Jan 2017

3. Joe is investigating the effect of light intensity on the height of cress seedlings.
He grows the cress in 5 plastic trays.
He puts each tray under a different light intensity.

(a) Suggest how Joe could estimate the average height of the cress seedlings at each light intensity.

: Select 20 seedlings from across the tray
: Cut them from base
: Use ruler to measure height / RANDOM SELECTION
: Calculate average

(3)

The table below shows Joe's results.

distance of seedlings from light, in cm	average height of seedlings in mm
1	40
2	20
3	10
4	5
5	2.5

(b) Describe and explain the results in the table.

Average height declines / gets smaller further away from light (1)
Average height halves for each CM (1)
Light needed for photosynthesis, which is needed for growth and the height depends on availability of light.

(4)

1

7. Freddie and Ben were learning about digestion in class.
They decided to investigate the effect of changing temperature on the breakdown of starch, using amylase.
Iodine solution is used to detect the presence of starch.

(a) Name the product produced when amylase breaks down starch.

any from: glucose / sugar / simple sugars ..... (1)

Freddie and Ben mixed together amylase and starch at 30 °C. They took a dimple tile and added three drops of iodine solution to each dimple.

After one minute, a drop of the starch and amylase mixture was added to iodine in the first dimple. They recorded the colour of the iodine solution.

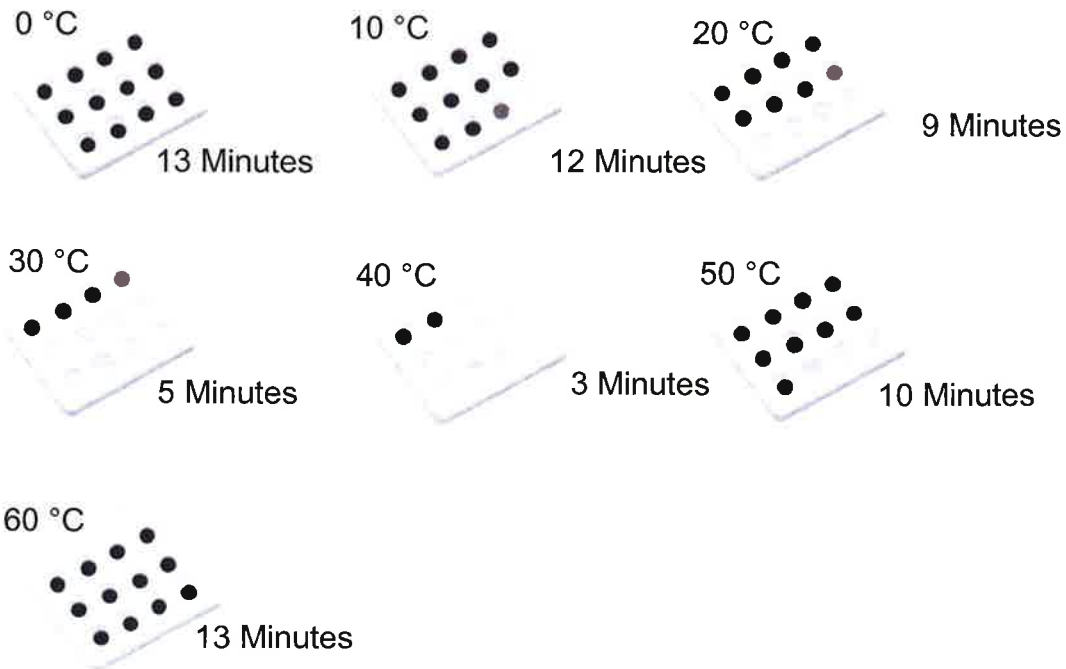
The starch and amylase mixture was added to each of the dimples in turn, at one minute intervals, until the iodine solution no longer changed colour.

This showed that the amylase had completely digested the starch.

The time taken to digest the starch completely was recorded in minutes.

Freddie and Ben repeated the experiment at six other temperatures, 0 °C, 10 °C, 20 °C, 40 °C, 50 °C and 60 °C.

No starch digestion was observed at 0 °C or 60 °C during the 13 minutes of the experiment.
The results of the experiment are shown below.



(b) (i) Describe the colour changes that occur when iodine solution is mixed with starch.

Orange to blue/black

..... (1)

(ii) Name the variable changed by Freddie and Ben.

*Temperature

..... (1)

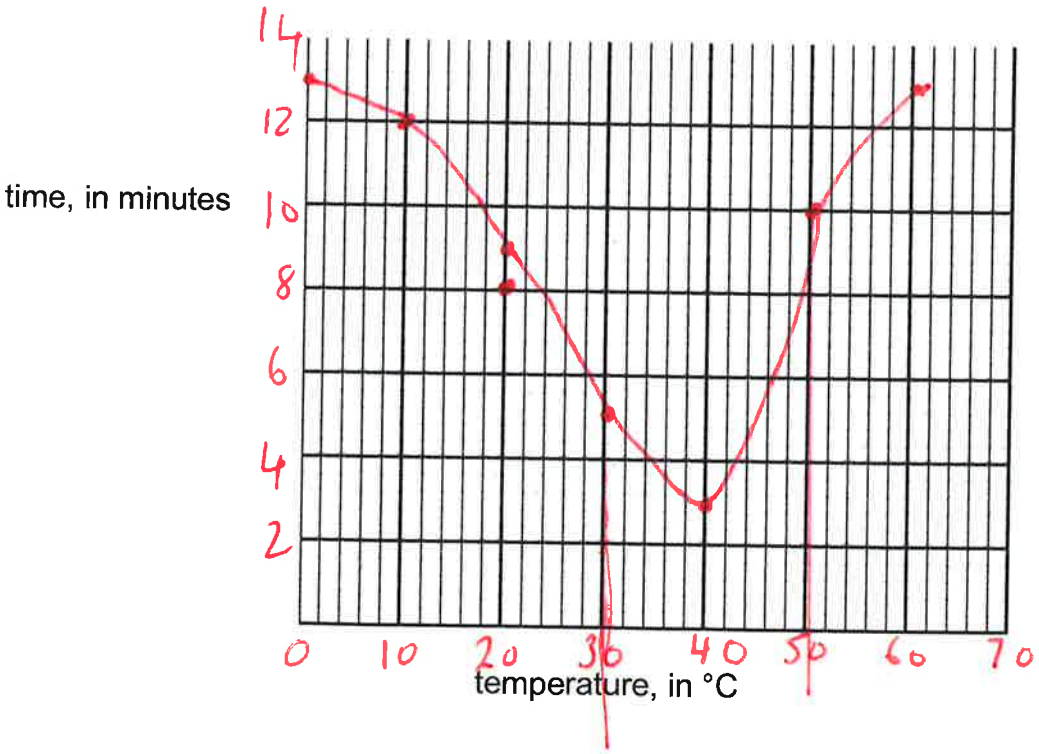
(iii) Explain why Freddie and Ben recorded the result of the 30 °C experiment as 5 minutes.

