



General Certificate of Secondary Education  
2022

Centre Number

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Candidate Number

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# Biology

Unit 2  
Higher Tier



[GBL22]

\*GBL22\*

**WEDNESDAY 15 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 ten** questions.

## INFORMATION FOR CANDIDATES

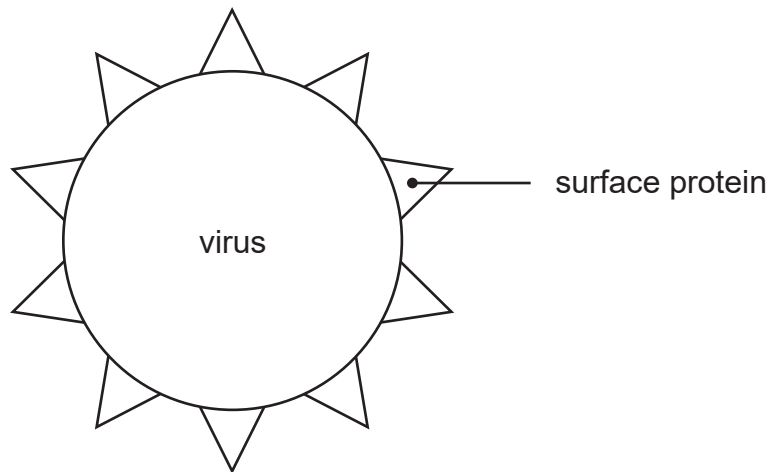
The total mark for this paper is 90.

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 **10(c)**.



1 (a) The diagram shows one strain of the flu virus.



(i) What term is given to the proteins found on the surface of a virus?

\_\_\_\_\_

[1]

The flu vaccine contains weakened viruses which are injected into the body.

White blood cells respond to the weakened viruses and produce antibodies.

(ii) Explain why the viruses used in the vaccine must be weakened.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

[2]

(iii) Name the type of immunity produced by the flu vaccine.

\_\_\_\_\_

[1]

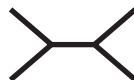


(iv) Name the type of white blood cell which produces antibodies.

[1]

\_\_\_\_\_

(v) Draw a circle around the type of antibody which would be produced in response to this flu virus.



[1]

(vi) Describe and explain the action of this type of antibody on the flu virus.

\_\_\_\_\_

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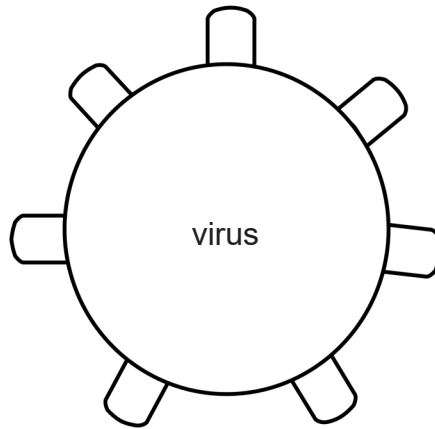
[3]

[Turn over



(b) Every year a different strain of the flu virus forms.

The diagram shows a new strain of the flu virus.



(i) Describe **two** ways the new strain of the virus differs from the original strain.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_ [2]

(ii) Use the diagram to explain why a new flu vaccine has to be given every year.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [1]





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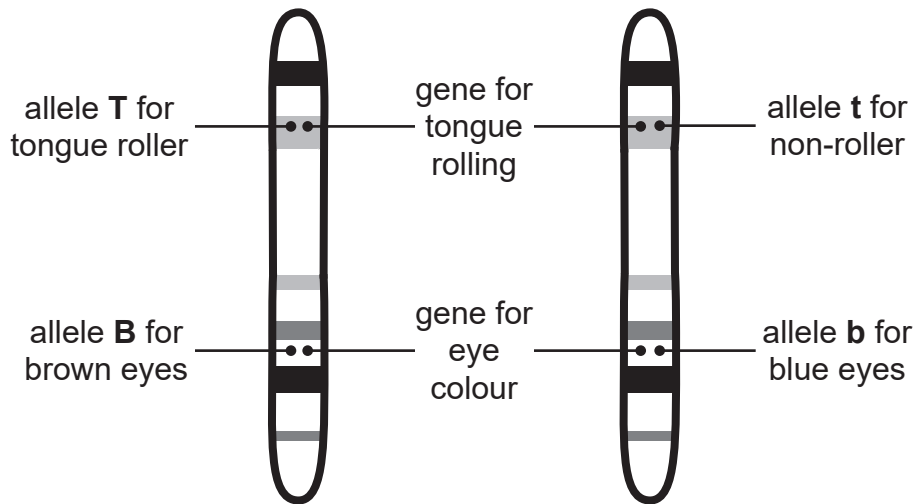
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**[Turn over**



