



General Certificate of Secondary Education
2023

Centre Number

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Candidate Number

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Biology

Unit 2

Higher Tier



[GBL22]

GBL22

FRIDAY 9 JUNE, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 90.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **9(b)**.



- 1 (a) The table shows the average percentage of different workers who develop skin cancer in Canada each year.

Type of work	Average percentage of workers who develop skin cancer
Office	8
Farming and forestry	35
Transport	9
Construction of buildings and roads	23
Other workers	25

A total of 4560 workers develop skin cancer each year.

- (i) Calculate the number of workers in farming and forestry who develop skin cancer each year.

Show your working.

_____ [2]

- (ii) Suggest why farm and forestry workers are more likely to develop skin cancer than office workers.

_____ [2]



(b) Explain how skin cancer develops.

[3]

(c) Give **two** ways skin cancer can be treated.

1. _____

2. _____

[2]



2 Coronary heart disease is a type of cardiovascular disease.

In 2019, the number of deaths in Northern Ireland due to coronary heart disease was 86 per 100 000 people.

The population of Northern Ireland in 2019 was approximately 1 885 000.

- (a)** Calculate the number of deaths in Northern Ireland due to coronary heart disease in 2019.

Show your working.

_____ [3]

- (b)** The table shows data on the risk factors which may lead to four people having a heart attack due to coronary heart disease.

Person	Risk factor		
	regular exercise	blood cholesterol level / mg per 100 ml	cigarette smoker
A	yes	200	yes
B	yes	240	no
C	no	200	no
D	no	240	yes

Source: Principal Examiner



(i) Give the letter of the person at highest risk of having a heart attack.

[1]

(ii) Suggest **two** lifestyle changes which this person could make to help reduce their risk of having a heart attack.

1. _____

2. _____

[2]

(c) Drugs such as aspirin can be used to treat cardiovascular disease.

(i) Describe how aspirin helps protect against cardiovascular disease.

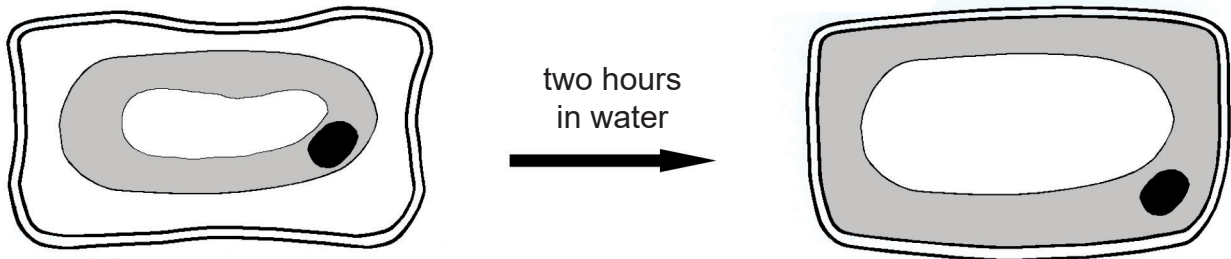
[2]

(ii) Give **one other** drug which can be used to treat cardiovascular disease and explain how it works.

[2]



3 The diagram shows the effect of placing a plant cell in water for two hours.



Source: Chief Examiner

(a) Give the term which describes the appearance of the plant cell **before** it was placed in water for two hours.

[1]

(b) Give **three** ways the plant cell has changed after being placed in water for two hours.

1. _____

2. _____

3. _____

[3]

(c) Name the process which causes these changes.

[1]



(d) Red blood cells were placed in water for two hours.

(i) Give the term which describes what happens to these red blood cells.