The iodine stayed clear after 5 minutes (1)

So all of the starch had been digested (broken down) (1)

..... (2)

(c) (i) Use the information in the diagram **to plot** the graph below, showing the time taken to digest starch, in minutes, against temperature, in °C.



(3)

(ii) Draw a line of best fit.

need to see evidence on the graph

(1)

(iii) Use the graph to predict the temperature at which amylase digests starch at its fastest rate.

Between 30°C - 50°C

..... (1)

3

(iv) Suggest why the results for 0 °C and 60 °C may not be accurate.

The colour had not changed after 15 minutes, when measurements stopped (2)

A different type of amylase is often used in the food industry to break down starch.
The amylase is usually obtained from bacteria and works best at temperatures between 50–60 °C.

(d) (i) Suggest how this bacterial amylase differs from the amylase that Freddie and Ben used.

The temperature of this (bacterial) amylase works best at about 10°C higher than Ben / Fred's (1)

(ii) Suggest why it is an advantage for the food industry to use amylase that works best at between 50–60 °C.

- It will digest starch faster
- therefore will reduce the costs of production (2)

Spring 2016

2 The steps taken when testing a leaf for starch are outlined in the statements below.
The steps are not in the correct order.

(a) Write the numbers 2 to 5 in the box below to show the correct order.
(Number 1 has been done for you.)

stage	number
heat the leaf in boiling ethanol	2
dip the leaf in hot water again	3
spread the leaf over a white tile	4
dip the leaf in hot water 1	1
add iodine solution to the leaf and look for a colour change	5

(2)

(b) Suggest a reason for doing the following steps in the method.

(i) heat the leaf in boiling ethanol

To remove Chlorophyll from the leaf (1)

4

(ii) dip the leaf in hot water

Softens the leaf

(1)

(iii) add iodine solution to the leaf

Changes from orange to blue to black in the prekence of starch

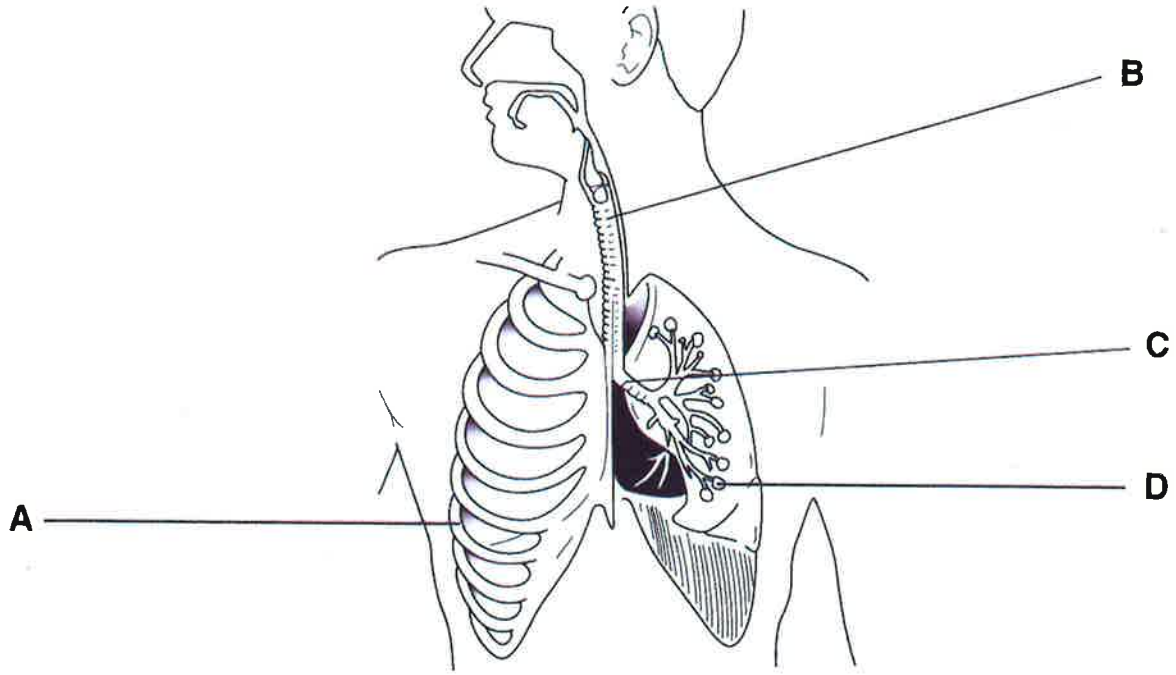
(1)

(c) Explain why a water bath is used to heat the tube containing ethanol, rather than a Bunsen burner.

Ethanol is flammable and therefore dangerous in the presence of flames

(1)

Q5 The diagram below shows the human respiratory system.



(a) Give the names of the organs labelled A–D in the diagram.

A Ribs

B Trachea or windpipe

C Bronchus

D Alveoli (4)

(b) Suggest two ways in which structure **A** is important.

1: Protection of organs

2: Used in breathing to help ventilate the lungs

(2)

5

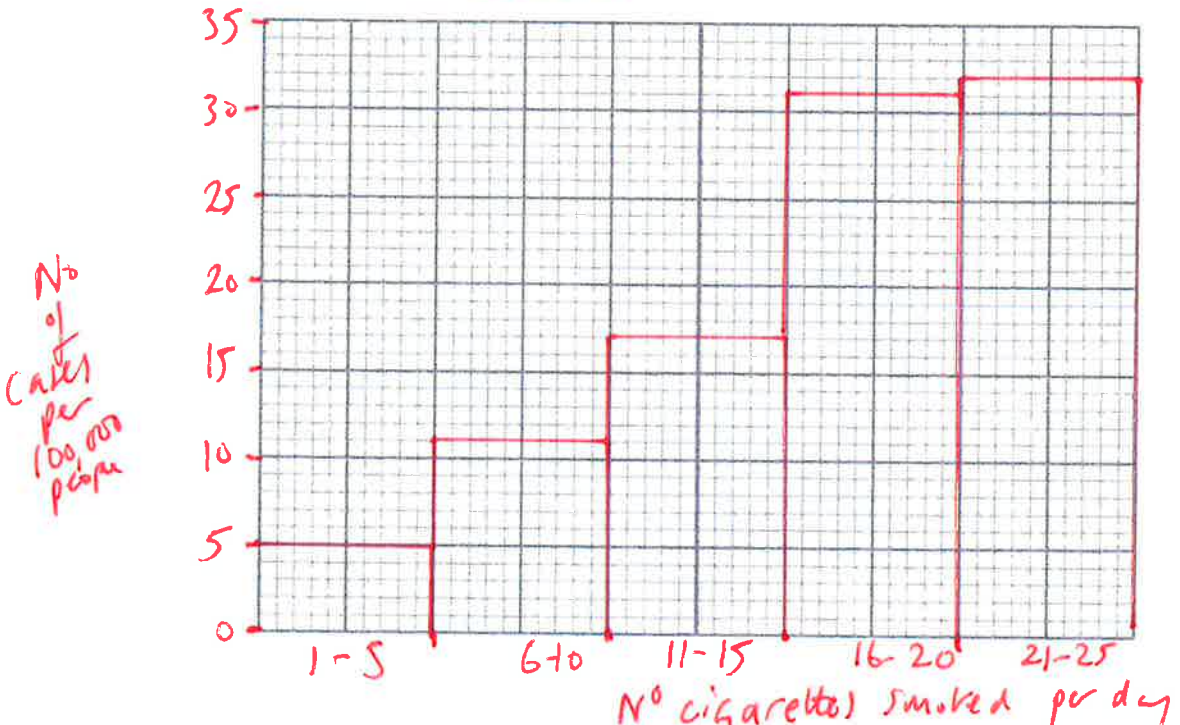
People who smoke may develop a disease called bronchitis.