\*28GBL2205\*

2 The diagram shows a pair of chromosomes.



(a) Use evidence from the diagram to explain what is meant by

a gene. \_\_\_\_\_

\_\_\_\_\_ [1]

an allele. \_\_\_\_\_

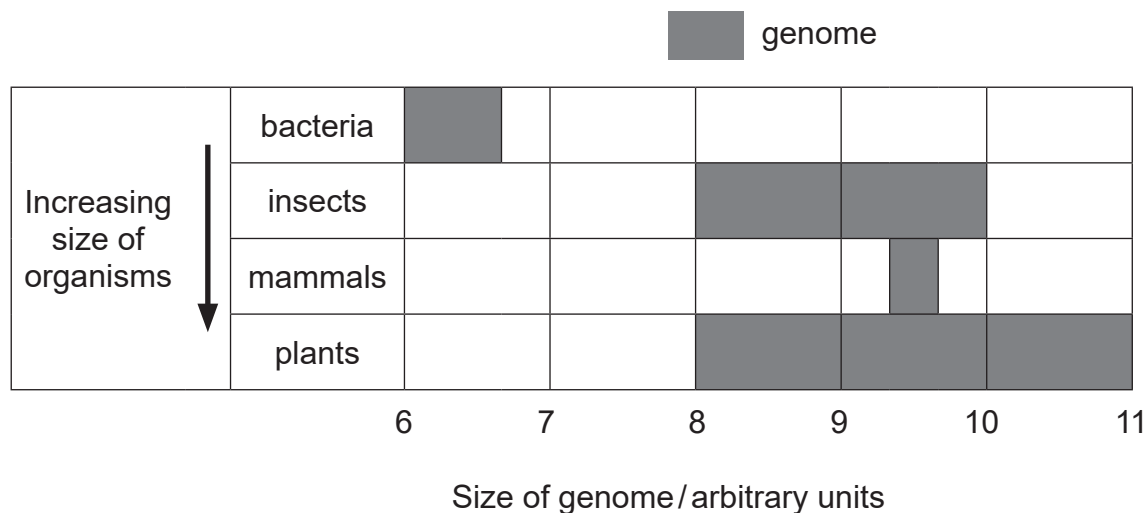
\_\_\_\_\_ [1]

(b) (i) What is a genome?

\_\_\_\_\_  
\_\_\_\_\_ [1]



The diagram shows the range in size of the genomes for four groups of organisms.



(ii) Which group of organisms has the smallest genome?

\_\_\_\_\_

[1]

(iii) Which group of organisms has the smallest **range** of sizes of genome?

\_\_\_\_\_

[1]

A student examined the diagram and claimed that the larger the genome, the bigger the organism.

(iv) Name a group of organisms which does not fit this trend.

Use evidence from the diagram to support your answer.

\_\_\_\_\_

\_\_\_\_\_

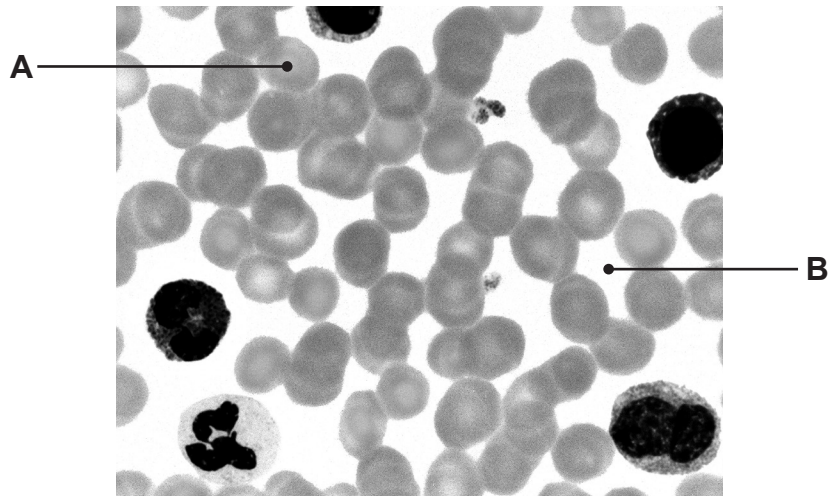
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\_\_\_\_\_ [2]

[Turn over



3 (a) The photograph shows a human blood smear.