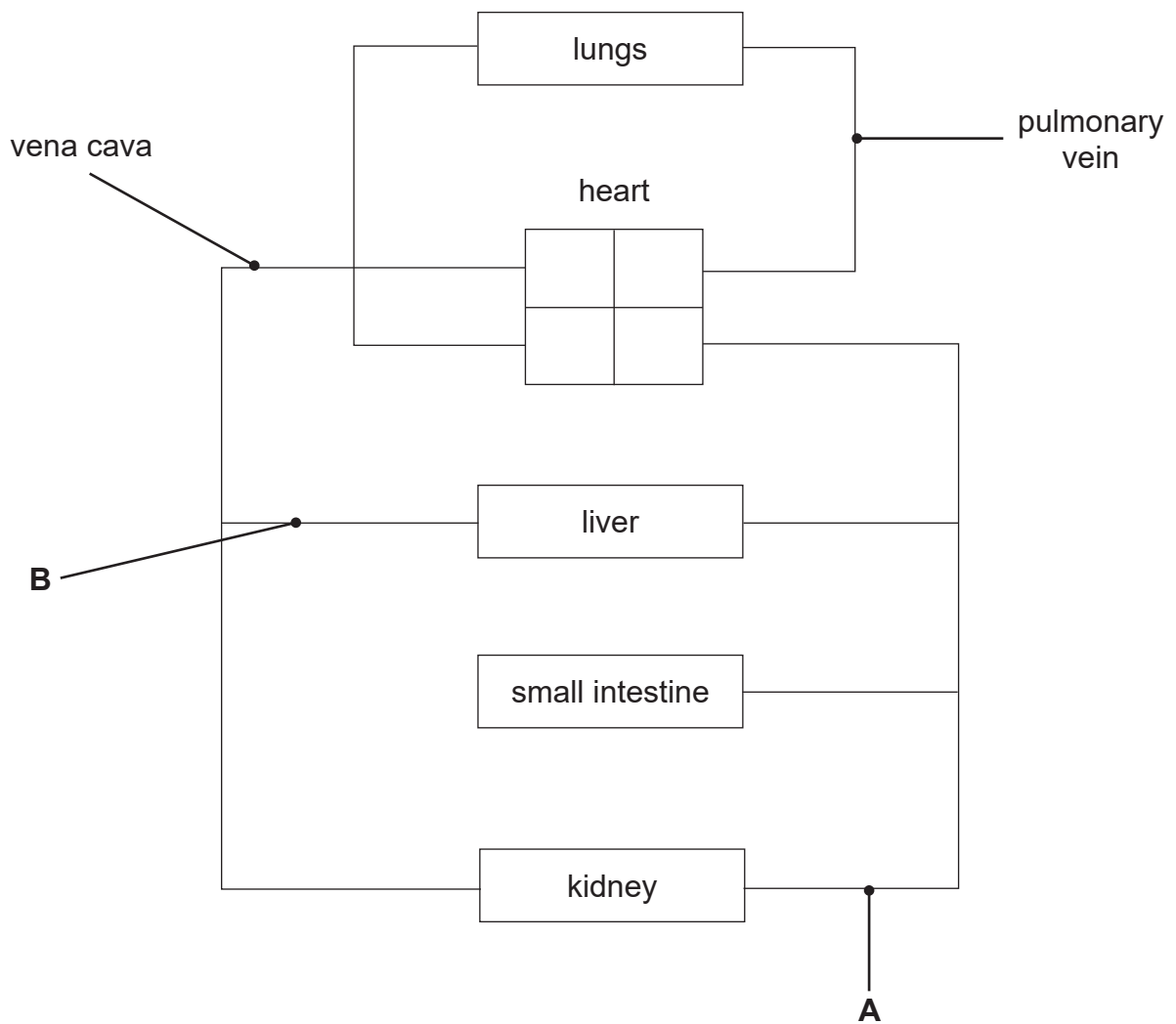
[1]

(ii) Explain why red blood cells behave differently to plant cells when placed in water for two hours.

[1]



4 The diagram shows part of the circulatory system.



Source: Principal Examiner

(a) Name blood vessels **A** and **B**.

A _____

B _____

[2]



(b) Complete the diagram by drawing

- a line to show the hepatic portal vein.
- an arrow to show the direction of blood flow in the pulmonary vein. [2]

(c) (i) Describe **two similarities** in the **structure** of the pulmonary vein and the vena cava.

1. _____

2. _____

_____ [2]

(ii) Describe **one** difference in the composition of the blood in the pulmonary vein and the vena cava.

_____ [1]



5 (a) Complete **Table 1** about female contraception.

Table 1

Type	Example	How it works
chemical	contraceptive pill	
	female condom	
	sterilisation	

[5]

Table 2 compares the effectiveness of some contraceptives when they are used correctly, according to the instructions, and when they are not used correctly.