The table below shows the effect of the number of cigarettes smoked per day on the number of cases of bronchitis.

number of cigarettes smoked per day	number of cases per 100 000 people
1–5	5
6–10	11
11–15	17
16–20	31
21–25	32

highlight type of graph

c) Plot the data given above as a bar graph on the graph paper below. Label the axes.



(4)

(d) Describe the pattern shown in the data.

As consumption of cigarettes increases so do the cases of bronchitis (1)

Largest jump from 1-15 cigarettes a day to 16-20. (3)

(e) Name two other diseases of the respiratory system caused by smoking.

disease 1: emphysema

disease 2: lung cancer

look up in text books. (2)

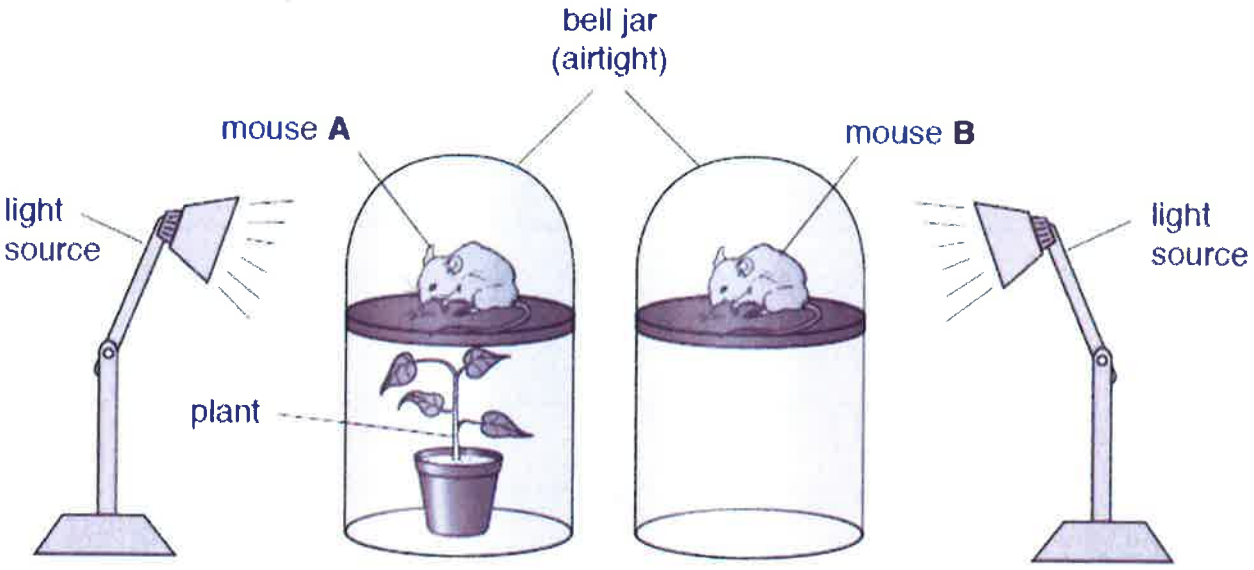
6

Summer 2015

5 In 1772, Joseph Priestly carried out experiments with mice and plants in bell jars.

The bell jars were airtight, so that gases could not move in or out.

The mice were provided with food and water.



The mice were respiring.

(a) Complete the following equation for respiration. RTQ

oxygen + glucose → carbon dioxide + water + energy release (2)

(b) Suggest why mouse **A** is more likely to survive than mouse **B**.

Plant produces oxygen during photosynthesis (1)
So Mouse has oxygen for respiration (1)
Mouse B might die – oxygen is used up (1)
and respiration needed for survival (3)

(b) Describe a test for carbon dioxide gas.

test: limewater (bubble gas into)

result: goes cloudy / milky
(2)

7

The rate of respiration can be measured by measuring the volume of carbon dioxide released per minute.

The following data were collected to investigate the effect of temperature on the rate of respiration.

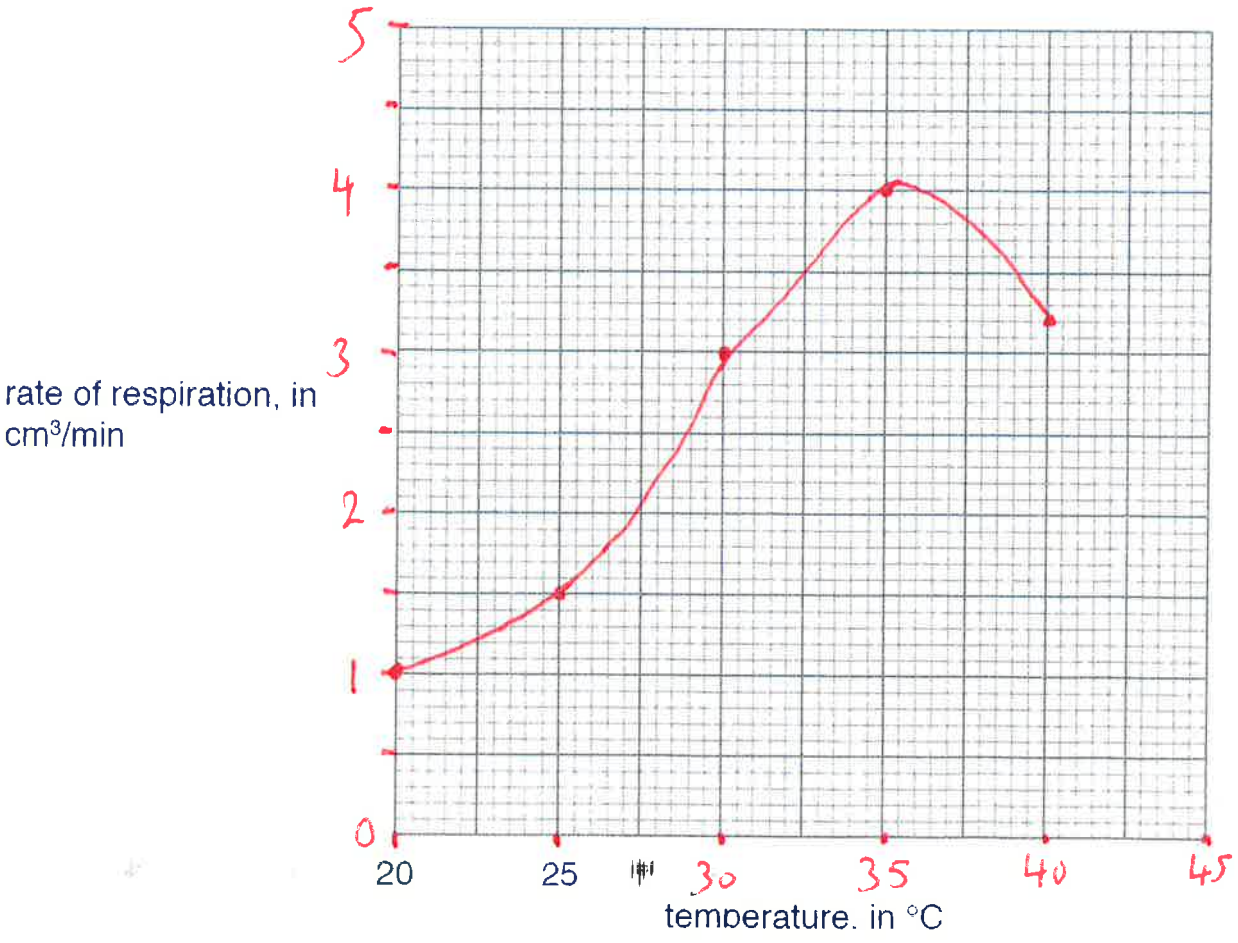
temperature, in °C	rate of respiration, in cm^3/min
20	1.0
25	1.5
30	3.0
35	4.0
40	3.2

