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Answer ALL the questions. Write your answers in the spaces provided.

1. For each question (a) to (g), choose the correct answer.

Put a cross (☒) in the correct box.

(a) The photograph shows a cactus.



A cactus is

- A an animal
- B a plant
- C a fungus
- D a bacterium

(1)

(b) The food test for glucose uses

- A iodine solution
- B Biuret solution
- C ethanol
- D Benedict's solution

(1)



(c) A process found in the carbon cycle is

- A decomposition
- B ultrafiltration
- C vasodilation
- D fertilisation

(1)

(d) The potato cube below has sides of 1cm.



Which row in the table correctly shows the surface area, volume and surface area to volume ratio of this cube?

		Surface area in cm ²	Volume in cm ³	Surface area to volume ratio
<input type="checkbox"/>	A	3	1	3:1
<input type="checkbox"/>	B	6	3	2:1
<input type="checkbox"/>	C	1	6	1:6
<input type="checkbox"/>	D	6	1	6:1

(1)

(e) Which shows a genetic cross between a homozygous recessive individual and a heterozygous individual?

- A NN × NN
- B nn × NN
- C nn × Nn
- D Nn × Nn

(1)

(f) Organs used for excretion include

- A heart and liver
- B kidneys and lungs
- C brain and pancreas
- D eyes and stomach

(1)



(g) A plant shoot that grows towards light is

- A negatively geotropic
- B negatively phototropic
- C positively geotropic
- D positively phototropic

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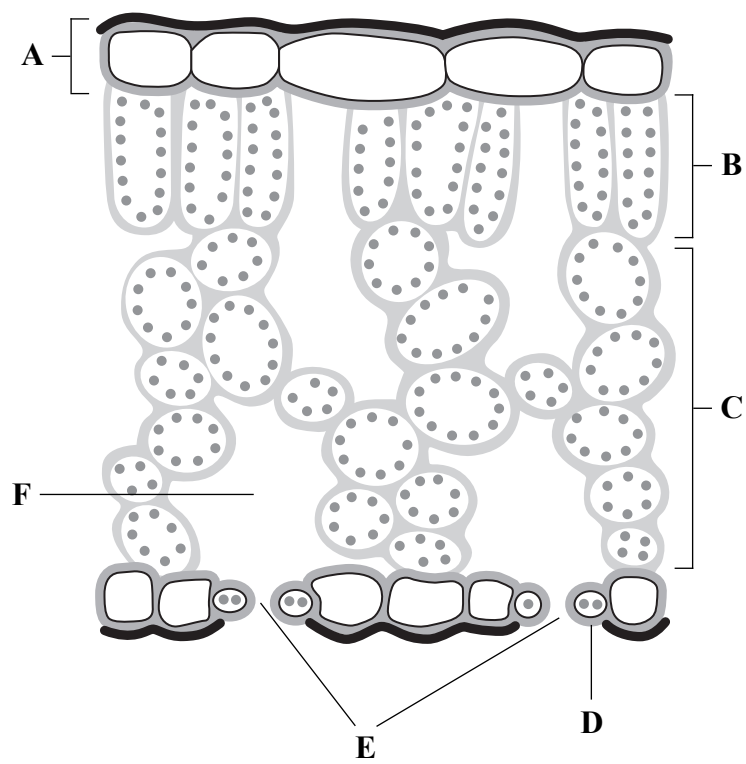
(1)

Q1

(Total 7 marks)



2. The diagram shows a section through a leaf with parts labelled A to F.



(a) Complete the table by writing the correct label letter for each part.

The first one has been done for you.

Part	Letter
Upper epidermis	A
Air space	
Palisade cells	
Spongy cells	
Stomata	

(4)



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(b) The leaf is an important organ for photosynthesis in a plant.

Complete the word equation for photosynthesis by choosing the correct words from the list.

carbon dioxide glucose oxygen nitrogen water hydrogen

..... + → + (4)

(c) Suggest how the rate of photosynthesis will change as

(i) the temperature increases

..... (1)

(ii) the light intensity decreases.