© Steve Gschmeissner / Science Photo Library

(i) Name cell **A** and describe its function.

\_\_\_\_\_ [2]  
\_\_\_\_\_

(ii) Describe **one** way cell **A** is adapted to carry out this function.

\_\_\_\_\_ [1]  
\_\_\_\_\_

Part **B** transports the waste product urea.

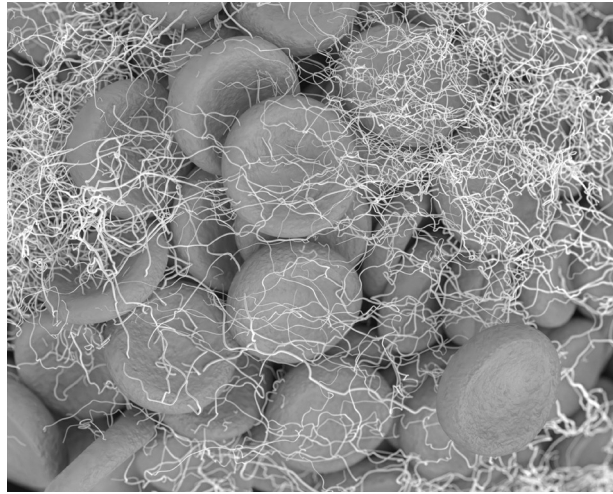
(iii) Name part **B** and give **one other** waste product it transports.

Name \_\_\_\_\_ [2]  
Waste product \_\_\_\_\_





(b) The photograph shows blood clotting.



© Getty Images

(i) Name the part of the blood which is needed for blood clotting.

\_\_\_\_\_

[1]

(ii) Use the photograph and your knowledge to describe the process of blood clotting.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

[3]

(iii) Suggest why blood clotting is necessary.

\_\_\_\_\_  
\_\_\_\_\_

[1]

[Turn over



4 (a) Oestrogen is a female sex hormone.

(i) Name the organ which produces oestrogen.