(d) (i) Use the table above to complete the horizontal axis of the graph below. (1)

(ii) Add an appropriate scale to the vertical axis of the graph below. (1)

(iii) Plot a graph of the rate of respiration against temperature. (2)

(iv) Draw a curve of best fit through the points. (1)



8

(e) Describe the effect of temperature on the rate of respiration.

Increase in temp causes increase in respiration between 20 - 35 °C (1)

Above 35°C an increase in temp causes a decrease in rate (1) - largest rate increase between 25°C and 30°C. (3)

(f) Suggest why temperatures above 40 °C were not used.

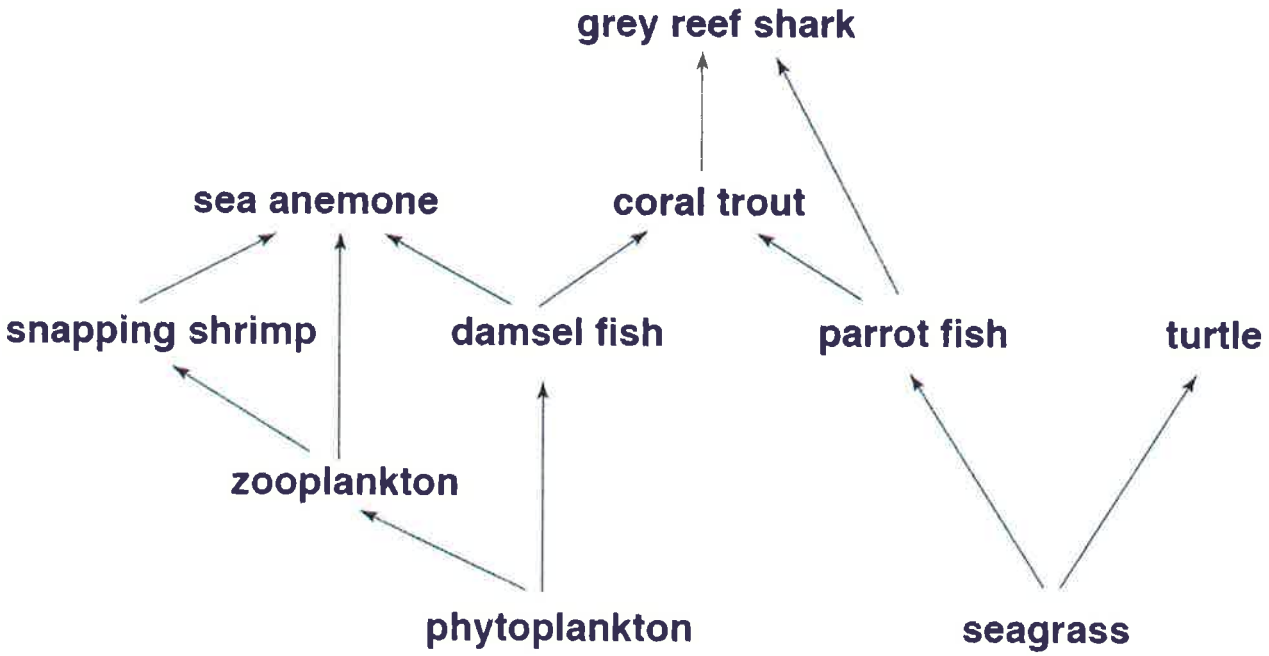
The organism would be killed. (1)

6. Coral reefs are extremely important habitats for tens of thousands of species of organisms.

(a) Define the term *habitat*.

Place where an organism lives (1)

The diagram below is an example of part of a food web for a coral reef.



Phytoplankton and seagrass are producers.

From the food web opposite name an organism which

(i) is a herbivore any of: Zooplankton / damsel fish / parrot fish / turtle

(ii) is both a secondary and tertiary consumer Sea anenome / grey reef shark

(iii) has no predators Sea anenome / grey reef shark. (3)

Corals are animals which build coral reefs.

They are very sensitive to pollution.

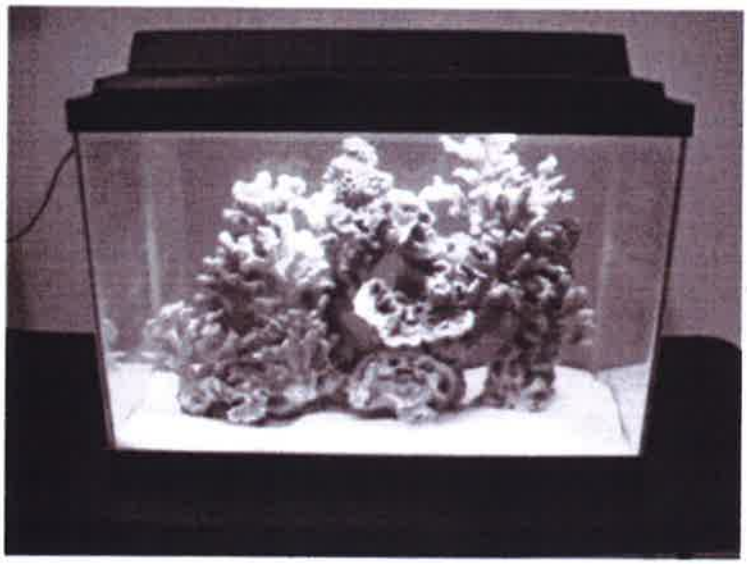
Coral is normally brightly coloured.

When a coral dies it turns white.