Table 2

Example	Number of pregnancies per 100 females	
	Used correctly	Not used correctly
contraceptive pill	less than 1	9
female condom	2	18
implant	less than 1	less than 1



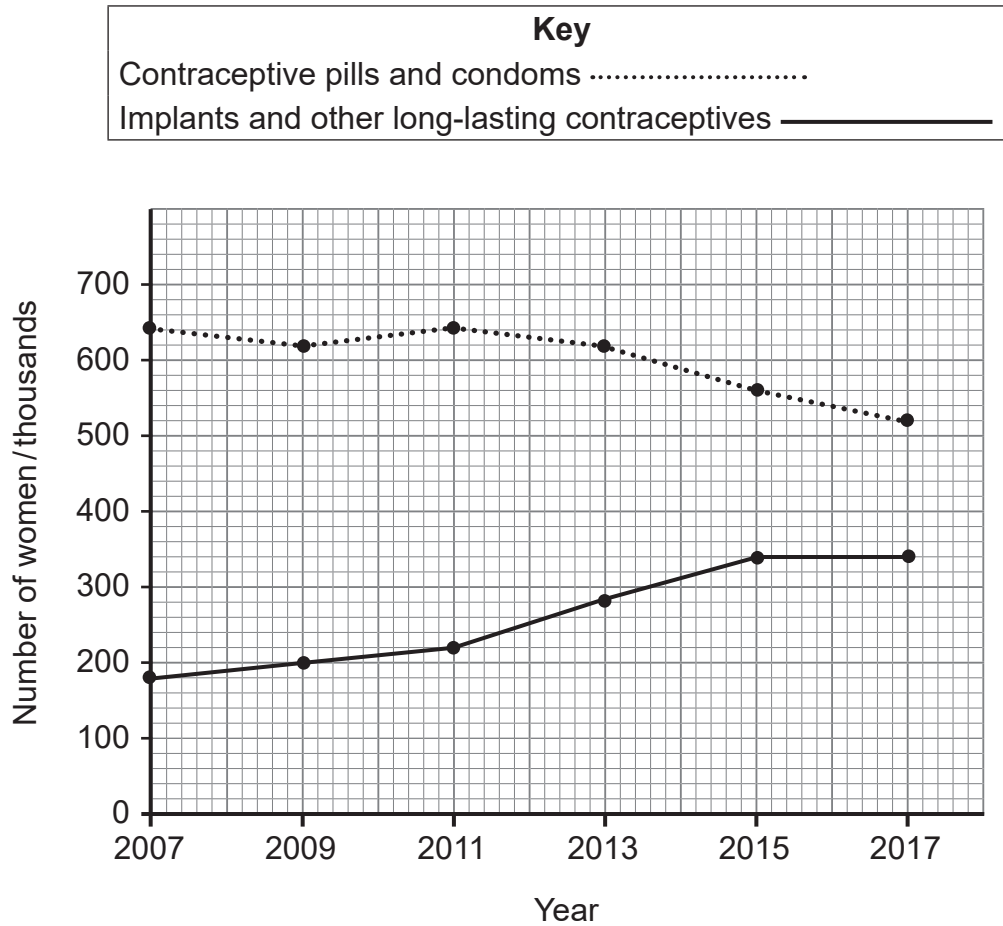
The number of pregnancies occurring when the contraceptive pill is used correctly differs from the number occurring when it is not used correctly.

- (b) Describe this difference and suggest a reason why the contraceptive pill may not be used correctly.

[2]



(c) The graph shows the number of women in England using different types of contraceptive.



(i) Calculate the change in the number of women using implants and other long-lasting contraceptives from 2007 to 2017.

Show your working.

_____ [3]



(ii) Use evidence from **Table 2** on page 10 to suggest a reason for this change.

[1]

(iii) How does this change compare to the number of women using the contraceptive pill and condoms over the same period of time?

[1]



6 **Diagram A** shows a heart from a healthy person.

Diagram B shows a heart from a person with a condition commonly known as a 'hole in the heart'.