\_\_\_\_\_

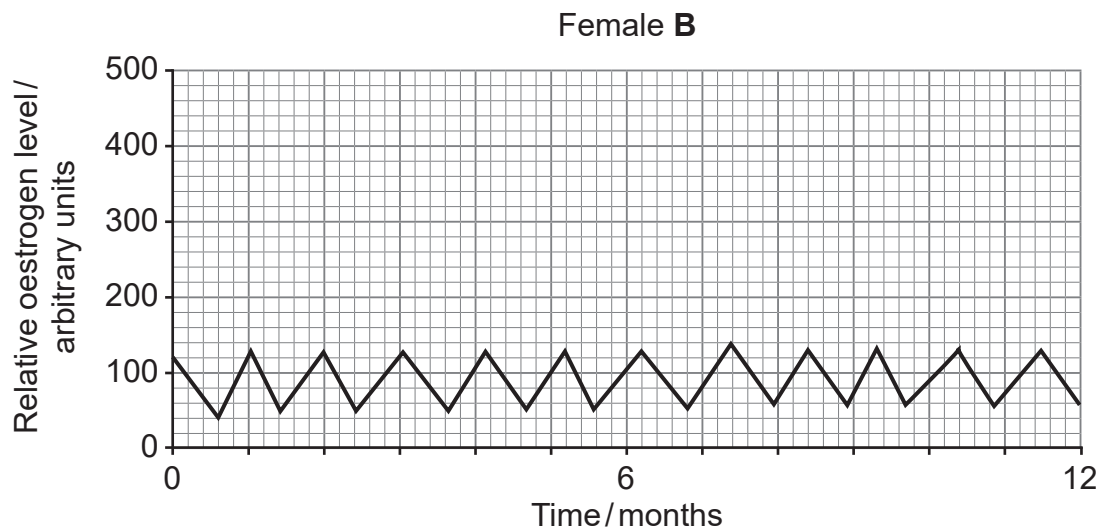
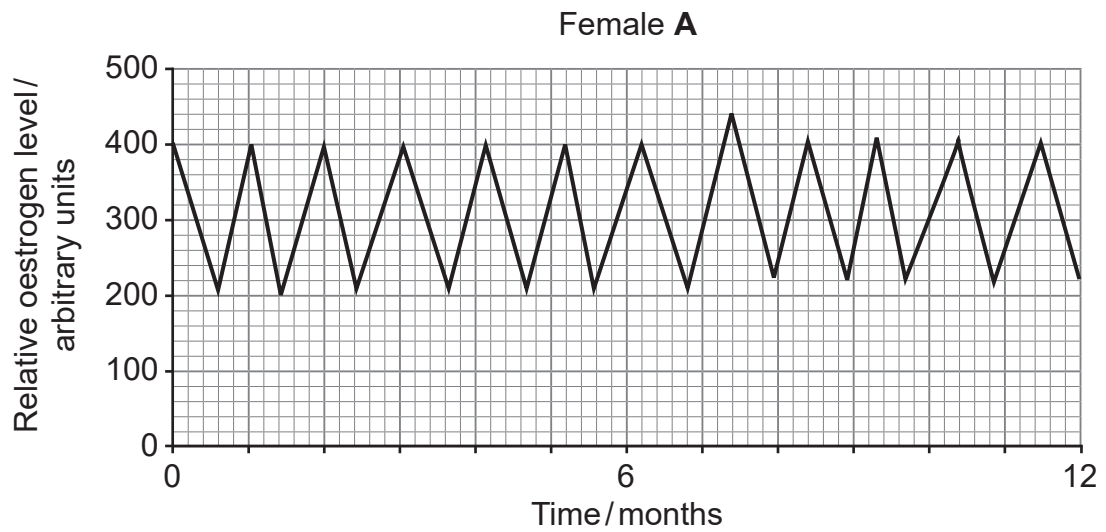
[1]

(ii) Name **one other** female sex hormone.

\_\_\_\_\_

[1]

(b) The graphs show changes in oestrogen levels of two females over 12 months.



Source: Principal Examiner



(i) Give the range in oestrogen level of female A and female B.

**Female A:** From \_\_\_\_\_ to \_\_\_\_\_ arbitrary units.

**Female B:** From \_\_\_\_\_ to \_\_\_\_\_ arbitrary units. [2]

(ii) Suggest why female **B** may have difficulty becoming pregnant.

Use evidence from the graph to support your answer.

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[2]

(iii) Suggest a treatment which could be used to help female **B** become pregnant.

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[1]



5 (a) Describe how water is lost from leaves by transpiration.

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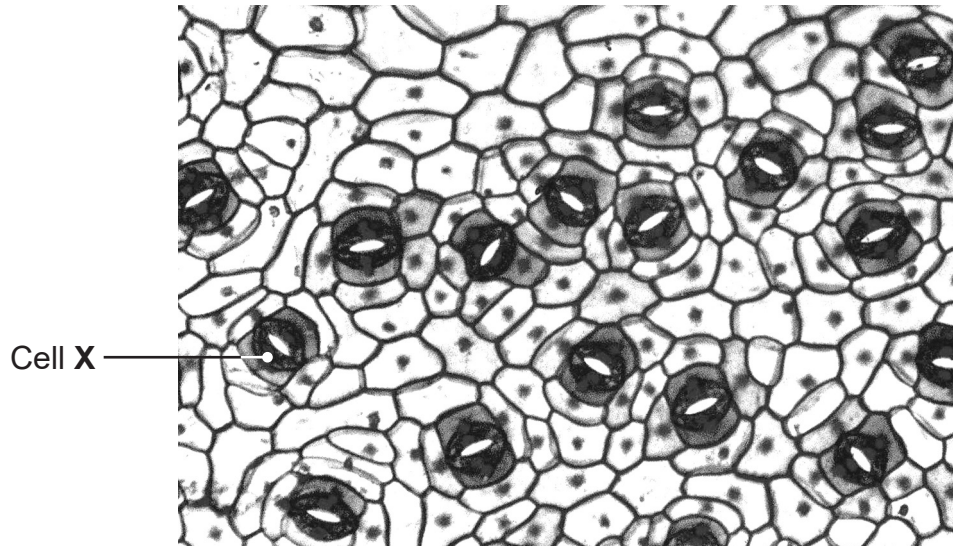
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[3]

The photograph shows the lower epidermis of a leaf.