Recent research has found that some of the chemicals found in suntan cream may dissolve in seawater and become poisonous to coral.

Scientists need to investigate how changing the concentration of these chemicals will affect the number of corals dying.

Below is a picture of a glass tank with some coral in it.



You are provided with 5 of these tanks, suntan cream, seawater and living coral.
You may use other pieces of apparatus.

(c) Describe how you could investigate the effect of changing the concentration of suntan cream on the number of corals dying.

You should include details of how your investigation will be valid and reliable.

5 tanks used with 5 different concentrations (1)
of suntan cream
- Concentrations stated e.g 0 - 5% (1)
Add corals to tank
Leave set number of days
Count number of corals now white / dead (1)
Consideration of fair testing e.g same temp / coral small (1)
Repeat → more results.

(4)

10

5 Offspring produced by sexual reproduction vary from each other.

Some of this variation is continuous and some is discontinuous.

(a) (i) In sexual reproduction in humans, two sex cells fuse together to form a single cell.

Give the names of the two sex cells involved.

name of male sex cell: Sperm ..... (1)

name of female sex cell: Egg or ovum ..... (1)

(ii) Explain the difference between discontinuous and continuous variation, giving an example of each.

Discontinuous: There are 2 or more groups into which the characteristic can fit e.g blood type

Continuous: Where a characteristic changes gradually e.g height. (4)

Below is a table which shows the average birth weight of baby boys in the first weeks after birth.

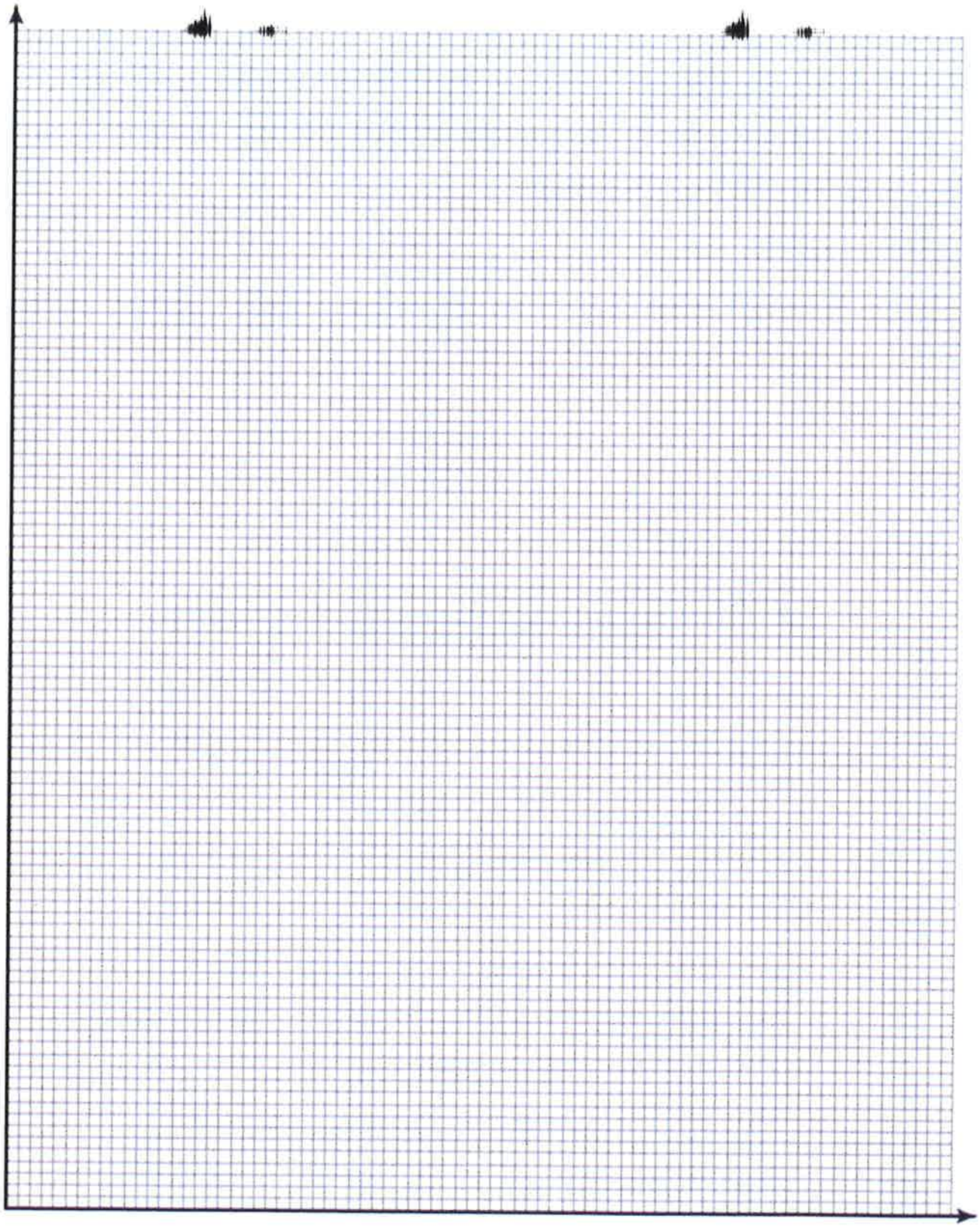
time after birth, in weeks	mass, in kg
0	3.8
5	4.4
10	5.8
15	6.7
20	7.3
25	7.7
30	8.2
35	8.6
40	9.1

On the graph grid, draw a line graph to show how the mass of a baby changes in the first 40 weeks after birth.

(i) label both axes and add suitable scales to them (2)

(ii) plot the data points (3)

(iii) add a line or curve (1)



c) Use the results to describe how the mass of a baby boy changes in the 40 weeks after birth.

.....

.....

..... (2)

12

6 Tom wanted to investigate the effects of drinking fizzy cola on his pulse rate.

First, he measured his *resting* pulse rate every minute for four minutes when sitting down.
Then he drank some cola.
He continued to measure his pulse rate each minute for the next five minutes.

(a) Suggest why Tom began the investigation by first measuring his resting pulse rate.

As a comparison / to be able to look for a change (1)

Tom's four readings for his resting pulse rate, in beats per minute, are listed below.

70 75 65 74

(b) Calculate an average resting pulse rate for Tom.
Make sure you show your working.

(70 + 75 + 65 + 75) ÷ 4 = 71 beats per minute. (2)

(c) Suggest why Tom took several readings to establish his resting pulse rate.

