Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2019

Biology

Unit 2
Higher Tier

[GBL22]

GBL22

FRIDAY 7 JUNE, MORNING

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 eleven** 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 **11(b)**.

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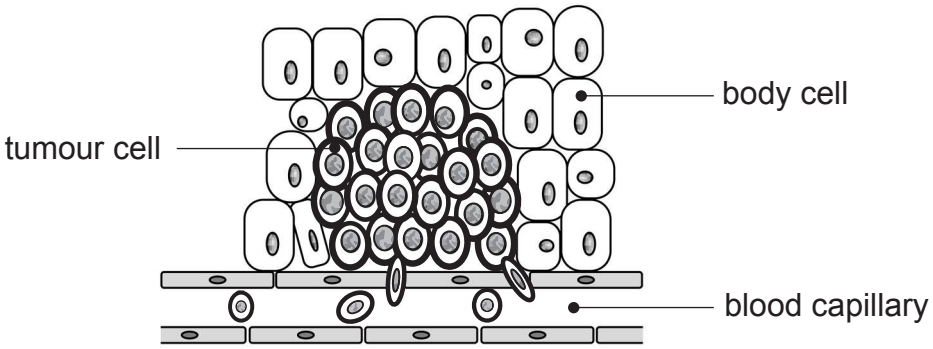
1 **(a)** What is cancer?

_____

_____ [2]

The diagram shows a malignant tumour.



Source: Chief Examiner

Look at the diagram.

(b) Give **two** differences between the structure of body cells and tumour cells.

1. _____

_____ [1]

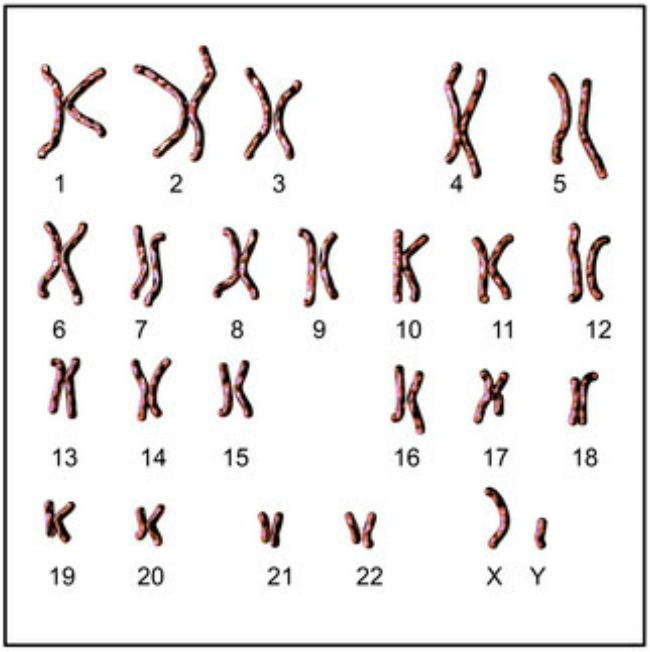
2. _____

_____ [1]

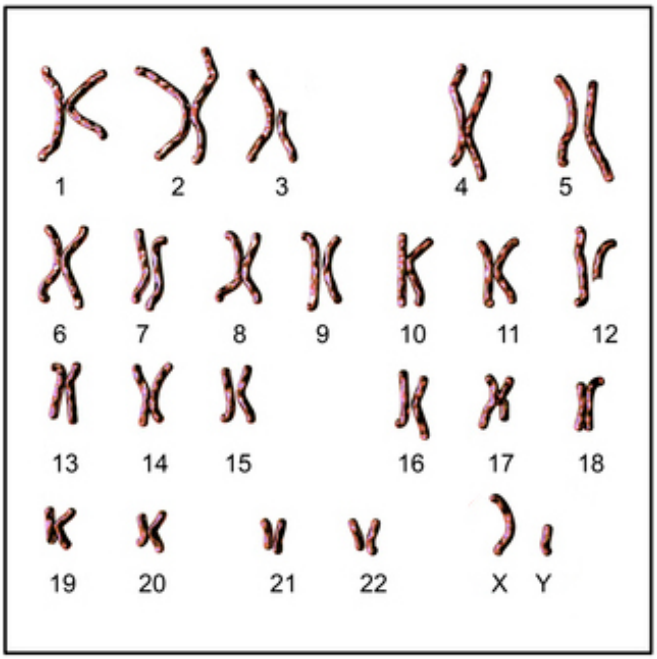
[Turn over

(c) The drawings show the chromosomes of a normal body cell and the chromosomes of a cancer tumour cell from the same person.

