling intraspecific and interspecific predation, controlling disease, removing waste products, controlling the quality and frequency of feeding, and selective breeding

3 Explain the methods used to produce large numbers of fish in a fish farm.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

5 Methods of fish farming have changed as more countries become involved in the industry.

(a) Suggest two reasons why more of our fish are supplied by fish farming rather than from traditional fishing.

(2)

1

.....

2

.....

(b) This photograph shows a new type of fish farm which has been developed in Denmark.



© <https://stateofgreen.com>

Fish farm in Denmark

This new type of fish farm differs from traditional fish farms because

- it uses water from under the ground instead of from rivers
- it uses fewer antibiotics

(i) Suggest one advantage of using water from under the ground rather than from rivers. (1)

.....

.....

(ii) Suggest the advantage of using fewer antibiotics in fish farms. (2)

.....

.....

.....

.....

(c) Another advantage of the new type of fish farm is the reduction in waste discharge.

The figures for a new type of fish farm and a traditional fish farm are shown in the table.

Nutrient waste	Mass of discharge in kg per tonne of fish produced		Discharge from new type of fish farm as a percentage of discharge from traditional farm
	traditional fish farm	new type of fish farm	
total nitrate	31.2	20.0	64.1
total phosphate	2.9	1.1	

(i) Calculate the total phosphate in the waste from the new type of farm as a percentage of the total phosphate in the waste from the traditional farm.

Show your working.

(2)

percentage = %

(ii) If waste from fish farms is released into rivers it will cause pollution.

Design an investigation to compare the pollution caused by waste released from the new type of fish farm with waste released from a traditional fish farm.

Your answer should include experimental details and be written in full sentences.

(6)

A series of horizontal dashed lines provided for writing the answer.

3 Fish produce and release nitrogenous waste.

(a) Suggest why two fish of the same size may produce different masses of nitrogenous waste.

(1)

.....

.....

.....

(b) The table shows the mass of nitrogenous waste released into the environment by four different fish farms.

Type of fish farm	Nitrogenous waste released in kg per 1000 kg fish produced
salmon	48.2
halibut	67.1
cod	72.3
haddock	72.3

Calculate the mass of nitrogenous waste released into the environment when 400 kg of cod fish are produced. Show your working.

(2)

mass = kg

1 Fish can be produced in large numbers on fish farms.

Design an investigation to find out if the growth of fish is affected by the temperature of the water in which they are farmed.

(6)

5.10 understand how selective breeding can develop plants with desired characteristics

7 The passage describes selective breeding.

Complete the passage by writing a suitable word in each of the spaces.

(4)

Selective breeding involves choosing organisms

with desired

These organisms are allowed to breed and produce

The process is for several generations.

(ii) Give **one** example of a desired characteristic developed by selective breeding in a **named** crop plant.

(2)

desired characteristic

crop plant

5.11 understand how selective breeding can develop animals with desired characteristics

(i) Describe the process of **selective breeding**.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

6 Flies lay their eggs in the urine and faeces that sticks to the wool on sheep. The eggs hatch and the larvae damage the skin of the sheep leading to infection.

To reduce this problem, farmers in New Zealand have been developing sheep that have no wool growth on their legs, their backside or on the underside of their abdomen.

(a) Suggest why flies are attracted to urine and faeces.

(1)

(b) Farmers have crossed different breeds of sheep to produce offspring with desired characteristics. The characteristics of different breeds of sheep are shown in the table.

Breed of sheep	Characteristic
Cheviot	bare heads and legs
East Friesian	bare backsides
Wiltshire	bare abdomens

Describe how farmers could use selective breeding to develop sheep with bare legs and bare backsides.

(4)

(c) Describe two differences between selective breeding and natural selection.

(2)

1.....

2.....

(d) Farmers sometimes use pesticides to prevent flies attacking sheep.
Give two problems with the use of chemical pesticides.

(2)

1.....

2.....

1 Farmers have used selective breeding to produce cows that give high milk yields.

(a) Describe how selective breeding can be used to produce cattle that give high milk yields.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

5.12 understand how restriction enzymes are used to cut DNA at specific sites and ligase enzymes are used to join pieces of DNA together

(ii) Name two enzymes that are used to genetically modify the DNA of the bacteria. (2)

1

2

(a) The process of genetic modification used to produce this sheep involves the use of two types of enzyme. One enzyme cuts DNA and the other enzyme joins DNA. The process also used a vector.

(i) Name the enzyme that cuts DNA. (1)

.....

(ii) Name the enzyme that joins DNA. (1)

.....

5.13 understand how plasmids and viruses can act as vectors, which take up pieces of DNA, and then insert this recombinant DNA into other cells

(a) (i) Name the small circle of DNA that is genetically modified in bacteria. (1)

.....