© Getty Images

(b) Name cell X.

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[1]





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\*28GBL2213\*

- (c) The number of stomata on the upper and lower epidermis of a leaf can affect the rate of transpiration.

The table shows the distribution of stomata on the upper and lower epidermis of four different plant species.

Plant species	Mean number of stomata per mm <sup>2</sup>	
	Upper epidermis	Lower epidermis
A	60	94
B	360	0
C	136	369
D	124	254

Source: Principal Examiner

Species **A** grows in countries with hot climates.

- (i) Explain why species **A** is the best adapted of the four species to grow in countries with hot climates.

Use **data** from the table to support your answer.

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[3]



(ii) Suggest which one of these plant species grows on the surface of ponds and lakes.

Explain how it is adapted to survive in this habitat.

Species \_\_\_\_\_

Explanation \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

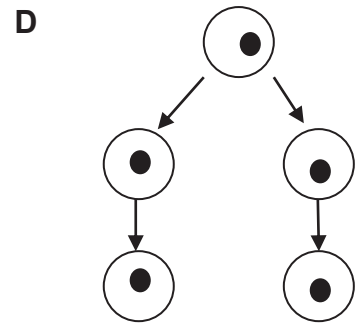
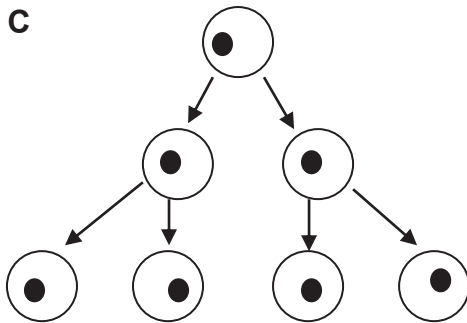
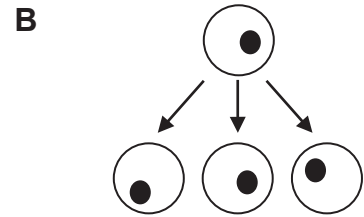
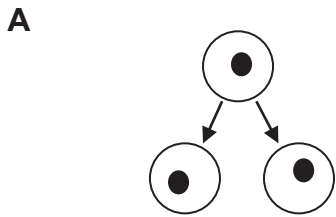
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[3]



6 (a) Meiosis is the type of cell division which forms gametes.

Diagrams A, B, C and D show cells dividing.



(i) Give the letter of the diagram which represents meiosis.

Give **two** pieces of evidence to support your answer.

Diagram \_\_\_\_\_

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_ [3]

(ii) Where does meiosis take place in males?

\_\_\_\_\_

[1]





Gametes produced by meiosis show genetic variation.

(iii) Name the process in meiosis which causes genetic variation.

\_\_\_\_\_ [1]

(b) The table shows the number of chromosomes found in the body cells of three different species.

Species	Number of chromosomes in a body cell
worm	12
goat	60
human	46

Source: Principal Examiner

(i) How many chromosomes are found in the gametes of a worm?

\_\_\_\_\_ [1]

Cells can also divide by mitosis.

(ii) Give the number of chromosomes found in a goat cell produced by mitosis.

\_\_\_\_\_ [1]

(iii) Give **two** functions of mitosis in living organisms.

