Name _____ **Class** _____ **Date** _____

1 Water fleas are tiny organisms that live in water. You can see a water flea's heart beating if you look at it under a microscope.

In an investigation, Sofia (student A) puts some water fleas into five beakers of water. She keeps the water in each beaker at a different temperature.

She puts some microscope slides in each beaker so that they reach the same temperature as the water fleas in that beaker.

Sofia places one water flea from each beaker on a microscope slide. She counts the number of heartbeats for one minute. The table below shows the results.

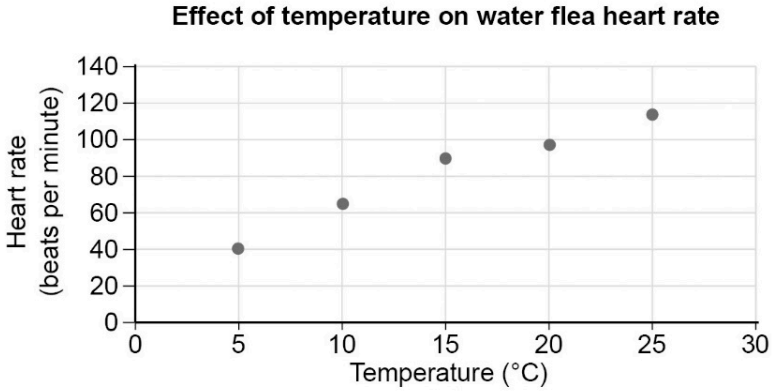
Student A results	
Temperature (°C)	**Heart rate (beats per minute)**
5	40
10	65
15	90
20	98
25	115

a Describe what this investigation is testing.

_____

(1)

This graph shows the results.



b **i** Describe the pattern shown in the results.

_____

_____

(1)

ii Sofia concludes that a water flea's heart rate is highest at 25 °C.

Give *two* reasons why she cannot be certain of this conclusion.

_____

_____

(2)

c Matthias (student B) repeats the investigation. The table shows his results.

Student B results	
Temperature (°C)	**Heart rate (beats per minute)**
5	70
10	100
15	137
20	198
25	270

i Compare the results recorded by students A and B.

(2)

ii Give *two* reasons why the two students' results could be different.

(2)

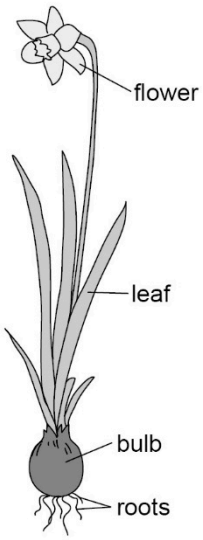
d Alcohol is a depressant that affects heart rate.

Devise a plan for an experiment that you could use to determine the effect of alcohol on the heart rate of water fleas.

(3)

(Total for Question 1 = 11 marks)

2 Daffodils grow from storage organs called bulbs. The diagram below shows a daffodil.



a Describe how the daffodil leaves make glucose.

_____

_____

_____

_____

_____

_____

(3)

The instructions on a packet of daffodil bulbs state:

> After flowering, wait until the leaves have turned pale yellow or brown before cutting back.

b What substance is lost from the leaves of the daffodil plants that makes them turn yellow? Tick *one* box.

- ☐ A chlorophyll
- ☐ B nitrate
- ☐ C starch
- ☐ D lipid

(1)

c Explain the reason for the instructions on the packet of bulbs.

_____

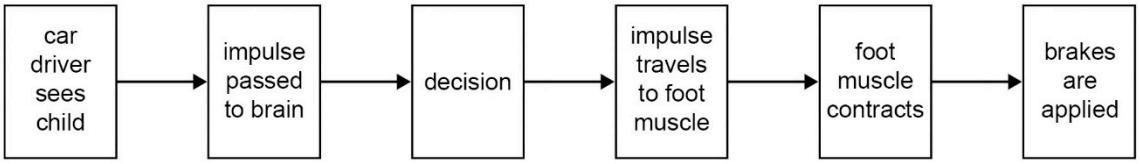
_____

_____

(2)

(Total for Question 2 = 6 marks)

3 The flowchart below shows the sequence of events when a child runs out in front of a moving car.



Explain why a driver who has been drinking alcohol is more likely to injure the child than a driver who has not.

_____

_____

_____

_____

_____

(3)

(Total for Question 3 = 3 marks)

4 Alejandro is looking at some cells using a microscope.

He starts by using a ×5 eyepiece lens and a ×10 objective lens.

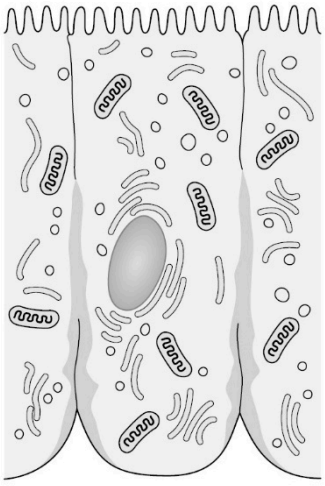
a Calculate the total magnification he is using.

_____

(1)

The diagram shows a drawing from a microscope slide of some cells that line the inside of the small intestine.

These cells absorb nutrients.



b In which part of this cell does aerobic respiration take place? Tick *one* box.