..... (1)

(Total 10 marks)

Q2

7

Turn over



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3. Gas exchange in mammals takes place in the lungs.

The diagram lists features in the lungs that help gas exchange. It also lists explanations to describe how each feature helps.

(a) Draw a line from each feature to the correct explanation.

Feature	Explanation
blood flow in capillaries	provides short distance for diffusion
moist lining in alveoli	increases surface area for diffusion
many alveoli	carries gases to and from alveoli
thin alveoli walls	allows gases to dissolve

(3)

(b) Smoking cigarettes causes problems for the breathing and circulation systems. The substances listed are breathed in when a cigarette is smoked.

nicotine carbon dioxide carbon monoxide tar

From the list, choose the substance that causes each of the following effects:

(i) combines with haemoglobin to reduce oxygen transport

..... (1)

(ii) collects in lungs and contains chemicals that cause cancer

..... (1)

(iii) speeds up heart rate and increases blood pressure.

..... (1)

(Total 6 marks)

Q3



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4. This food chain is from a woodland.

oak tree → caterpillar → shrew → hawk

(a) (i) Name the producer in this food chain.

..... (1)

(ii) Name the secondary consumer in this food chain.

..... (1)

(iii) How does the oak tree make its food? In your answer include

- where the energy comes from
- how the oak tree traps the energy.

.....
.....
..... (2)

(b) Pupils counted the numbers of organisms in the woodland food chain.

They found

- 1 oak tree
- 3000 caterpillars
- 11 shrews
- 1 hawk.

In the space below, draw a pyramid of numbers for this food chain.

(1)

Q4

(Total 5 marks)



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5. (a) Biotechnology is used to produce large numbers of plants.

Choose from the list the correct word to match each description.

cloning **explants** **in vitro** **in vivo**
micropropagation **pipettes** **sterile**

(i) The small pieces of plant.

..... (1)

(ii) The process by which small pieces of plant are grown using nutrient jelly.

..... (1)

(iii) Using a glass test tube to grow pieces of plants.

..... (1)

(iv) The production of genetically identical organisms.

..... (1)

(v) Nutrient jelly which is free of bacteria.

..... (1)

(b) Name a human hormone that is produced by genetically modified bacteria.

..... (1)

(Total 6 marks)

Q5



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6. Aphids are small insect pests that feed on the sugar transported in plant stems.

(a) (i) Name the tissue that transports sugar in plant stems.

..... (1)

(ii) Suggest why sugar is transported from the leaves to the roots.

.....
.....
.....
..... (2)

(b) Biological control is the use of an organism to kill or reduce the numbers of a pest. Farmers use ladybirds to reduce aphid numbers. Farmers could also use insecticides to control aphid numbers.

Biological control has advantages and disadvantages when compared to using insecticides.

Put a cross (☒) in the correct box on each row to show whether each statement about biological control is an advantage or disadvantage when compared to using insecticides.

Statement	Advantage	Disadvantage
harmless to other organisms	<input type="checkbox"/>	<input type="checkbox"/>
acts slowly	<input type="checkbox"/>	<input type="checkbox"/>
some pests survive	<input type="checkbox"/>	<input type="checkbox"/>
pests unlikely to develop resistance	<input type="checkbox"/>	<input type="checkbox"/>
no need to use more than once	<input type="checkbox"/>	<input type="checkbox"/>

(3)

Q6

(Total 6 marks)



7. The table lists the names of different structures found within a human.

Complete the table by numbering each structure in order of its size.
Use number 1 for the smallest structure through to number 4 for the largest.