(iii) Name a vector. (1)

.....

3 Describe the stages by which a bacterium can be genetically modified to produce large amounts of a named human protein.

(5)

5.14 understand how large amounts of human insulin can be manufactured from genetically modified bacteria that are grown in a fermenter



(c) (i) Describe how bacteria can be genetically modified to produce human insulin.

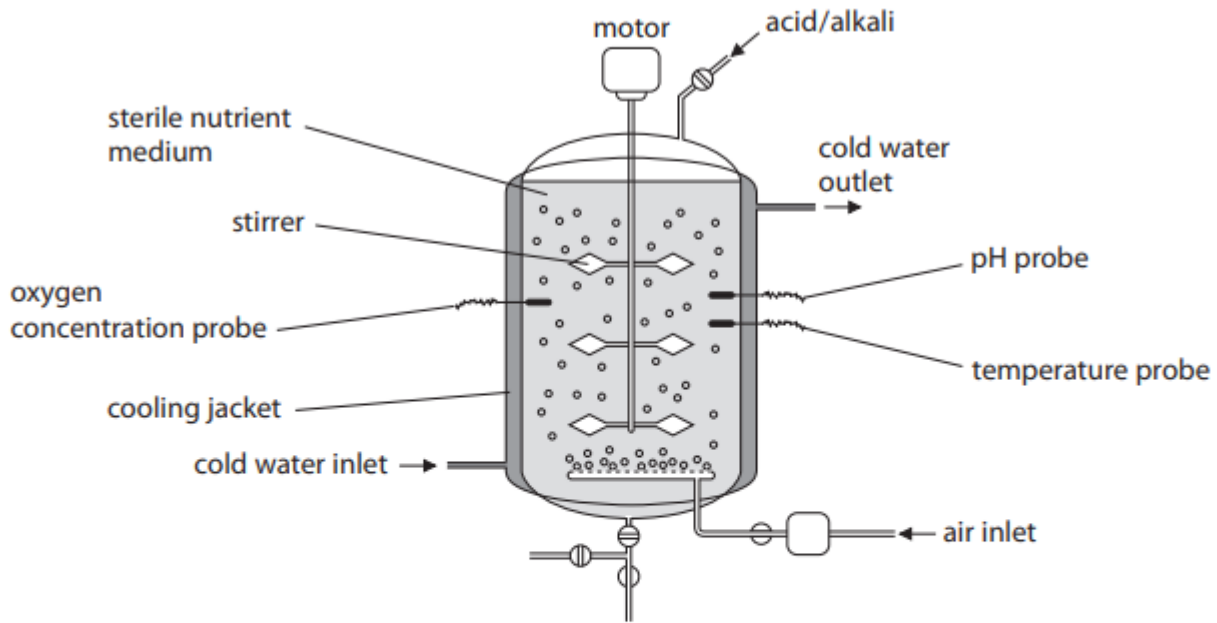
(5)

(ii) The term that best describes bacteria that have been genetically modified to produce human insulin is

(1)

- A** antibiotic
- B** aseptic
- C** pathogenic
- D** transgenic

(d) The diagram shows part of a fermenter used to grow large numbers of genetically modified bacteria.



(i) Suggest how the air inlet helps the genetically modified bacteria to grow. (2)

(ii) If the pH probe stops working the pH in the fermenter becomes more acidic. Describe and explain how this affects the production of human insulin. (4)

5.15 understand how genetically modified plants can be used to improve food production



1 Plants can be genetically modified (GM) to make them resistant to pests.

Describe an investigation that could be carried out to find out if GM plants produce a better yield than normal plants.

Your answer should include experimental details and be written in full sentences.

(6)

Area with horizontal dashed lines for writing the answer.

5.16 understand that the term transgenic means the transfer of genetic material from one species to a different species

5 (a) Explain what is meant by the term **transgenic organism**.

(2)

.....

.....

.....

.....

(b) Give one example of the use of transgenic organisms.

(1)

.....

.....

5.17B describe the process of micropropagation (tissue culture) in which explants are grown *in vitro*

5 The passage describes tissue culture in plants.

Complete the passage by writing a suitable word or words in each of the spaces.

(10)

Plant scientists use the technique of micropropagation to produce large numbers of genetically plants.

A small fragment of plant, called an, is cut using a scalpel.

The scalpel needs to be to reduce the risk of contamination by

The fragment is then placed in a vessel containing a medium.

This medium needs to contain, to provide the growing plants with energy. It also contains mineral ions such as magnesium for production and

for amino acids. The advantages of micropropagation include the ability to produce

..... numbers of plants and it can be done

at time of year.

- 5 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Micropropagation: good or bad?