Row **Normal body cell**



Row **Cancer tumour cell**



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Look at the drawings.

(i) How can you tell the person is male?

_____

_____ [1]

Look at rows 1 and 2 in both drawings.

(ii) Give the numbers of **two** chromosome pairs that differ in the cancer tumour cell compared to those in the normal body cell.

_____ and _____ [1]

(iii) What term describes these random changes in the chromosomes (DNA) of a cancer tumour cell?

_____ [1]

(d) Explain why screening programmes are important in the treatment of cancer.

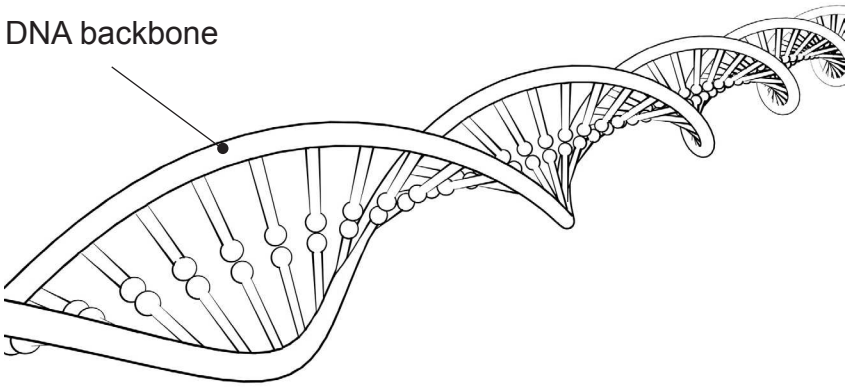
_____

_____

_____

_____ [2]

2 **(a)** The diagram shows a model of part of a DNA molecule.



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Look at the diagram.

(i) What term describes the shape of the DNA molecule?

_____ [1]

(ii) Name the **two** molecules that make up the backbone of the DNA molecule.

_____ and _____ [2]

(iii) Name the part of the cell where DNA is found.

_____ [1]

(iv) Describe how the DNA of individuals differs.

_____

_____

_____

_____ [2]

(b) The table shows the percentage of bases in the DNA of different organisms.

Organism	Adenine	Cytosine	Guanine	Thymine
Human	30.9	19.8	19.9	29.4
Grasshopper	29.3	20.8	20.6	29.3
Yeast	31.3	17.1	18.7	32.9
Bacterium		18.0		

(i) Complete the table for bacterial DNA using the base pairing rules. [3]

Show your working.

(ii) Give **three** conclusions about the percentage of the base cytosine in these four organisms.