More results therefore more reliable - in case he made a mistake (1)

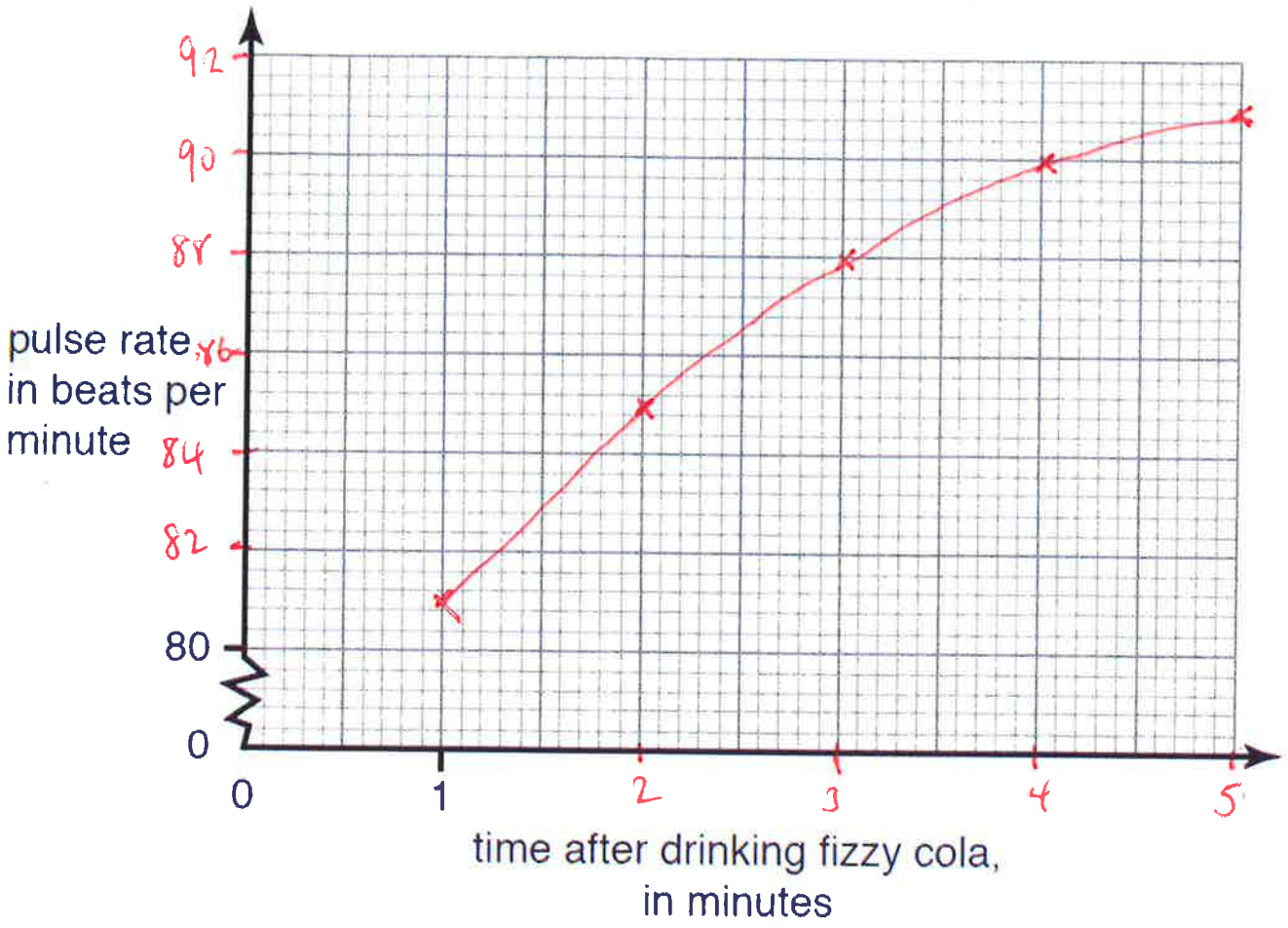
The table below shows Tom's pulse rate for the five minutes after he drank the fizzy cola.

time after drinking fizzy cola, in minutes	pulse rate, in beats per minute
1	81
2	85
3	88
4	90
5	91

13

(d) (i) Complete the scales on the horizontal and vertical axes. (2)

(ii) Plot the results on the axes and join the points with a smooth curve. (3)



(iii) Describe the effect of fizzy cola on Tom's pulse rate.

Fizzy cola increases the heart rate (1)
Increase is greatest at first, then rate increases at slower rate (1) (2)

(iv) Tom's teacher suggested he also measured his pulse rate after he drank fizzy water. Explain why measuring Tom's pulse rate before and after he drank fizzy water improved the investigation.

- As a control / comparison
- To check it is not due to the fizziness of cola
- To check it is the caffeine which is having the effect. (2)

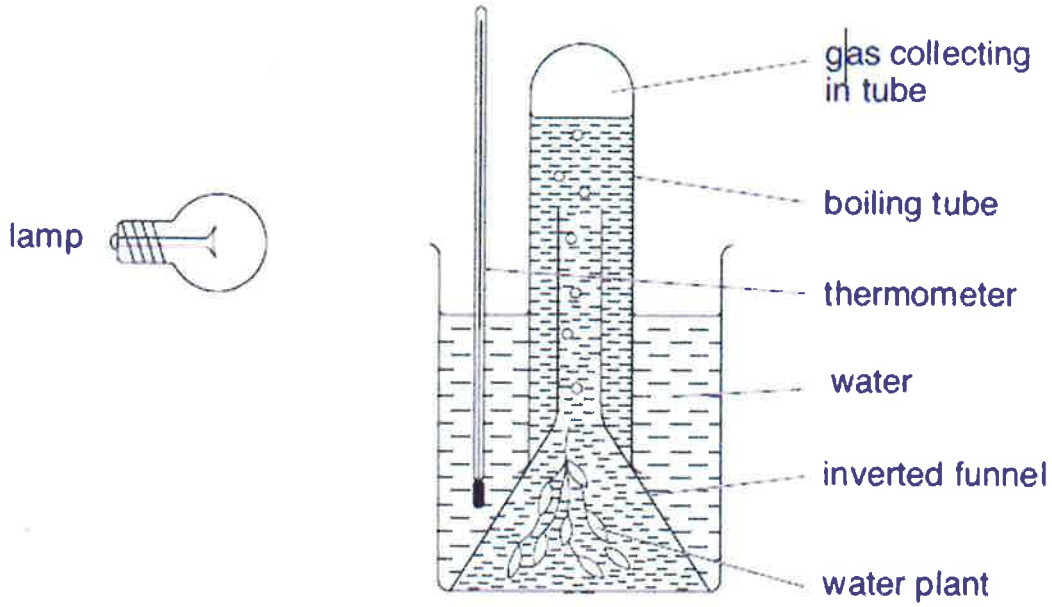
(v) Use the space below to suggest a reliable method for investigating the effect of exercise on your own pulse rate in school.

(1) Find resting heart rate
(1) Suitable type of exercise
(1) for 5 minutes
Measure heart rate after exercise
(1) Repeat / find average. (4)

19

5 Izzy and Frank wanted to investigate the effect of temperature on the rate of photosynthesis in plants.

They used water at four different temperatures and counted the number of bubbles produced by Elodea pondweed per minute at each temperature.



