Write your name here

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Centre Number | | | | | |

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Biology

Unit: KBI0/4BI0
Science (Double Award) KSC0/4SC0
Paper: 1B

Wednesday 8 January 2014 – Morning
Time: 2 hours

Paper Reference
KBI0/1B 4BI0/1B
KSC0/1B 4SC0/1B

You must have:
Ruler
Calculator

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 120.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 4 2 8 5 9 A 0 1 3 2

PEARSON

Answer ALL questions.

1 The table gives features of three different groups of organism.

Complete the table by putting a tick (✓) in the box if the organisms in the group have the feature and a cross (×) in the box if the organisms in the group do not have the feature. The first one has been done for you.

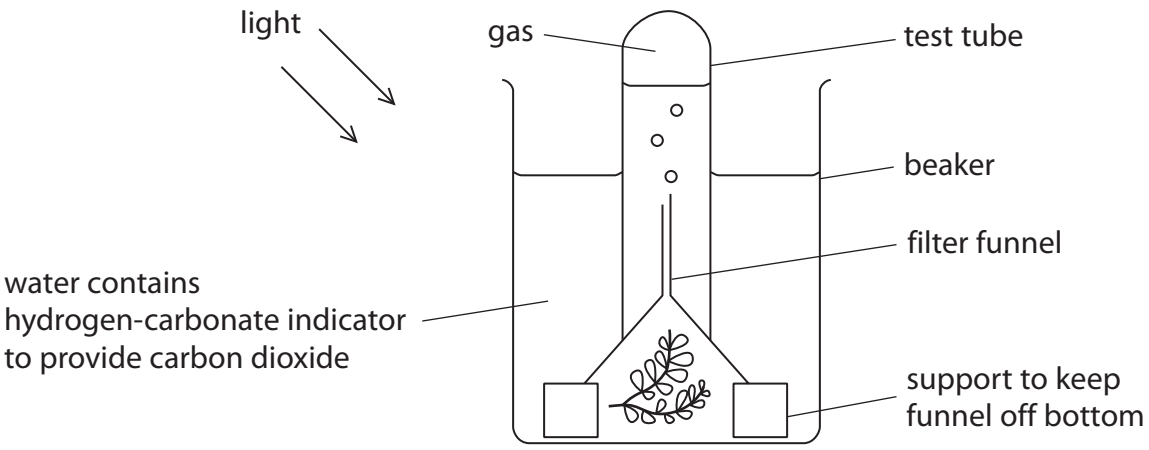
(4)

Feature of organism	Group of organism		
	Bacteria	**Fungus**	**Virus**
have a protein coat	×	×	✓
all are pathogens			
cell walls made of chitin			
contain DNA in a nucleus			
respire			

(Total for Question 1 = 4 marks)

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2 A student investigated the effect of red, green and blue light on the rate of oxygen production of a water plant. She used the apparatus shown.



The student shone different coloured lights on the plant. She measured the rate of oxygen production, for each colour, by counting the number of bubbles released per minute.

The results are shown in the table.

Reading	Rate of oxygen production in bubbles released per minute		
	Red light	Green light	Blue light
1	10	1	12
2	11	1	10
3	9	1	2
Average	10	1	11

(a) Give two reasons why the data in the table are reliable.

(2)

1 .....

.....

2 .....

.....

(b) Suggest how the student could modify the apparatus to measure the rate of oxygen production more accurately.

(1)

.....

.....

.....

.....

(c) Name the independent variable in this investigation.

(1)

.....

(d) The student changed the colour of the light but kept the intensity the same.

Give three other variables that she should keep the same in order to make the comparison of oxygen production valid.

(3)

1 .....

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2 .....