1. _____

_____ [1]

2. _____

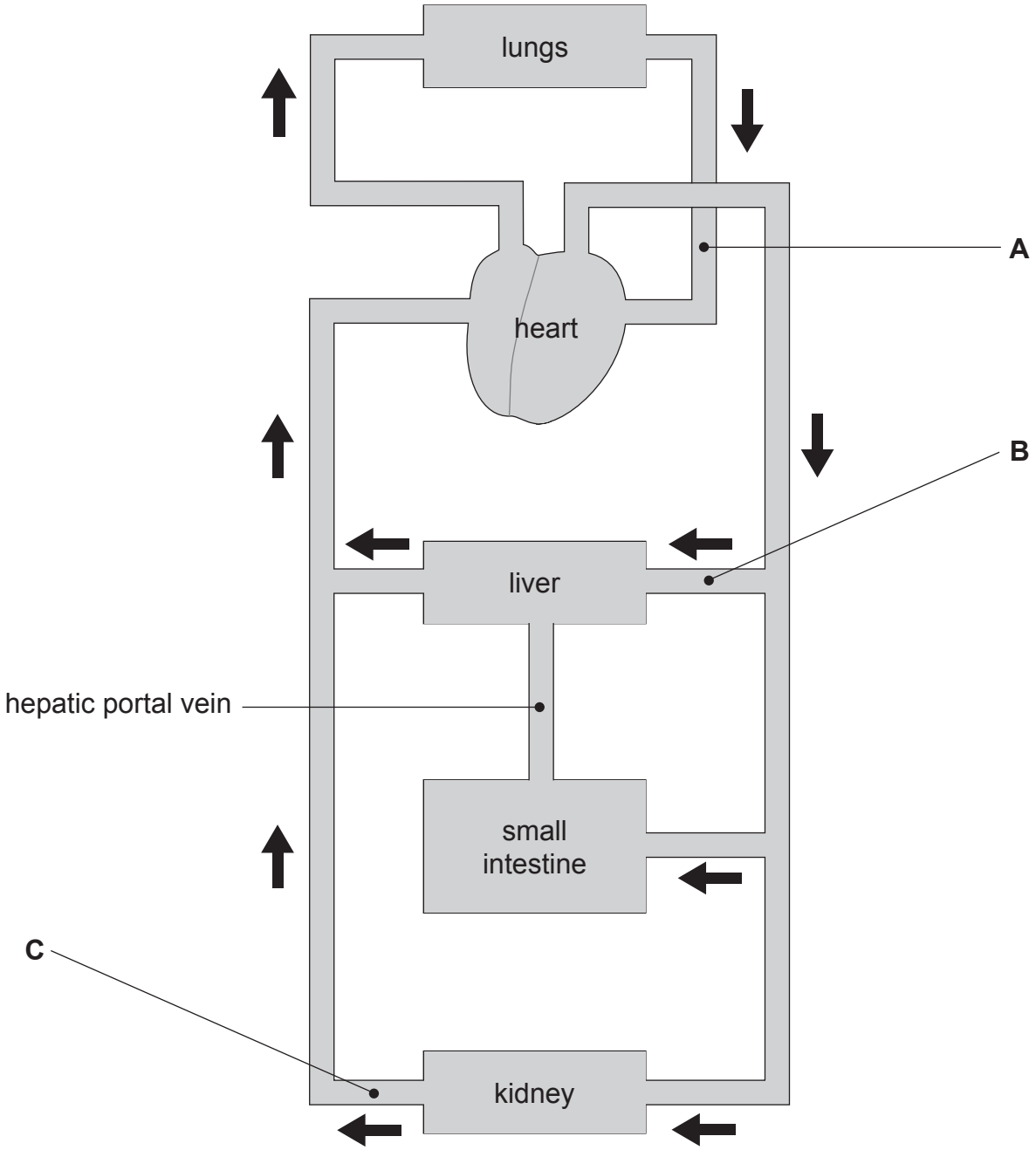
_____ [1]

3. _____

_____ [1]

[Turn over

3 The diagram shows part of the circulatory system.



© Barking Dog Art. Used with permission

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

A _____ [1]

B _____ [1]

C _____ [1]

(b) Give **two** ways the composition of blood in vessel **A** differs from vessel **C**.

1. _____ [1]

2. _____ [1]

(c) Describe the role of the hepatic portal vein.