(a) Write down two factors, other than temperature, which affect the rate of photosynthesis in plants.

factor one: Carbon dioxide (concentration) ..... (1)

factor two: light (intensity) ..... (1)

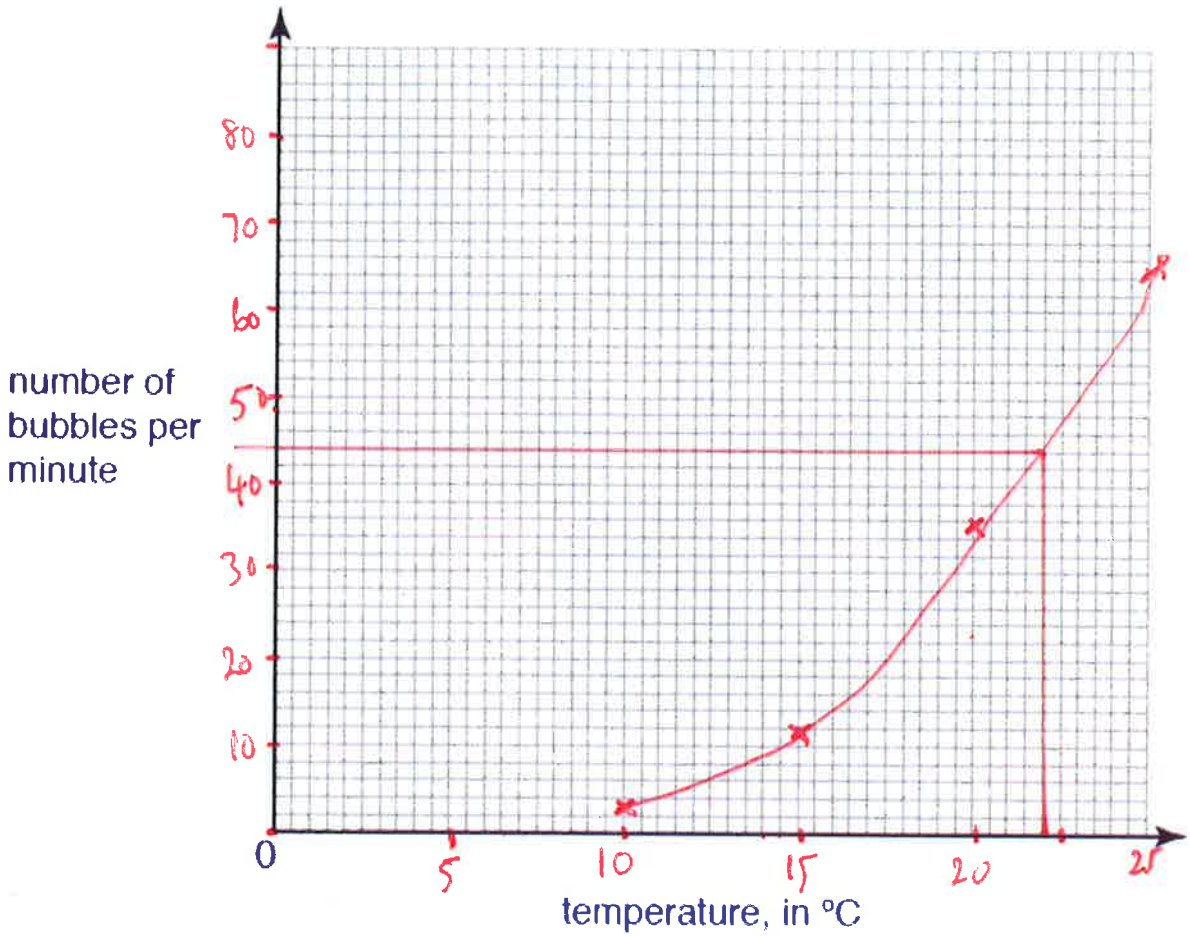
Their results are shown in the table below.

temperature, in °C	number of bubbles produced per minute
10	4
15	12
20	36
25	68

15

(b) (i) Choose suitable scales and complete the axes of the graph. (2)

(ii) Draw a line graph of this data on the graph paper opposite to show how the number of bubbles produced per minute by Elodea changes with temperature. (2)



(iii) Draw a line or curve of best fit on your graph above. (1)

(iv) Use your graph to describe the effect of increasing the temperature on the number of bubbles produced per minute by the Elodea.

Number of bubbles increase with temperature. Slowest rate of increase at lower temperature (2)

(v) Use your graph to predict the number of bubbles produced per minute by the Elodea pondweed at 22 °C.

You must show clearly on your graph how you arrived at your answer.

number of bubbles produced per minute at 22 °C 48 ± 2 (2)

(c) Name the gas given off by the Elodea pondweed and describe a chemical test for this gas.

name of gas: Oxygen (1)

chemical test: Relights a glowing splint (1)

16

5 The African Elephant *(Loxodonta africana)* is the largest living land animal. Elephants have been hunted by humans for their ivory tusks.

Below is a table showing an estimate of the size of the population of elephants in Kenya since 1970.

The Convention on International Trade in Endangered Species (CITES) banned the trade of ivory in 1990.

year	population of elephants in Kenya, in thousands
1970	167
1990	16
1995	26
2010	32

(a) Write down the name of the vertebrate group to which the African Elephant belongs.

..... Mammal ..... (1)

(b) Give two characteristics of the vertebrate group to which African Elephants belong.

(c)

1: ..... Body fur / hair ..... (1)

2: ..... Suckle their young / Give birth to live young ..... (1)