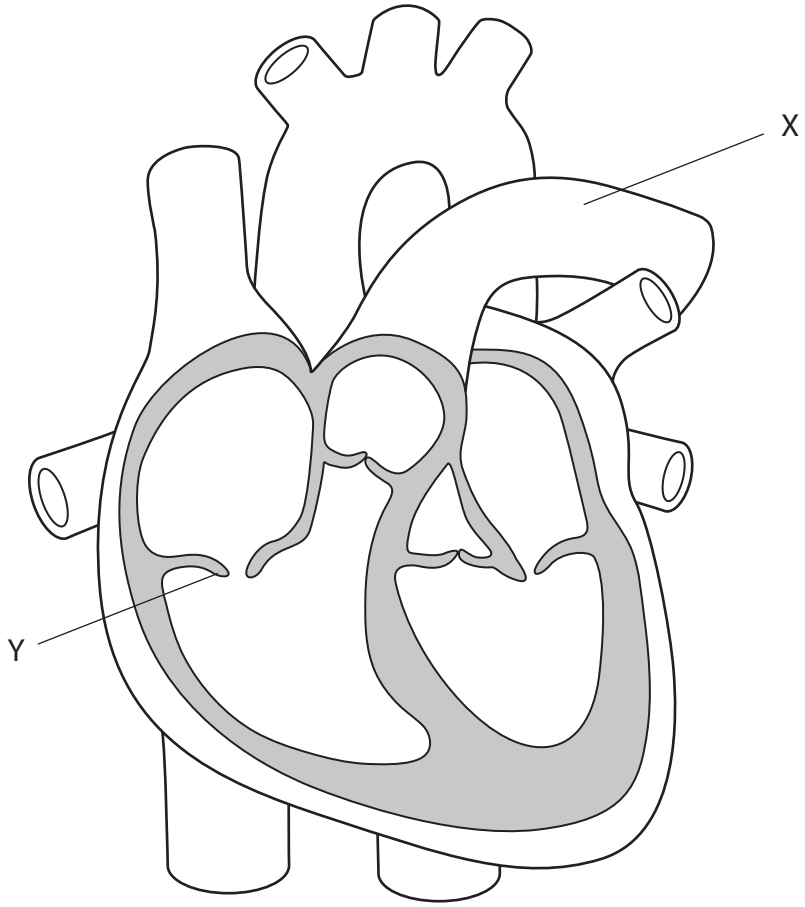
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3 .....

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(Total for Question 2 = 7 marks)

3 The diagram shows a section through a human heart.



(a) The blood in vessel X is transported to an organ.

(i) Name the organ.

(1)

.....

(ii) State two changes to the blood in this organ.

(2)

1 .....

.....

2 .....

.....

(b) What is the function of the part labelled Y?

(1)

.....

.....

(c) The diagram shows the contraction and relaxation of the atria and ventricles during several heartbeats.

Each square represents a time of 0.1 second.

■ = contraction

□ = relaxation



(i) For how long do the ventricles contract during one heartbeat?

(1)

Answer ..... second

(ii) How many heartbeats does the diagram show?

(1)

Answer .....

(iii) Use the diagram to calculate the heart rate of this person in beats per minute. Show your working.

(2)

Answer ..... beats per minute

(Total for Question 3 = 8 marks)

4 Polydactyly is a genetic disorder in which people inherit an extra digit.

The X-ray image shows the left hand of someone with polydactyly. The person has six digits, five fingers and one thumb.



Polydactyly is caused by a dominant allele (D). The table describes the different genotypes for polydactyly.

(a) Complete the table by giving the correct genotype, alleles of each genotype and the expected number of digits per hand.

(4)

Genotype	Alleles	Expected number of digits per hand
homozygous dominant		six
	dd	
heterozygous	Dd	

(b) The table lists possible matings between parents. Complete the table by writing the probability of each mating producing a child with polydactyly. One has been done for you.

(2)

Parent genotypes	Probability of child with polydactyly
Dd × DD	
Dd × dd	0.5
Dd × Dd	