_____

_____

_____

_____ [2]

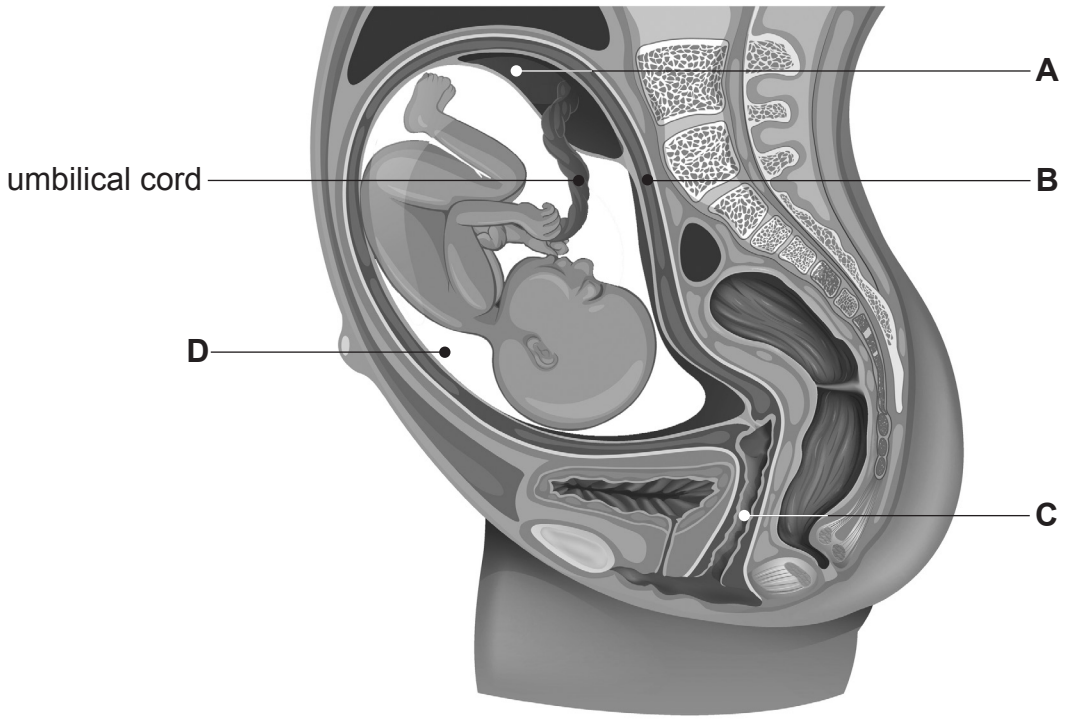
(d) Explain why the circulatory system is described as a double circulation.

_____

_____

_____ [1]

4 The diagram shows a foetus in a uterus.



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(a) **(i)** Name parts **A**, **B** and **C**.

A _____ [1]

B _____ [1]

C _____ [1]

(ii) Name liquid **D** and describe its function.

D _____ [1]

Function _____

_____

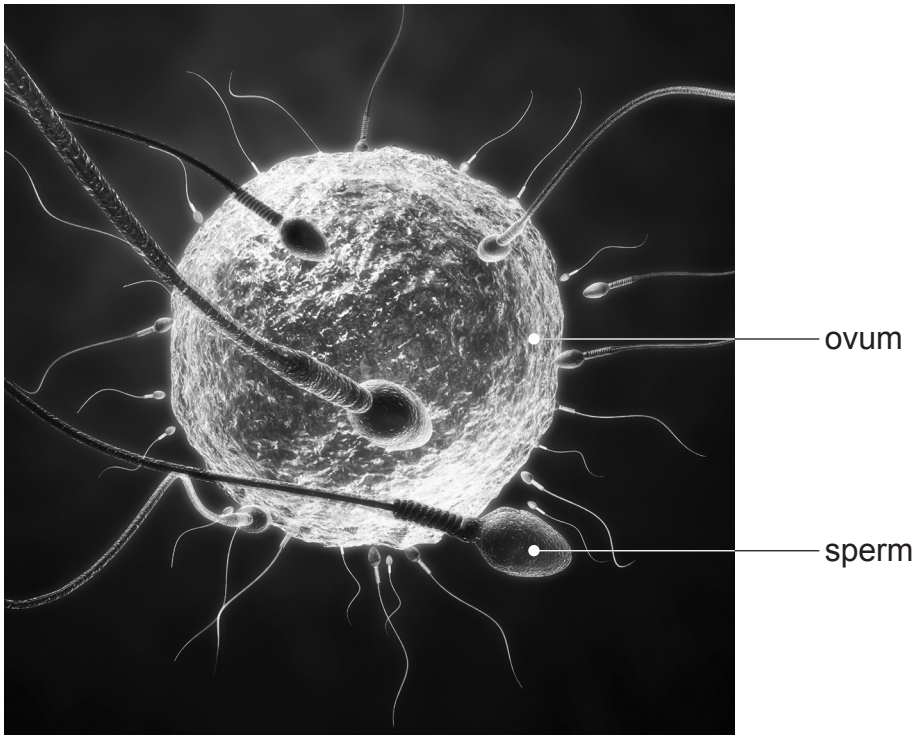
_____ [1]