Name of structure	Order of size
brain	
nucleus	
nervous system	
nerve cell	

(Total 3 marks)

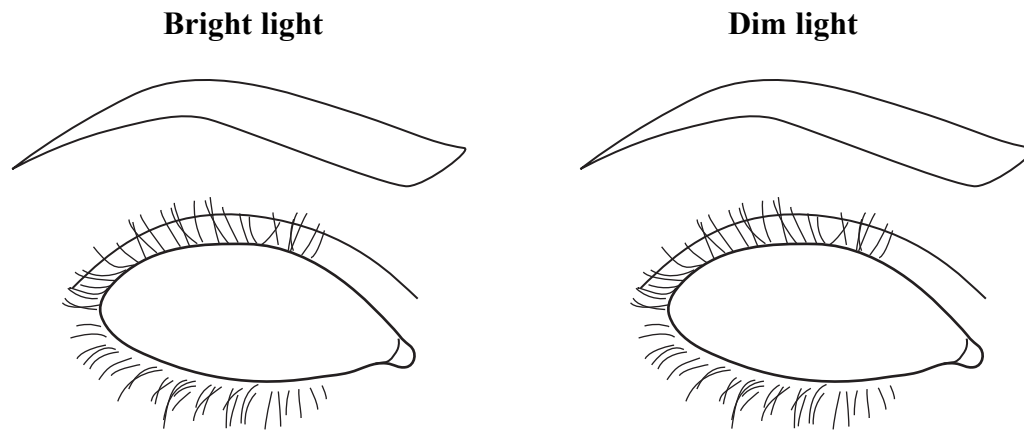
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Q7



9. The iris of the eye helps the pupil to change as a person moves from an area of bright light to an area of dim light.

(a) (i) Draw and label the iris and the pupil in each eye below to show how they would appear in bright and dim light.



(3)

(ii) Explain how the iris produces this change in appearance in the pupil.

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

(2)

(iii) Explain why it is important to change the appearance of the pupil when moving from bright light into dim light.

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

(2)



(b) Changes in the eye also take place to help focus on near objects.
Describe these changes.

.....

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.....

.....

(3)

(Total 10 marks)

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Q9

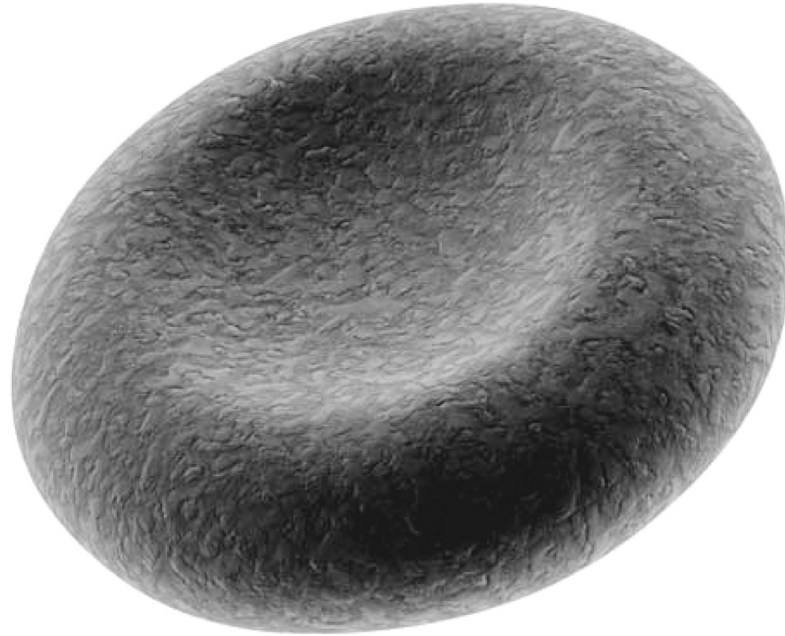


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10. The diagram shows a normal red blood cell.



(a) Describe **two** ways in which the structure of a normal red blood cell helps it to absorb and transport oxygen.

1

.....