Plant cells have the ability to produce a genetically identical copy of their parent plant. They can do this because the information is coded in the sequence of bases in their DNA. Micropropagation involves taking small pieces, known as explants, from a plant with the desired characteristics. The explants are sterilised and then put into a growth medium containing sucrose, amino acids and a variety of minerals as well as growth promoting chemicals.

5

All the young plants produced from the original cell or piece of tissue are clones. The sterile conditions in which they have been grown allow these plants to be disease free. Micropropagation can also produce plants which are free of pathogens such as viruses.

10

Micropropagation is used to produce commercial quantities of plants. Large quantities of flowers are cloned in this way. The quality and characteristics of the flowers produced can be controlled more easily than when using sexual methods of reproduction. With rare or endangered plant species, micropropagation may be the last chance of reproducing them if more conventional methods have failed.

15

The process has been used to create large numbers of palm oil plants. The oil extracted from these plants can be used in a wide variety of food and consumer products. It can also be used to make biofuel for use as a sustainable energy source in cars.

20

The increased demand for the use of palm oil has had serious environmental consequences, with huge areas of rainforest being destroyed to make way for fresh plantations. Today, Malaysia and Indonesia account for 90 per cent of global production. Indonesia already has six million hectares of oil palm plantations, with plans for another four million by 2015 dedicated to biofuel production. This destruction of habitat will result in more rainforests disappearing, pushing several species such as the orangutan towards extinction.

25

- (a) Name one base found in DNA (line 3).

(1)

- (b) Suggest why explants are sterilised (line 4).

(2)

(c) Suggest why amino acids are provided in the growth medium (line 5).

(1)

(d) What is meant by the term **pathogen** (line 10)?

(1)

(e) Suggest two reasons why growers prefer to use micropropagation rather than sexual methods of reproduction to produce good quality flowers (lines 11 to 14).

(2)

1

2

(f) Suggest what is meant by the term **sustainable energy source** (lines 19 and 20).

(1)

1 (a) Describe how the process of micropropagation (tissue culture) can be used to produce plants with desirable characteristics.

(5)

5.18B understand how micropropagation can be used to produce commercial quantities of genetically identical plants with desirable characteristics

(b) Plants can also be produced from seeds.
Give two advantages of using micropropagation rather than using seeds to produce plants with desirable characteristics.

(2)

1.....

2.....

5.19B describe the stages in the production of cloned mammals involving the introduction of a diploid nucleus from a mature cell into an enucleated egg cell, illustrated by Dolly the sheep

(c) There is a shortage of people willing to donate their organs. Scientists hope to create cloned organisms to solve this problem.

(i) What is a **cloned** organism?

(2)

.....

.....

.....

(ii) Suggest **two** advantages of using cloned organisms to provide organs rather than relying on people to donate organs.

(2)