(b) Name **two** waste substances which pass from the foetus to the mother.

1. _____ [1]

2. _____ [1]

5 **(a)** The photograph shows many sperm and an ovum before fertilisation.



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(i) Name the part of a sperm, shown in the photograph, that adapts it to swim towards the ovum.

_____ [1]

Sperm use energy moving towards the ovum.

(ii) Name the structures found in a sperm which release energy by respiration.

_____ [1]

Fertilisation occurs in the oviduct.

(b) **(i)** Describe the process of fertilisation.

_____

_____

_____

_____

_____ [2]

(ii) Name the cell produced by fertilisation.

_____ [1]

(iii) Describe what happens to this cell as it moves down the oviduct.

_____

_____

_____

_____

_____ [2]

6 Some couples experience infertility problems when trying to conceive a child.

(a) Give **three** causes of infertility.

1. _____

_____ [1]

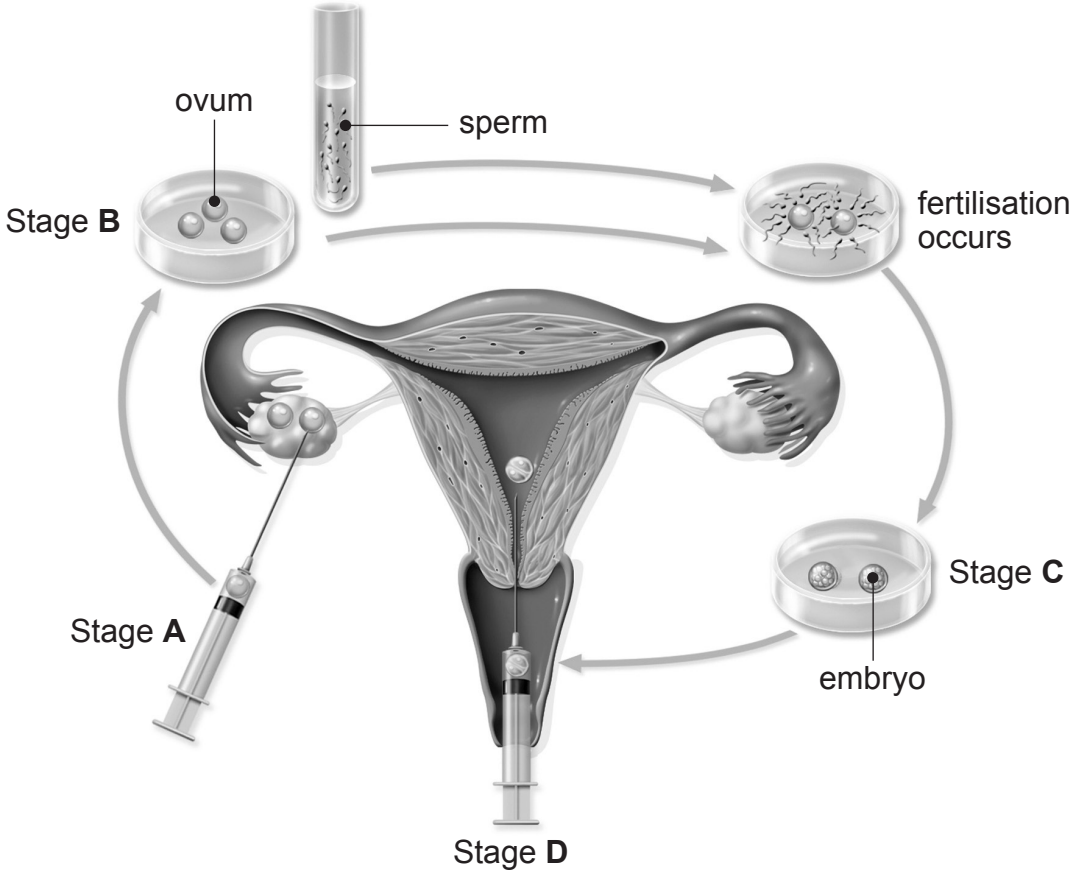
2. _____

_____ [1]

3. _____

_____ [1]

The diagram shows the stages of *in vitro* fertilisation (IVF) which can be used to help couples to conceive a child.



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(b) During stage **A** several ova are removed from the woman's ovary.

(i) Describe how the woman's ovaries are stimulated to produce several ova at the same time.

_____

_____ [1]

(ii) Explain why several ova are removed from the woman's ovary.

_____

_____ [1]

(c) Following stage **D**, implantation occurs.

(i) What is implantation?

_____

_____

_____ [2]

(ii) Name the process which takes place in the embryo, following implantation, to produce a variety of tissues and organs.