1. \_\_\_\_\_

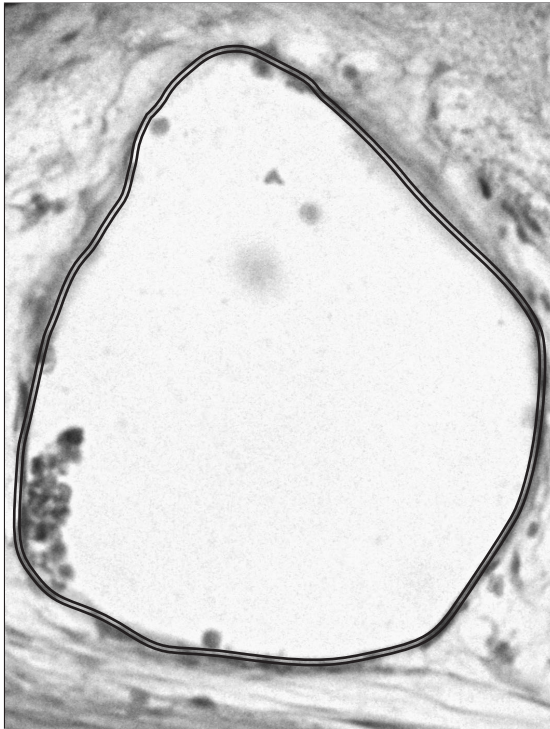
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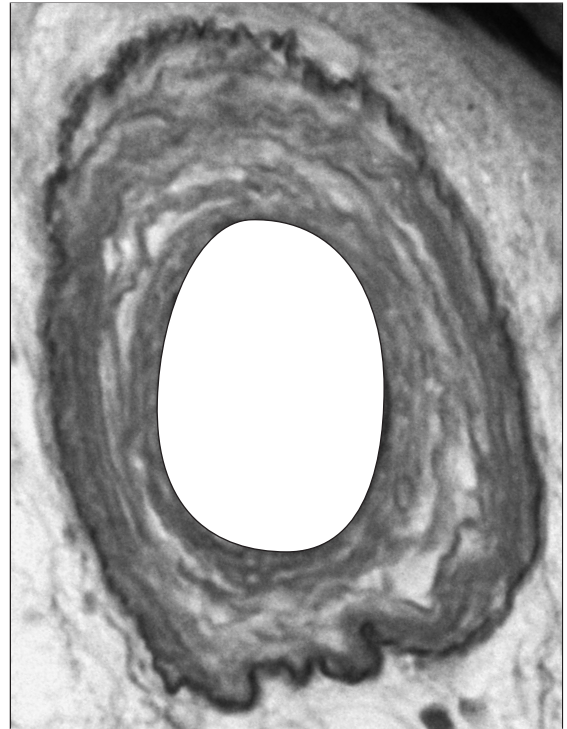


7 (a) The photographs show cross sections of two different types of blood vessel.

Blood vessel A



Blood vessel B



© Ralph T. Hutchings / Science Photo Library

(i) Name each type of blood vessel.

A \_\_\_\_\_

B \_\_\_\_\_

[2]

(ii) Describe **two** differences, visible in the photographs, between blood vessels A and B.