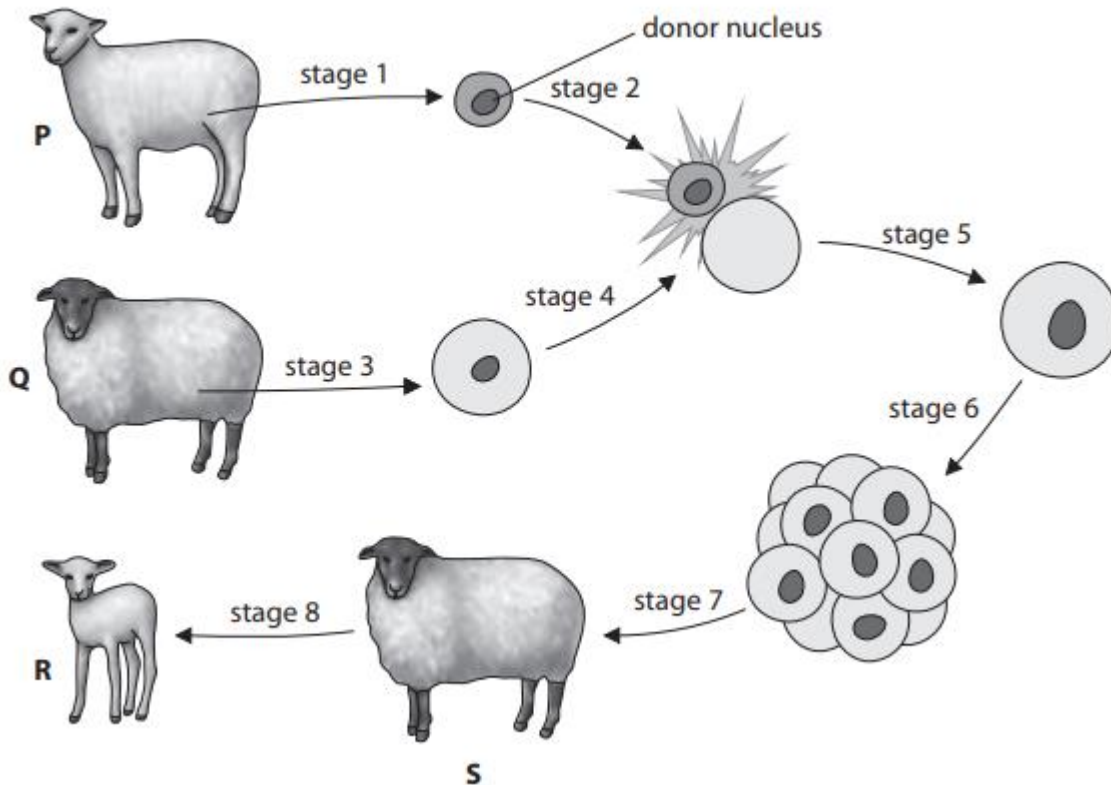
1

.....

2

.....

7 The diagram shows stages in the cloning process that produced Dolly the sheep.



(a) The table lists three events that take place in the cloning process that produced Dolly the sheep.

Complete the table by giving the number of the stage when each event takes place.

(3)

Event	Stage number
cell division produces an embryo	
an embryo is put into a surrogate mother	
an egg cell is collected from a female sheep	

(b) Which sheep in the diagram is Dolly?

(1)

- A P
- B Q
- C R
- D S

(c) Which sheep are genetically identical?

(1)

- A P, Q, R and S
- B P and Q
- C P and S
- D P and R

2 Describe the stages used to produce a cloned mammal.

(5)

3 The photograph shows a Siberian tiger.



Siberian tigers are very rare and are in danger of becoming extinct. Scientists hope to use cloning as a method to increase the number of Siberian tigers.

The passage below describes the process of cloning. Complete the passage by writing a suitable word on each dotted line.

(6)

A nucleus is taken from a body of an adult Siberian tiger.

This nucleus is put into an enucleated cell, a cell that has had

its nucleus removed. The cell is given a mild electric shock to help it divide by a type

of cell division called A ball of cells is produced called

an The ball of cells is placed into the

of a female Bengal tiger. This female tiger is called a mother.

5.20B understand how cloned transgenic animals can be used to produce human proteins

(c) There is a shortage of people willing to donate their organs. Scientists hope to create cloned organisms to solve this problem.

(i) What is a **cloned** organism?

(2)

.....

.....

.....

.....

(ii) Suggest **two** advantages of using cloned organisms to provide organs rather than relying on people to donate organs.

(2)

1

.....

2

.....

2 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Transgenic animals

The term 'transgenic' means the transfer of genetic material from one species to a different species. Cattle, pigs or sheep are made to superovulate and their eggs are collected. The eggs are fertilised and a desired gene is injected into them using a needle. Some of the fertilised eggs take up the gene, which becomes part of one of the animal's chromosomes. The fertilised eggs develop into embryos which are cultured and then implanted into surrogate mothers to complete their development.

5

10

In 1993, the world's first transgenic lamb, known as Tracy, was produced from a fertilised egg which had been injected with a human gene. When Tracy became an adult sheep she was able to produce milk containing the human protein AAT. This protein can be used to treat human lung diseases such as emphysema and cystic fibrosis.



© Science Museum/SSPL

15 Tracy looked like a normal sheep and was able to reproduce. She gave birth to two lambs, one of which inherited her ability to produce AAT milk. Tracy showed that human proteins could be made in other mammals and extracted from their milk. This technique can now be used to obtain milk that contains specific antibodies or blood clotting factors.

20 Another potential use of transgenic animals is to produce organs for transplanting into humans. This is important because of the decreasing availability of human organ donors and the increasing demand for organs.

Transgenic technology can also be used to transfer genes into cattle for disease resistance, increased meat production and increased ability to digest cellulose.

(a) Explain what is meant by the term **gene** (line 3).

(2)

(b) Suggest what is meant by the term **superovulate** (line 2).

(1)

(c) In which part of the surrogate mother are the embryos implanted (lines 6 to 7)?

(1)

(d) Name the human behaviour that can lead to emphysema (line 11).

(1)

(e) What percentage of eggs produced by Tracy were known to contain transgenic DNA (lines 13 to 14)?

(1)

(f) (i) To be able to work, the blood clotting factors must be extracted from the milk.

Suggest why drinking milk containing blood clotting factors will not help to clot blood (line 17).

(1)

(ii) Suggest why it is an advantage to increase the ability of cattle to digest cellulose (line 22).

(2)

(g) Suggest the benefits of producing transgenic hearts.

(3)