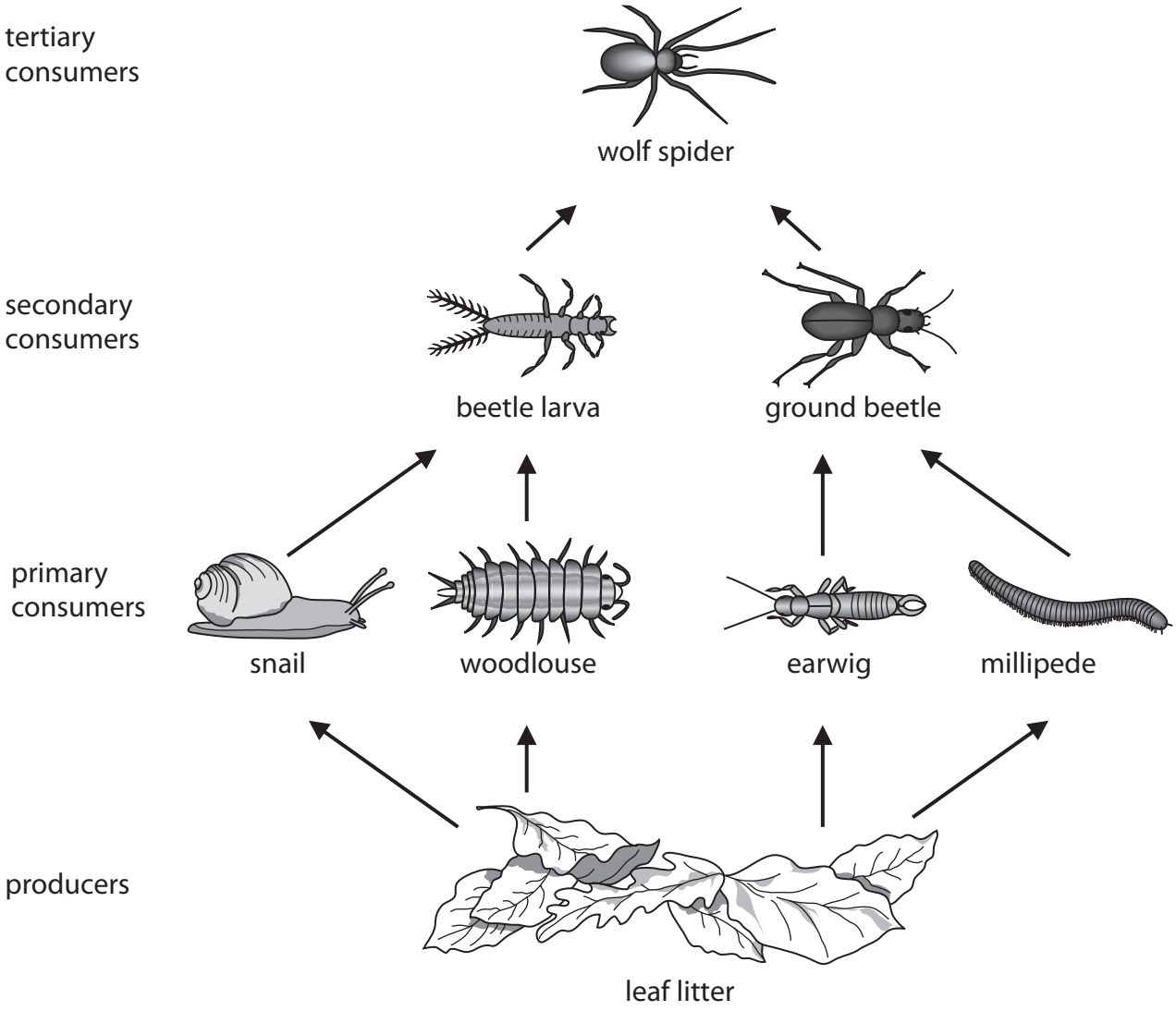
(Total for Question 4 = 6 marks)

5 Describe the stages used to produce a cloned mammal.

(5)

(Total for Question 5 = 5 marks)

6 When trees lose leaves, they fall to the ground and form leaf litter. The leaf litter provides food for many animals. The diagram shows a food web that includes leaf litter.



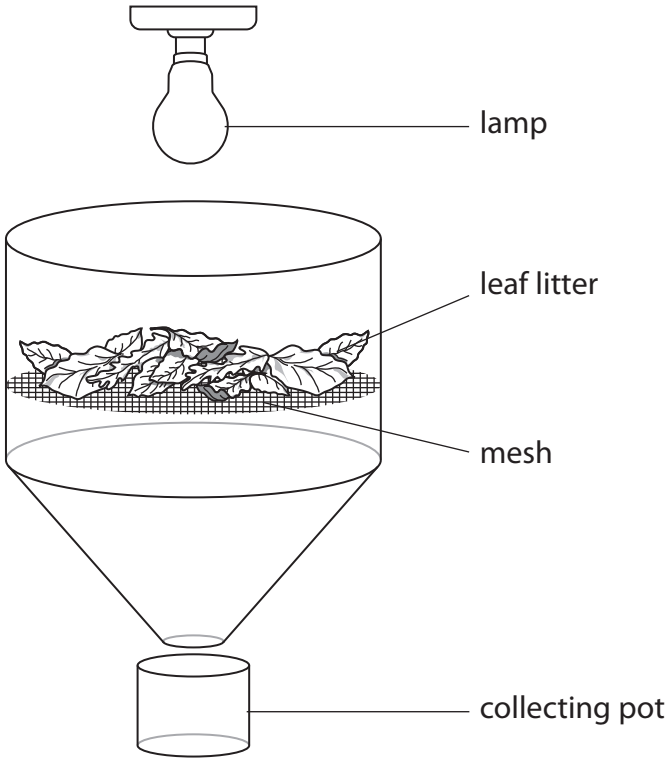
(a) Use information in the food web to complete the table.