2

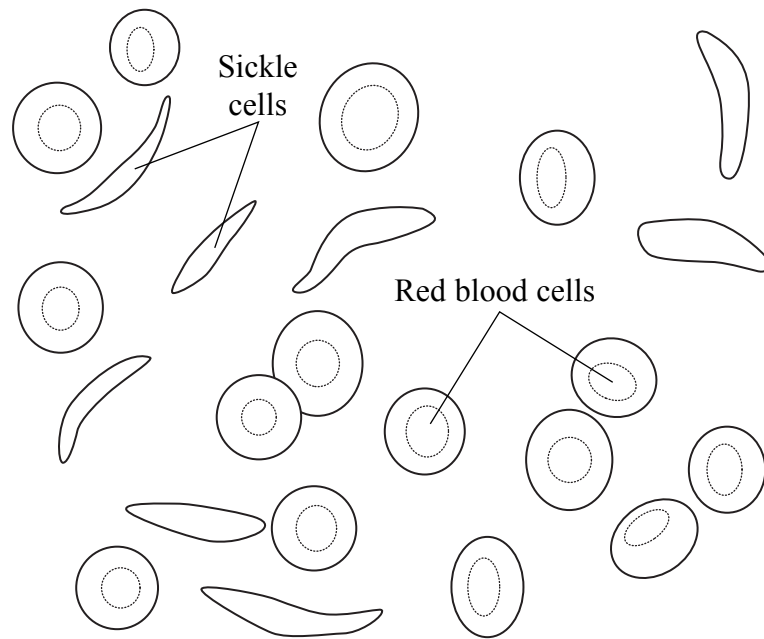
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(2)



(b) Sickle cell anaemia is an inherited condition that affects the shape of red blood cells. It is caused by a recessive allele, **n**, which causes the cells to buckle and look sickle-shaped. The dominant allele, **N**, allows red blood cells to develop normally.

The diagram shows normal red blood cells and sickle-shaped red blood cells.



(i) What is an allele?

.....

(1)



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(ii) Two parents know they are both heterozygous for sickle cell anaemia.

Complete the genetic diagram below to show the genotypes of the parents, their gametes and their possible offspring.
Use the letter **N** for the dominant allele and the letter **n** for the recessive allele.

Parent genotypes

Gamete genotypes

Possible offspring genotypes

(3)

(iii) What are the phenotypes of the possible offspring?

.....

(1)

Q10

(Total 7 marks)



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11. The heart rate of an athlete was measured every ten minutes for one hour during a training session.

The results are shown in the table.

Time in minutes	0	10	20	30	40	50	60
Heart rate in beats per minute	66	77	88	100	112	114	113

(a) Describe how the heart rate changes during the training session.

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

(2)

(b) Explain the change in the results from 0 minutes to 40 minutes.

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

(4)

Q11

(Total 6 marks)



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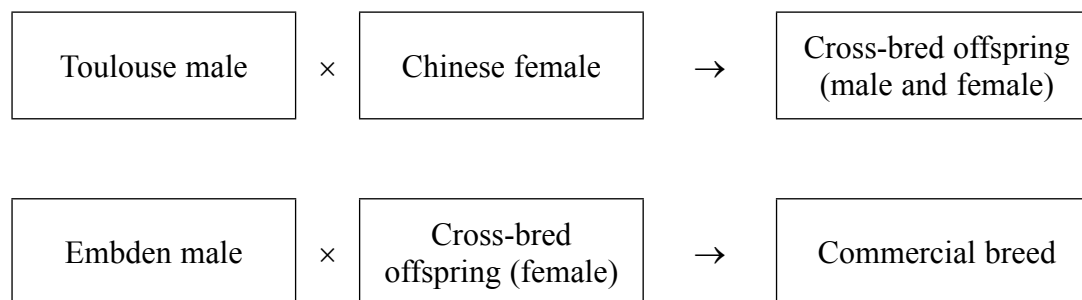


12. The photograph shows a bird called a goose.



Two breeds of goose called Toulouse and Embden grow quickly. However, both breeds lay very few eggs. Another breed of goose called Chinese lays lots of eggs but grows slowly.

Farmers have used a breeding process to produce a commercial breed of goose from these three different breeds. The diagram below shows the breeding process.



(a) Name the **two** desired characteristics farmers wanted to obtain with the commercial breed of goose.

1

2

(2)



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(b) Use the information opposite to suggest **one** difference in the characteristics of the cross-bred female and the Chinese female.

.....

.....

(1)

(c) The breeding process involves farmers choosing which birds breed with each other.

What name describes a breeding process in which humans choose which animals breed together?

.....

(1)

Q12

(Total 4 marks)

TOTAL FOR PAPER: 75 MARKS

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