_____ [1]

7 During exercise, the cardiac output increases and the muscles in the body receive more blood.

(a) Explain why this is necessary.

_____

_____

_____

_____

_____

_____

_____

_____ [3]

(b) A group of scientists investigated the effect of exercise on the heart before and after a man took part in a fitness programme.

They measured the man's heart rate and the volume of blood pumped out by his heart during each contraction when exercising.

They then calculated his cardiac output using the formula:

Cardiac output /cm^3 min^{-1}	**=**	**Heart rate /beats per min (bpm)**	**×**	**Volume of blood pumped out during each contraction/cm^3**

The table shows their results for the man during exercise.

	Heart rate / bpm	**Volume of blood pumped out during each contraction/cm^3**	**Cardiac output /$cm^3\,min^{-1}$**
Before fitness programme	160	38	6080
After fitness programme	125	65	

(i) Use the formula opposite and the data in the table above to calculate the change in cardiac output brought about by the fitness programme.

Show your working.

Change _____ $cm^3\,min^{-1}$ [2]

(ii) After the fitness programme the man's heart was able to pump out a greater volume of blood during each contraction.

Explain why.

_____

_____ [1]

[Turn over

8 Whooping cough is a communicable bacterial infection of the respiratory system.

(a) Suggest how the whooping cough bacteria spread from one person to another.

_____

_____ [1]

(b) The vaccine for whooping cough brings about active immunity.

(i) What is active immunity?