- ☐ A nucleus
- ☐ B mitochondria
- ☐ C vacuole
- ☐ D chloroplast

(1)

c Write a word equation for aerobic respiration.

_____

(2)

d Explain how the cells in the diagram are adapted to their function.

_____

_____

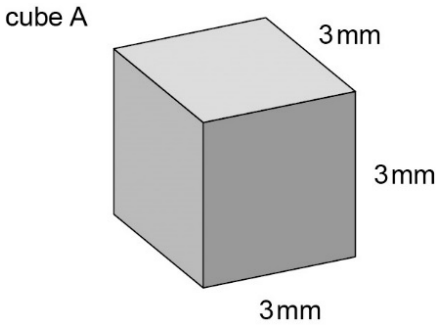
_____

_____

(2)

(Total for Question 4 = 6 marks)

5 **a** The diagram below shows cube A, with sides of 3 mm.



i Calculate the volume of cube A.

volume = _____ mm^3

(1)

ii Calculate the surface area of cube A.

surface area = _____ mm^2

(1)

b Cube B has sides of 4 mm.

Compare the surface area : volume ratio of cube B with the surface area : volume ratio of cube A.

_____

_____

_____

_____

_____

(3)

c Describe how the alveoli of the lungs are adapted to their function.

_____

_____

_____

_____

_____

_____

(3)

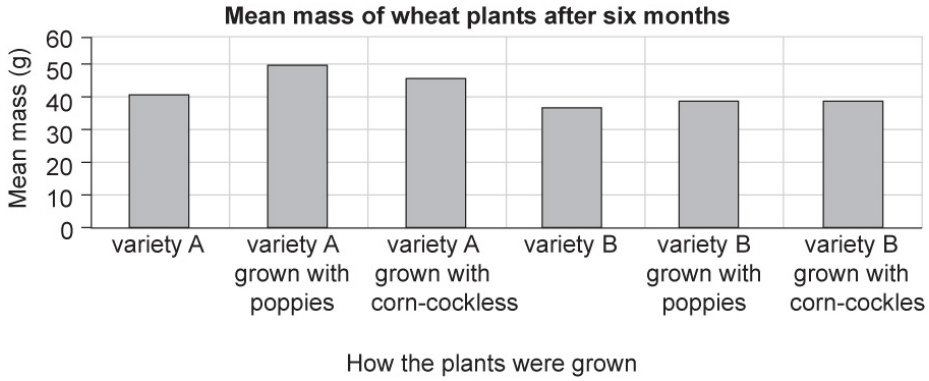
(Total for Question 5 = 8 marks)

6 Some scientists investigate how well different varieties of wheat plants grow on their own and with other plants.

They grow 50 wheat plants of a variety A and 50 wheat plants of variety B in a large greenhouse.

They plant some plants of variety A on their own and plant some next to other plants. They do the same with plants of variety B.

After six months, they calculate the mean mass of each variety of wheat plant. The results are shown in the bar chart below.



a Compare the results for variety A and variety B.

(3)

b The scientists want to produce a variety of wheat that gives a bigger mean mass than variety A or variety B. How should they do this? Tick *one* box.

- ☐ A natural selection
- ☐ B selective breeding
- ☐ C asexual reproduction
- ☐ D seed germination

(1)

c The scientists grow some more wheat plants of variety A in three different fields.

They plant 50 plants in each field.

After six months they measure the mass of the plants from each field. The table shows their results.

Field number	Mass of wheat plants (g)
1	32
2	35
3	25

i Calculate the mean mass of wheat plants grown in the three fields.

Show your working.

mean mass = _____ g

(2)

ii Describe the difference in the mean mass of wheat plants for variety A grown in fields outdoors and variety A grown in a greenhouse. Give *two* possible reasons for the difference.

Description _____

_____

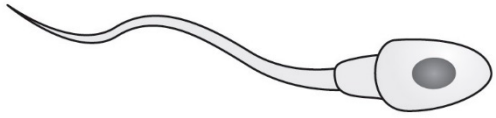
Reason 1 _____

Reason 2 _____

(3)

(Total for Question 6 = 9 marks)

7 This diagram shows a human sperm cell.



a Respiration takes place in the middle piece of a sperm cell.

Explain why respiration is important to a sperm cell.

_____

_____

_____

(2)

b A sample of semen contained 40 million sperm cells. Forty per cent of these sperm cells were damaged.

Calculate how many sperm cells in this semen sample were damaged and how many were not damaged. Show your working.

damaged = _____ not damaged = _____

(2)

(Total for Question 7 = 4 marks)

8 Choose the best word to complete each sentence.

characteristics	genes	inheritance	dying	reproduce	survival

Write *one* word in each box. Each word may only be used once.

Individual animals in a species show a wide range of [ ].

This range is because of differences in their [ ].

Those individuals most suited to the environment are likely to have a greater chance of [ ] and will go on to [ ].

(4)

(Total for Question 8 = 4 marks)

9 'Animals and plants are interdependent for the gases they need.'

Evaluate this statement.

_____

_____

_____

(3)

(Total for Question 9 = 3 marks)

10 Explain the roles of the different nutrient groups in the human body.

(6)

(Total for Question 10 = 6 marks)

TOTAL FOR TEST = 60 MARKS