The first one has been done for you.

(4)

	Number
the number of different tertiary consumers	1
the number of trophic levels	
the number of food chains	
the number of different predators	
the number of different consumers	

(b) The following apparatus is called a Tullgren funnel. It is used to sample the number of animals living in leaf litter. The animals move away from the light and fall into the collecting pot.



A student used a Tullgren funnel to sample the number of millipedes living in leaf litter in two areas of a forest. The student took leaf litter from 5 quadrats in the centre of the forest and from 5 quadrats near the edge of the forest.

The table shows the student's results.

Quadrat	Number of millipedes per m^2 of leaf litter	
	Centre of forest	Edge of forest
1	10	4
2	8	2
3	8	3
4	13	6
5	12	4

(i) One stimulus that the millipedes respond to in the Tullgren funnel is light. Suggest two other stimuli that might cause millipedes to fall into the collecting pot.

(2)

1 .....

2 .....

(ii) State the difference in the number of millipedes found in the leaf litter samples from the two areas of the forest and suggest two reasons for this difference.

(3)

difference .....

reason 1 .....

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reason 2 .....

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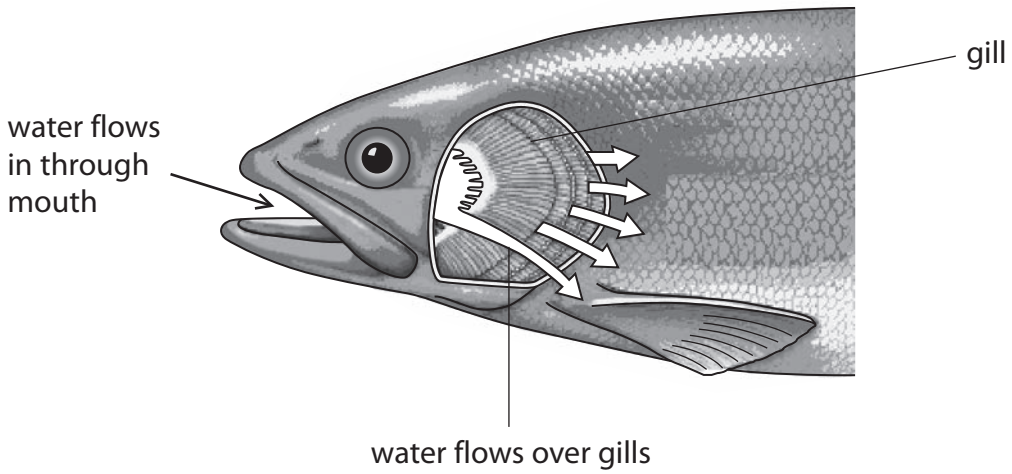
(iii) The student collects leaf litter using a quadrat. Draw a quadrat in the space below.

(1)

(Total for Question 6 = 10 marks)

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7 Fish breathe by opening their mouths to allow water containing oxygen to pass over their gills. This is shown in the diagram.



(a) (i) Gas exchange takes place in the gills.

What is meant by the term gas exchange?

(1)

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.....

(ii) Fish use their gills as a gas exchange surface.

Suggest three ways in which fish gills are adapted for efficient gas exchange.

(3)

1 .....

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2 .....

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3 .....