_____

_____ [1]

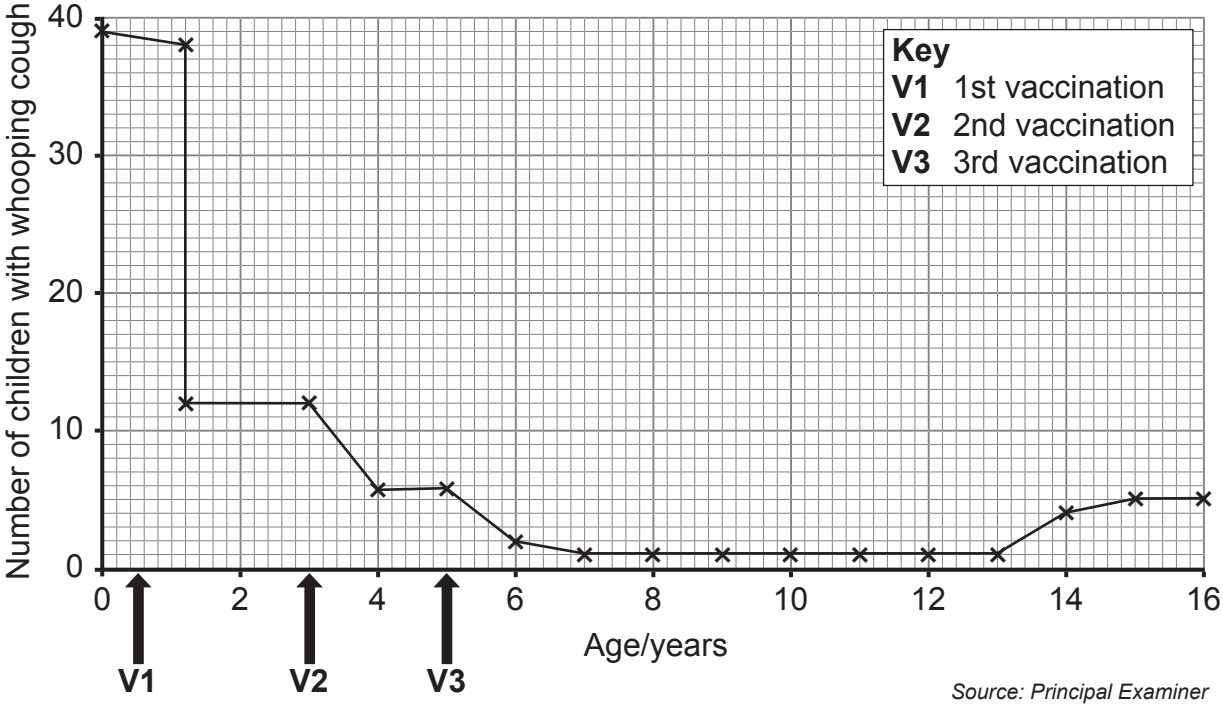
(ii) Suggest what is present in the vaccine to bring about active immunity.

_____

_____ [1]

(c) The graph shows the effect of a vaccination programme on the number of children with whooping cough in a large population.

The children were vaccinated against whooping cough at six months old and again at three and five years old.



Source: Principal Examiner

(i) Describe **one** similarity and **two** differences between the effects of the **V1** and **V2** vaccinations on the number of whooping cough cases.

Similarity _____

_____ [1]

Difference 1 _____

_____

_____ [1]

Difference 2 _____

_____

_____ [1]

[Turn over

(ii) What term is used to describe the second and third (**V2**, **V3**) vaccines in the vaccination programme?

_____ [1]

(iii) Explain the advantage to these children of receiving **V2** and **V3**.

_____

_____ [1]

(iv) Suggest **one** reason for the increase in the number of children with whooping cough after the age of 10 years old.

_____

_____

_____ [1]

9 **(a)** Huntington's disease is a genetic condition that can be inherited.

The allele causing Huntington's disease **(H)** is dominant over the normal allele **(h)**.

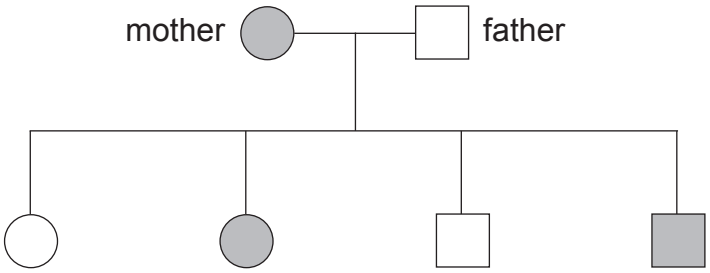
(i) Give the possible genotypes of a person with Huntington's disease.

_____ or _____ [2]

The pedigree diagram shows the inheritance of Huntington's disease in a family.

Key

○ Normal female	□ Normal male
● Female with Huntington's disease	■ Male with Huntington's disease



Source: Principal Examiner

(ii) Give the genotype of the mother.

Use evidence from the pedigree diagram to explain your answer.

Genotype _____ [1]

Explanation _____

_____

_____

_____

_____ [3]

[Turn over

(b) Down's syndrome is another genetic condition.

Genetic screening can be used to identify if Down's syndrome is present in the genome of a foetus.

(i) What is a genome?

_____

_____ [1]

(ii) Name a test which is used to screen for Down's syndrome.