Diagram A

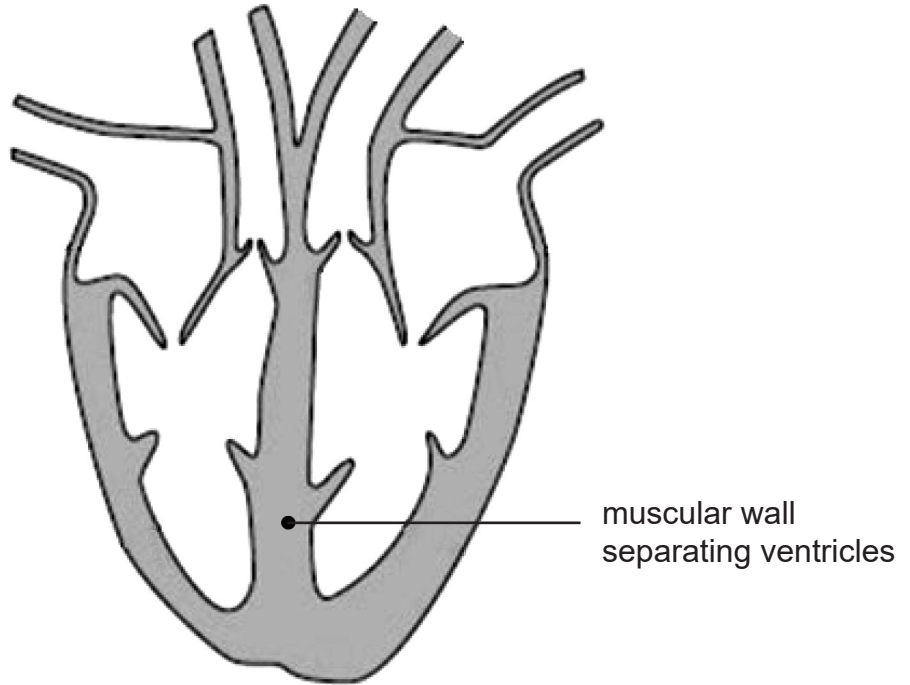
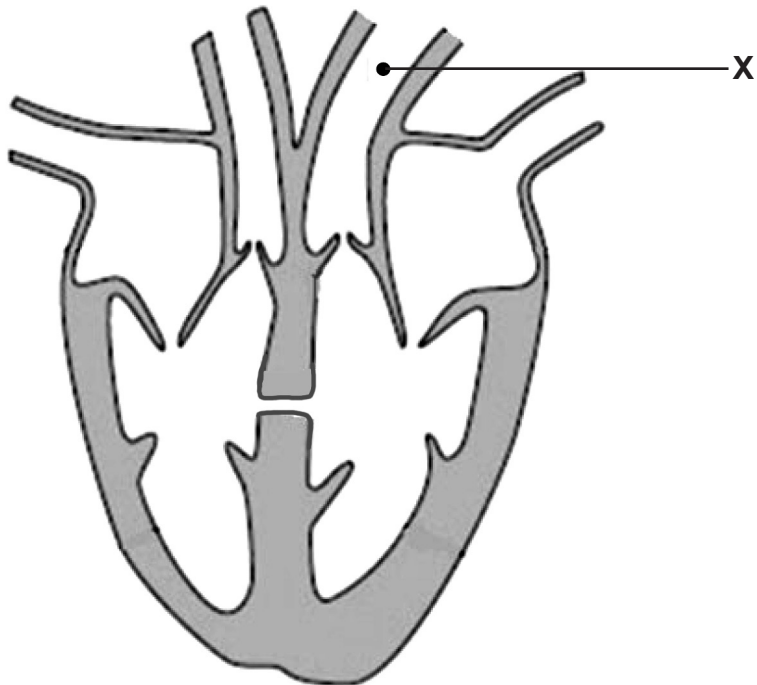


Diagram B



Source: Principal/Chief Examiner



(a) Describe how the structure of the heart in a person with this condition differs from the structure of a heart in a healthy person.

[1]

(b) Suggest why, in this heart condition, blood may flow from the left ventricle to the right ventricle, but not from the right ventricle to the left ventricle.

[1]

(c) (i) Name blood vessel X.

[1]

(ii) Describe and explain how this heart condition could affect the blood pressure in blood vessel X.

[2]

[Turn over



(d) Suggest why people with this heart condition often become tired and look pale.