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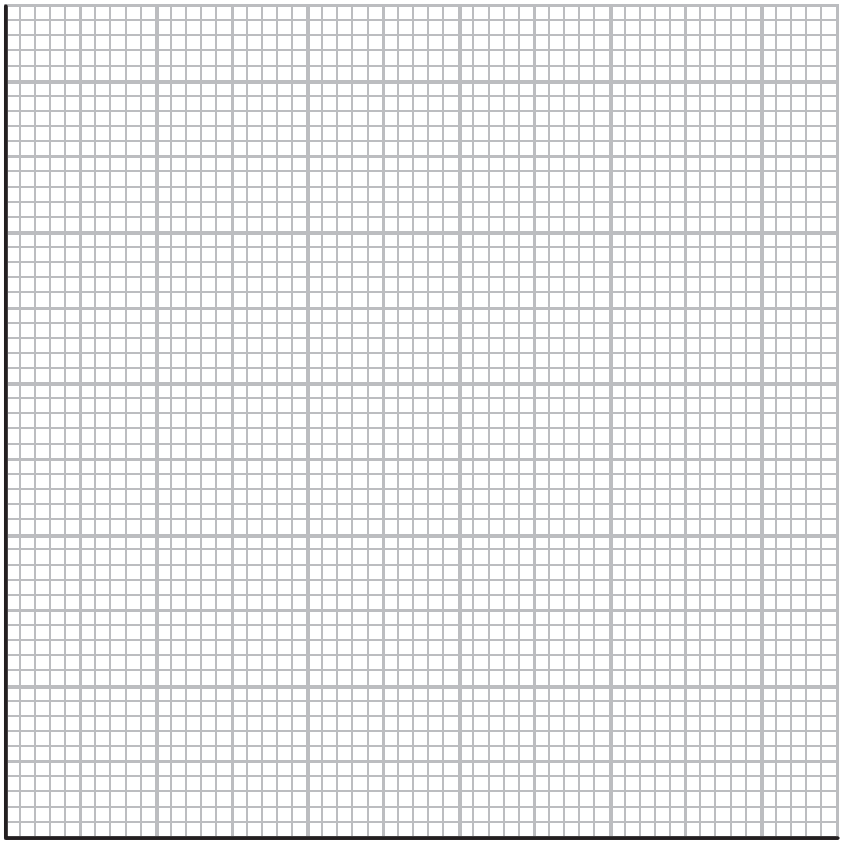
(b) Students investigated the effect of temperature on the breathing rate of fish. They put fish of the same size in tanks of water at different temperatures. They measured the breathing rate by counting the number of times the fish opened their mouths in a minute.

The results are shown in the table.

Water temperature in °C	Breathing rate in breaths per minute				
	Trial 1	Trial 2	Trial 3	Trial 4	Average
2	2	3	3	4	3
8	30	33	27	30	30
14	54	52	53	53	53
20	80	75	81	84	80
26	101	98	102	101	101

(i) Plot a line graph to show the effect of water temperature on the **average** breathing rate of the fish. Join the points with straight lines.

(5)



(ii) Suggest how the results support the hypothesis that warm water contains less oxygen than cold water.

(1)

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.....

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(iii) The students controlled the size of fish. Explain why this is needed to make it a valid investigation.

(1)

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(iv) Give two other factors the students should have controlled.

(2)

1 .....

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2 .....

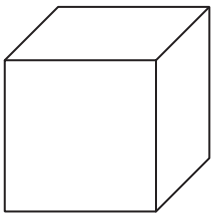
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(Total for Question 7 = 13 marks)

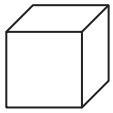
8 A student investigated the effect of size on the movement of molecules.

He cut three different sized cubes from a block of clear agar jelly.

Cube A was 2 × 2 × 2 cm. Cube B was 1 × 1 × 1 cm and cube C was 0.5 × 0.5 × 0.5 cm.



cube A



cube B



cube C

The student wore safety glasses and placed the cubes in a beaker of red dye solution for five minutes.

He then poured the solution into another beaker, washed the surface of the cubes and dried them with blotting paper.

He then cut each cube in half and examined the newly cut surfaces.

Diagram 1 shows what the cubes looked like.