_____ [1]

(iii) Describe **one** ethical issue associated with genetic screening.

_____

_____

_____

_____ [1]

10 Drug trials have to be carried out on modern medicines before they can be licensed for use.

(a) Complete the table by filling in the two empty boxes.

Type of trial	Drug tested using	Reason for the trial
1	Cells and tissues	To check if drug is effective
2 Clinical		To determine the optimum dose

[2]

(b) **(i)** Give **one other** way the drug might be tested in trial type **1**.

_____ [1]

(ii) Give **one other** reason why it is necessary to carry out trial type **1**.

_____ [1]

(c) Explain why it is important to determine the optimum dose of the drug.

_____

_____

_____

_____ [2]

The results of the trials are validated by peer review.

(d) What is peer review?

_____

_____

_____ [1]

11 An investigation into the population of tawny owls in southern Finland has shown changes in their survival over a number of years relative to the snow depth on the ground.

Tawny owls feed on lemmings. These are small mouse-like animals which are easier to see when the winter snow depth is low.

(a) Suggest why the number of tawny owls increased when the winter snow depth was low.

_____

_____

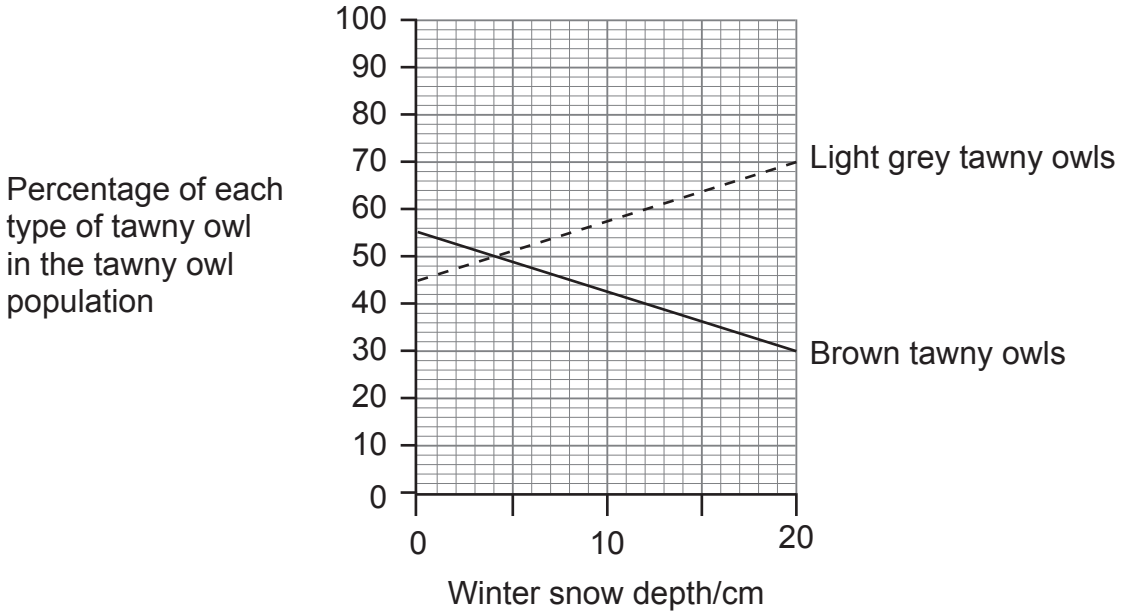
_____ [1]

Tawny owls found in southern Finland may have brown feathers or light grey feathers.

Feather colour is an inherited condition.

Both types of tawny owl are preyed on by **eagle** owls.

The graph shows the percentage of both types of tawny owl in different depths of snow.



[Turn over

(b) Explain how natural selection brings about the change in the percentage of the tawny owls with brown feathers as the winter snow depth **decreases**.

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

[6]

Scientists believe the changes to the depth of winter snow is caused by global warming.

(c) If global warming continues for the next 30 years, suggest what may happen to the population of tawny owls with light grey feathers.

_____

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
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6	
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9	
10	
11	
Total Marks	

Examiner Number

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