Become tired _____

_____ [2]

Look pale _____

_____ [1]





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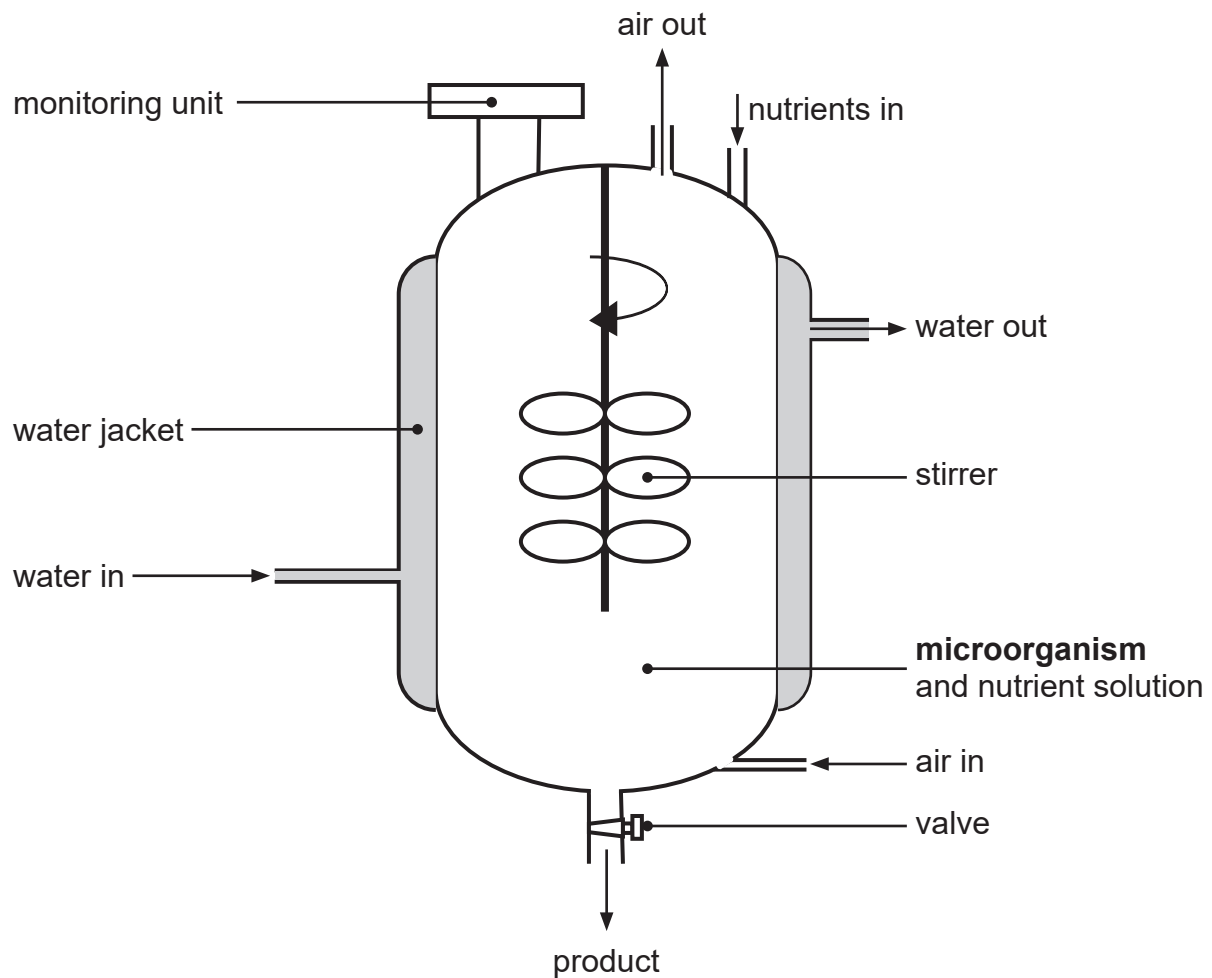
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7 (a) The diagram shows a fermenter used in the production of penicillin.



Source: Principal Examiner

(i) Name the type of **microorganism** used in the production of penicillin.

[1]

(ii) What is the function of the stirrer?

[1]



(iii) Explain why the air entering the fermenter must be sterile.

[1]

The monitoring unit detects changes in temperature inside the fermenter.

(iv) Describe and explain the change in temperature inside the fermenter during the production of the penicillin.

[2]

A fermenter is also used in the production of human insulin.