any 2 =

17

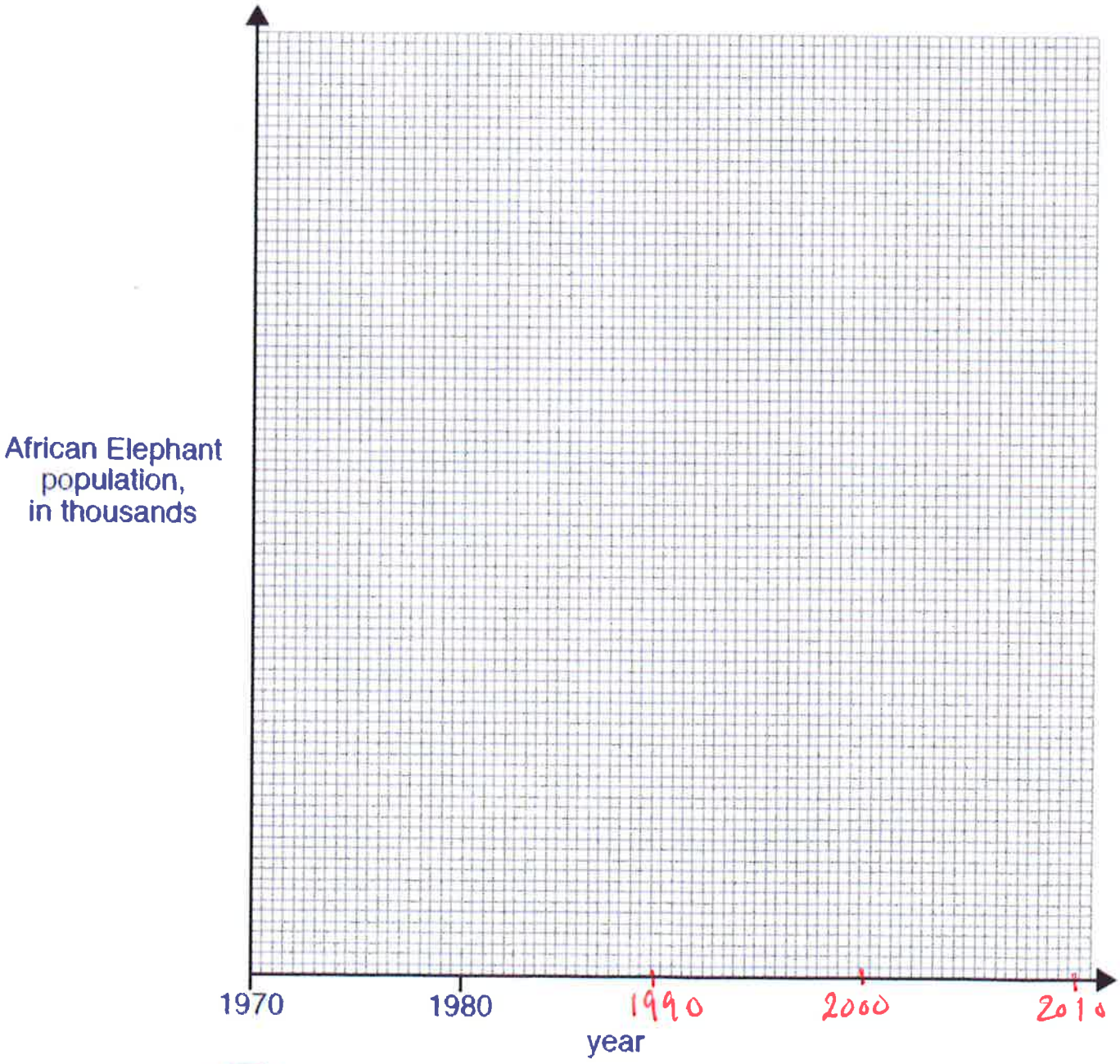
(c) Follow the instructions below to plot a line graph of the data in the table.

Instruction 1: Complete the horizontal axis with a linear scale to show the year. (1)

Instruction 2: Add a linear scale to the vertical axis to show the African Elephant population; try to make sure that you use as much of the graph paper as possible. (1)

Instruction 3: Using the data in the table opposite, plot the four points on the graph to show how the African Elephant population has changed over time. (2)

Instruction 4: Join the points using a curve of best fit. (1)



(d) Describe and explain the shape of the graph which you have drawn above.

- Dramatic fall from 1970 to 1990
- Graph shows a rise since 1990
- Rise is due (probably) to the ban

(2)

18

6. All plants need to carry out the process of photosynthesis to survive.
The more photosynthesis a plant carries out, the healthier and faster it will grow.

(a) (i) Write down the name of the nutrient which plants make when they carry out photosynthesis.
Glucose
..... (1)

(ii) Write down the name of the by-product of photosynthesis.
Oxygen
..... (1)

(iii) Sunlight is needed for photosynthesis.
Write down the names of TWO chemicals which are required for photosynthesis.
1: Carbon dioxide ..... (1)

2: Water ..... (1)

Like all living organisms, plants need to carry out the process of respiration in all of their cells.
At night plants use up their stored starch in respiration.

(b) (i) Write down the name of the chemical used to test for the presence of starch in a leaf.
Iodine solution
..... (1)

(ii) Write down the colour this chemical turns in the presence of starch.
Blue/black
..... (1)

(iii) Describe the steps you would need to carry out in a school laboratory to test a leaf for the presence of starch.
Remember to include any safety precautions which you would take.

- Place leaf in boiling water
- Place in boiling ethanol / alcohol
- Rinse in water
- Add iodine
- SAFETY = no naked flame / use a water bath.

..... (4)

Jan 2013

6. In April 2010, a massive oil spill began in an area of sea called the Gulf of Mexico. An oil spill of this size takes years to clean up.

To begin with, the oil floats on top of the water.
(a) Suggest why the floating oil will reduce the rate of photosynthesis in marine plants and phytoplankton.
light
Less light
..... (1)

(b) Marine plants and phytoplankton are the producers in sea food chains. Suggest what effect an oil spill would have on the numbers of primary consumers in the area.

Give a reason for your answer.
effect: Numbers also decrease
reason: Less food / primary consumers starve / producers have died. ..... (2)

(c) Look at the picture below.
It shows a sea bird with oil from an oil spill covering its feathers.

Suggest two effects this could have on the bird and why it is likely to result in the bird dying if it is not helped.

effect on bird 1: Cannot fly

reason it might cause the bird to die: Cannot find food / escape predators

effect on bird 2: Cannot swim / affects waterproofing

reason it might cause the bird to die: Cannot find food / escape predators. (4)

(d) Oil is difficult to clean up.
Recently, scientists have discovered naturally occurring bacteria which can digest oil.
These bacteria could be used to help remove the oil from oil spills.
Underline the word or phrase which best completes the following sentence.

Bacteria are remember 5 Kingdoms.

animals **fungi** **plants** **single-celled organisms** (1)

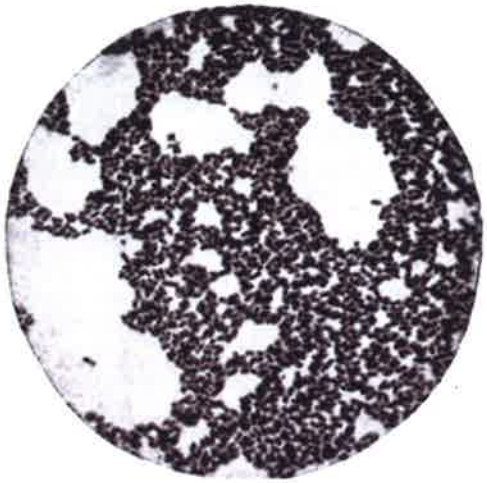
(d) Scientists need to find the best conditions in which to grow the bacteria. They already know that the concentration of nitrates available to them affects how fast they grow.

Suggest one other factor which might affect how fast the bacteria can grow and reproduce.

Temperature / pH / Concentration of other minerals (1)

20

It is possible to grow these bacteria in a glass petri dish on a special substance called agar gel. As the bacteria grow, they cover the surface of the gel and make it look dark and cloudy. The larger the cloudy areas on the agar, the more bacteria there are.



The picture above show a petri dish with dark areas of growth of bacteria on agar gel after 48 hours.

(f) Using the space below, suggest how you could find out the best concentration of nitrates for bacterial growth. (It is possible to buy agar gel containing different concentrations of nitrates for the bacteria to grow on.) Describe clearly how you would make your investigation a fair test. You may use diagrams to help you with your answer.

- Different concentrations tested
- Repeats made
- Area measured
- fair testing
  - Same volume
  - Same temperature
  - Same food source
  - Same pH