1. \_\_\_\_\_

\_\_\_\_\_

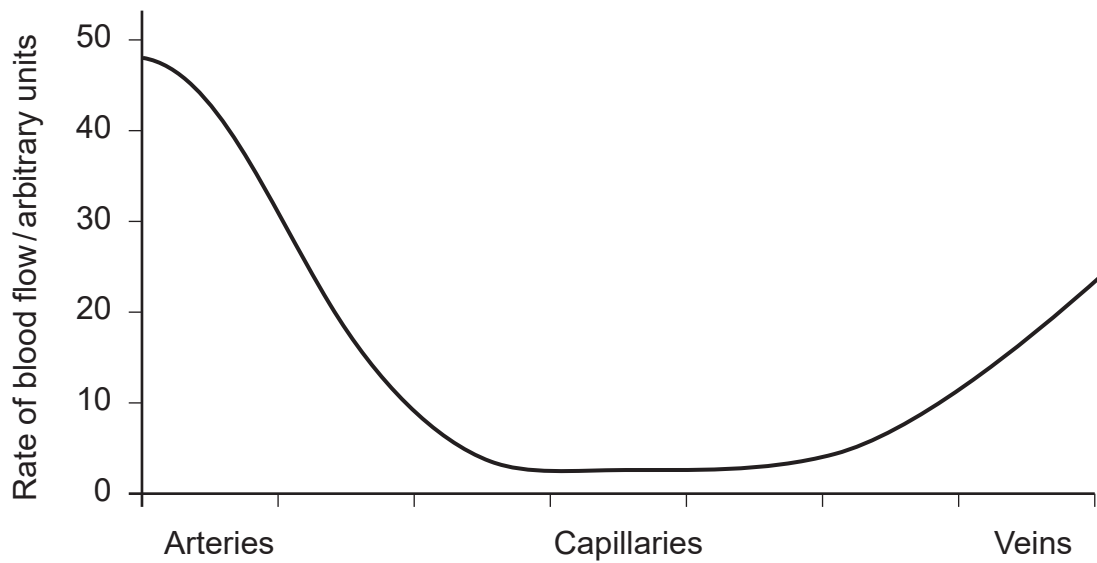
2. \_\_\_\_\_

\_\_\_\_\_

[2]



(b) The graph shows the rate of blood flow in arteries, capillaries and veins.



Source: Principal Examiner

(i) Describe and explain the change in the rate of blood flow between arteries and capillaries.

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[2]

(ii) Explain how this change in the rate of blood flow helps capillaries carry out their function.

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[2]

[Turn over



8 (a) Flower colour in pea plants shows variation.

(i) Explain what is meant by variation.

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[2]

Flowers of pea plants can be purple or white.

(ii) Name the **type** of variation shown by flower colour in pea plants.

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[1]

Other examples of variation in pea plants include:

**A** – the length of the pea pod

**B** – whether the peas are smooth or wrinkled

**C** – the number of peas per pod

**D** – the number of root nodules per plant

**E** – whether the plants are tall or dwarf

(iii) Give the letters of the **two** examples which show the same **type** of variation as flower colour.

\_\_\_\_\_ and \_\_\_\_\_

[1]



(b) The root nodules of pea plants contain nitrogen-fixing bacteria.

The table shows how the average number of root nodules per plant varied when different masses of nitrate were added to the soil around each plant.

Mass of nitrate added to soil / mg	Average number of root nodules per plant
0	24
50	19
100	15
150	11
200	7

Source: Principal Examiner

(i) Calculate the **percentage change** in the average number of root nodules per plant when pea plants were grown in soil containing 200 mg of nitrate **compared to** those grown in soil with no added nitrate.

Give your answer to **2 significant figures**.

Show your working.

\_\_\_\_\_ % [4]

(ii) What evidence suggests that variation in the average number of root nodules per plant is caused by their environment?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [1]

[Turn over



- 9 In a breed of dog, the allele for black coat colour **B** is dominant to the allele for brown coat colour **b**.

A dog breeder wanted to find out the genotype of a black dog.

He crossed the black dog with a brown dog.

- (a) What term describes the type of cross the dog breeder carried out?

\_\_\_\_\_

[1]

- (b) Complete the Punnett squares to show the possible results of this cross.

	brown dog		
black dog	Types of gamete	b	b

	brown dog		
black dog	Types of gamete	b	b

[4]



(c) Explain how the dog breeder may be able to tell the genotype of the black dog from the colour of the pups.

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[2]



10 Deoxyribonucleic acid (DNA) codes for proteins in cells.

(a) Describe the structure of DNA.

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[4]

(b) Describe how DNA differs from one person to another, making each of them unique.

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[1]







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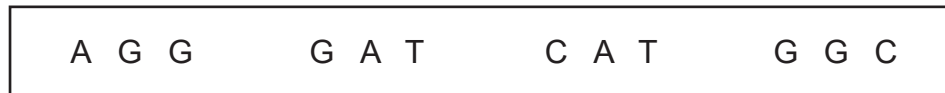


\*28GBL2225\*

**Diagram A** shows a section of a DNA strand from a normal skin cell.

**Diagram B** shows the same section of a DNA strand from a cancerous skin cell.

**Diagram A**



**Diagram B**



The table shows the amino acids coded for by different base triplets.

Base triplet	Amino acid
G A T	leucine
G G C	proline
A G G	serine
C A T	valine

(c) Describe and explain

- one environmental factor which may cause skin cancer.
- how this factor affects the DNA.
- what effect this has on the functioning of the DNA.

Give evidence from the diagrams and the table to support your answer.





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

Lined writing area for the student's response, consisting of 25 horizontal lines. The number [6] is located at the bottom right of the writing area.

[6]



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For Examiner's use only	
Question Number	Marks
1	
2	
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<b>Total Marks</b>	
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Examiner Number

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