Before human insulin or penicillin can be used, the process of **downstreaming** must be carried out

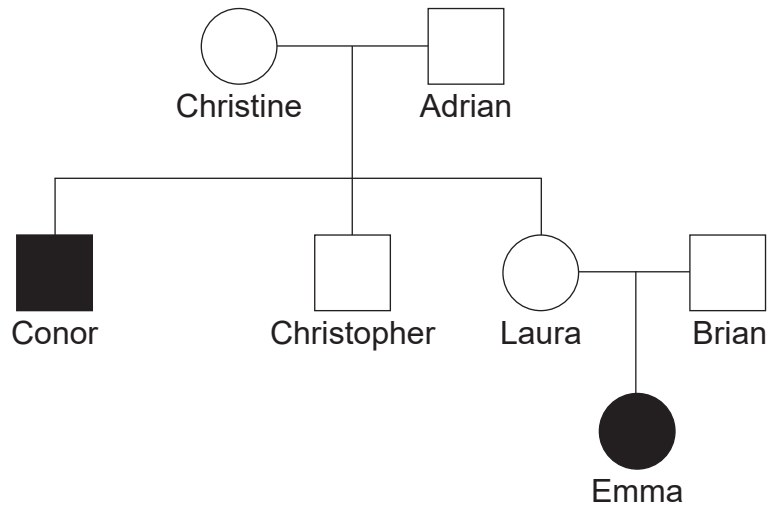
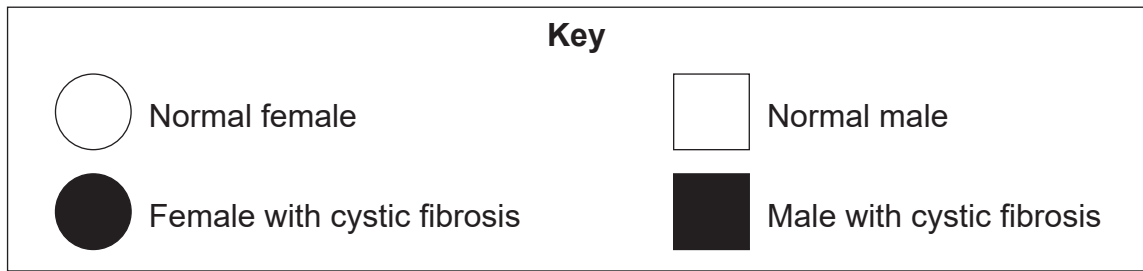
(b) Describe the process of downstreaming.

[3]

[Turn over



8 The pedigree diagram shows the inheritance of cystic fibrosis in a family.



The normal allele **A** is dominant to the cystic fibrosis allele **a**.

(a) Give Conor's genotype.

[1]



Cystic fibrosis is a recessive condition.

(b) Use evidence from the pedigree diagram to support this statement.

[2]

(c) Laura and Brian are expecting their second child.

(i) Complete the Punnett square to show the gametes from each parent and the possible genotypes of the child.

		Brian	
	gametes		
Laura	a		

[3]

(ii) What is the probability that their second child will carry the cystic fibrosis allele, but will not have the condition?

[1]