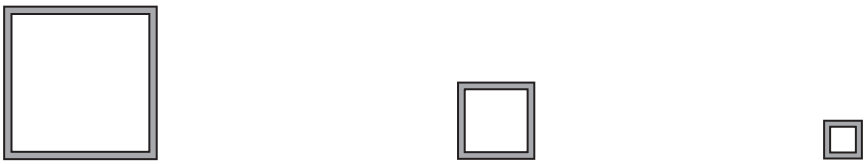


Diagram 1

(a) Why did he wear safety glasses?

(1)

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.....

(b) Explain how the red dye molecules entered the jelly.

(2)

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(c) Use a ruler to measure the distance the red dye has entered each cube in diagram 1.

(1)

..... mm

(d) (i) Calculate the surface area of cube A.

(2)

surface area = ... unit .....

(ii) Calculate the volume of cube A.

(2)

volume = ... unit .....

(e) The student was told by his teacher that the cubes have different surface area to volume ratios.

Complete the table by putting one tick (✓) in each row to show whether the statement applies to cube A, B or C.

(3)

	Cube A	**Cube B**	**Cube C**
largest surface area			
largest surface area to volume ratio			
greatest proportion of cube coloured red			

(f) Explain how this experiment can be used to understand the need for transport systems in larger organisms such as humans.

(3)

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(Total for Question 8 = 14 marks)

9 Describe an investigation to find out if leaves growing at the bottom of trees are greener than leaves growing at the top of trees.

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

(6)

(Total for Question 9 = 6 marks)

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10 The photograph shows an Arabian oryx.



Arabian oryx live in the desert where there is no free-standing water. Most of their habitat is sand. Plants, such as grass and small trees, cover only a small area. Oryx feed mainly on grass.

Summers are hot. Daytime temperatures can be as high as 41 °C and temperatures at night only fall to 24 °C. Oryx are less active in summer than in winter. In summer, they reduce their energy use by changing their behaviour and body processes.

(a) Suggest why oryx are less active in summer than in winter.

(3)

(b) In summer, oryx rest under trees during the day and feed at night. Suggest why they do this.

(2)

(c) Suggest where the oryx get their water from in the absence of free-standing water.

(1)

(d) Oryx and humans can control water loss by making their urine very concentrated. Describe how this is done.

(6)

(Total for Question 10 = 12 marks)

11 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)

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(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)

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

(2)

1 .....

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2 .....

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

(2)

1 .....

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2 .....

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(Total for Question 11 = 9 marks)

12 The diagram shows an insect pollinated flower called a lily.



(a) Describe the features of an insect pollinated flower that help it to attract insects.

(3)

(b) Sexual reproduction in flowering plants and mammals involves the process of gamete formation by meiosis followed by fertilisation.

Use the words from the box to complete the table about sexual reproduction in flowering plants and mammals.

Each word can be used once, more than once or not at all.

anther	copulation	fallopian tube	ovary	ovule
placenta	penis	pollination	seed	testes
uterus	vagina	zygote		

(5)

	In flowering plants	**In mammals**
female gametes are made in the		
male gametes are made in the		
gametes are brought together by		
fertilisation takes place in the		
embryos develop in the		

(c) Cell division in an organism can take place by mitosis or by meiosis.
Give three ways in which mitosis differs from meiosis.

(3)

1 .....

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2 .....

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3 .....

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(d) Suggest why a flower grower may want his coloured flowers to reproduce asexually.

(2)

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(Total for Question 12 = 13 marks)

13 Deforestation has an effect on the environment.

(a) (i) What is meant by the term **deforestation**?

(1)

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(ii) Explain the effects that deforestation has on the balance of oxygen and carbon dioxide in the atmosphere.

(3)

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(b) The release of pollutant gases into the atmosphere also has effects on the environment.

Complete the table by giving the names of the missing gases, and the effects of the gases on the environment.

(5)

Gas	Source	Effect on the environment
	cattle farming	
water vapour	combustion	
	burning fossil fuels	causes acid rain
	incomplete combustion	affects transport of oxygen in blood
CFC	refrigerators and air conditioning units	

(Total for Question 13 = 9 marks)

QUESTION 14 STARTS ON THE NEXT PAGE

14 Yeast can respire anaerobically and is used to produce beer.

(a) Write the word equation for anaerobic respiration in yeast.

(2)

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(b) Describe a test you could use to identify the gas produced when yeast respires anaerobically.

(2)

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(Total for Question 14 = 4 marks)

TOTAL FOR PAPER = 120 MARKS

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