[Turn over

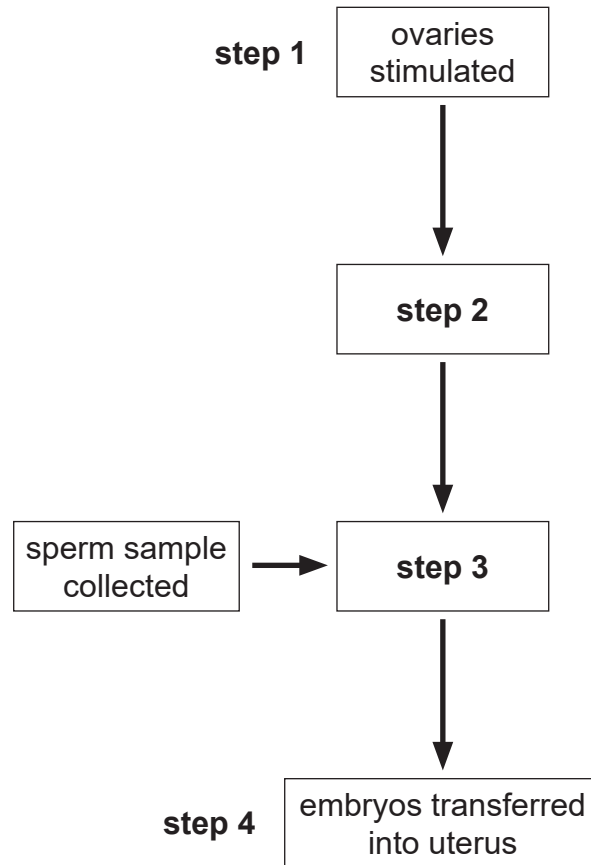


9 Some causes of infertility may be treated successfully by in vitro fertilisation (IVF).

(a) Give **one** cause of infertility in **females** which may be treated successfully by IVF.

[1]

The diagram shows some steps involved in one cycle of IVF.



(b) Describe how the ovaries are stimulated in **step 1**.
Describe in **detail** what happens in **steps 2** and **3**.

In this question you will be assessed on your written communication skills, including the use of specialist scientific terms.

Step 1 _____

Step 2 _____

Step 3 _____

_____ [6]

[Turn over

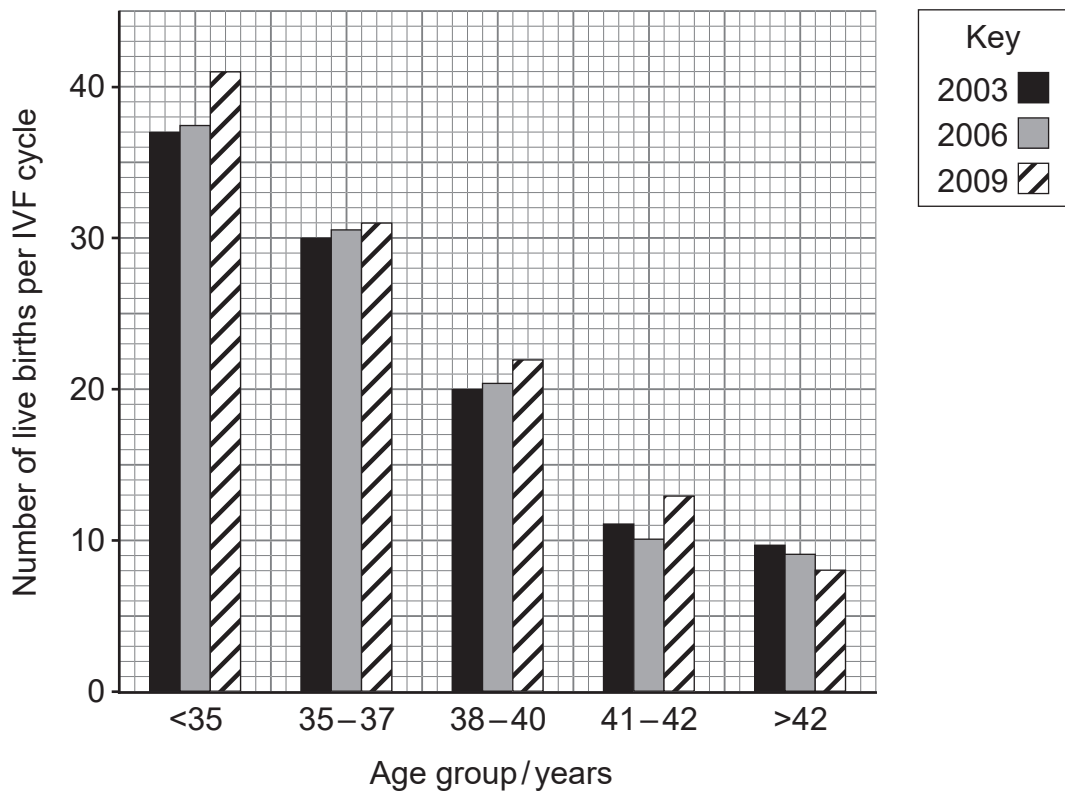


At the end of one cycle of IVF, some parents may decide to have unused embryos frozen.

(c) Suggest **one** advantage of having some unused embryos frozen.

[1]

(d) The graph shows the success rate of IVF in women in different age groups from 2003 to 2009.



(i) In 2009, between which **two** age groups was there the least difference in the number of live births per IVF cycle?

_____ and _____

[1]



- (ii) Describe the trend in the number of live births per IVF cycle in the under 35 year olds from 2003 to 2009.

Suggest an explanation for this trend.

Description _____

Explanation _____

_____ [2]



10 Blackleg is a disease which affects sheep.

The muscles become poisoned, which leads to the death of the animals.

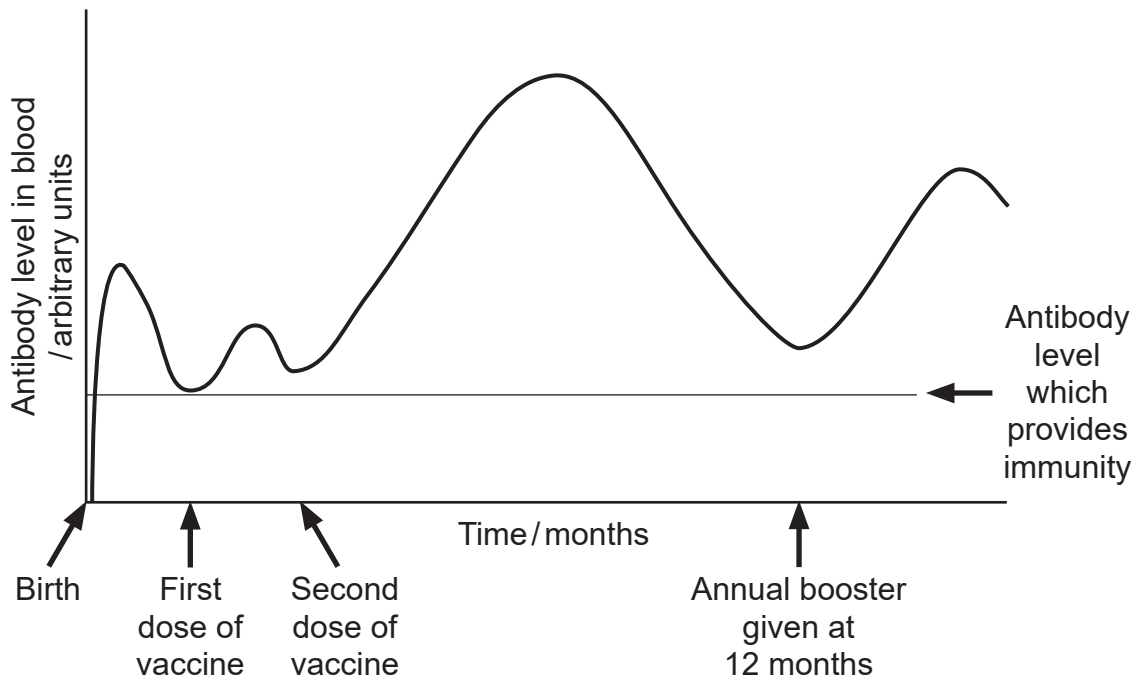
The bacteria which cause the disease are found in soil.

(a) Suggest how sheep can become infected with the disease.

[1]

A vaccination programme for the animals provides immunity against the disease.

(b) The graph shows the antibody level in the blood of a sheep at different stages of a vaccination programme.



(i) Suggest how the antibody level in the blood of the sheep is high enough to provide immunity shortly after birth.

[2]

(ii) Name this type of immunity.

[1]

(iii) Describe **two** ways the second dose of the vaccine differs from the first dose in its effect on the antibody level in the blood.

1.

2.

[2]



(iv) Explain how the second dose of vaccine caused the change in the antibody level shown in the graph.

[3]

(v) Suggest why a sheep may die if it does not receive its annual booster at 12 months.

[2]





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Sources:

Q1a.....Occupational Cancer Research Centre. Burden of occupational cancer in Canada: Major workplace carcinogens and prevention of exposure. Toronto, ON: 2019

Q5a, Table 2....."NHS "How effective is contraception at preventing pregnancy? Your contraception guide" © Crown Copyright

Q5c....."Data source © NHS England available under the Open Government Licence ('OGL'), / Adapted from "Are women turning their back on the pill?" - BBC News"

Q9d.....© Center for Human Reproduction, New York, NY

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Question Number	Marks
1	
2	
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Total Marks	
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Examiner Number

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