

School Certificate - Science

Student Summary Book – Process Style

Questions and Science Investigations

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Science Investigations

Planning And Conducting A Valid, Reliable Experiment

A valid, reliable experiment is a fair experiment. The features of the experiment are called **variables** and

- ☺ one variable is different in each group in the experiment. It is called the **independent variable**.
- ☺ all other variables are kept the same in all groups. They are called the **controlled variables**.
- ☺ one variable is measured or observed. It is called the **dependent variable**.

The aim of the experiment is to investigate the effect of the independent variable on the dependent variable.

A **valid** experiment tests the independent variable and controls all other variables.
A **reliable** experiment repeats the method numerous times.

Planning A Method

When you are planning an experiment, ask yourself these questions:-

1. Which variable will I make different?
2. Which variables must I keep the same?
3. What will I measure or observe? What measuring instrument will I use?
4. What safety precautions must I take?
5. How will I record the results?
6. How many times will I repeat the experiment?
7. How will I analyse the results? Will I calculate averages? Will I draw a graph?

Writing A Method

To write a method for an experiment, number each step and use this format:-

VERB NOUN CONDITION (when, where, how, how long?)

A simple way to write a method is to

- a) write the steps for ONE form of the independent variable
- b) write the phrase "Repeat steps 1-?" for the other forms of the independent variable

For example...

1. Put 500g of sandy soil into a pot.
2. Plant 20 seedlings in the pot.
3. Place the pot in constant light.
4. Add 100ml of water to the pot every day.
5. Measure the height of the seedlings with a ruler every day for 10 days.
6. Record results.
7. Repeat steps 1-6 four times.
8. Repeat steps 1-7 in 12 hours of light and 12 hours of darkness.
9. Repeat steps 1-7 in constant darkness.

Observations

Scientists collect information from experiments by making observations using their senses and measuring instruments. The senses give qualitative observations that describe the qualities of an object without using numbers eg, colour. However the senses are limited and can be unreliable. Measuring instruments increase our powers of observation. They give quantitative observations that refer to quantities eg, height, time, voltage. Where possible, scientists make quantitative observations because they are more accurate.

Tables

Data is presented in tables because this makes the data easy to understand, easy to see relationships and easy to make comparisons.

Line Graphs

A line graph is used to show a relationship between two variables that are measured. To draw a line graph:

1. draw the axes.
2. label each axis with the name of the variable and a unit of measurement eg, mass (g).
3. choose a suitable scale for each axis. Mark numbers at regular intervals along the axis.
4. plot each point with a cross.
5. join crosses with a ruled line or a freehand line.

Graphs can be used to extract information, make calculations, show trends, make comparisons, recognise patterns, make conclusions and predictions.

Conclusions

Making a conclusion from an experiment involves comparing experimental results with those predicted from the hypothesis. If the experimental results agree with the predicted results then the conclusion is that the hypothesis is supported. If the experimental results disagree with the predicted results then the conclusion is that the hypothesis is rejected.

Evaluation

At the completion of your experiment, consider what changes you should make to the method to make it more valid and reliable.

The next section of this booklet comprises of all the School Certificate Questions from past exams from 2004 – 2010 that involves the following:

- ☺ first hand investigations
- ☺ processing data
- ☺ analysing data

regardless of the topic in which they refer to.

School Certificate 2010

1) **Multiple Choice**

- i) What is the purpose of the conclusion in a scientific investigation?
- (A) To explain the reason for doing the investigation
 - (B) To state an expected outcome of the investigation
 - (C) To give sources of information to be used in the investigation
 - (D) To make a statement which shows whether the data collected supports the hypothesis

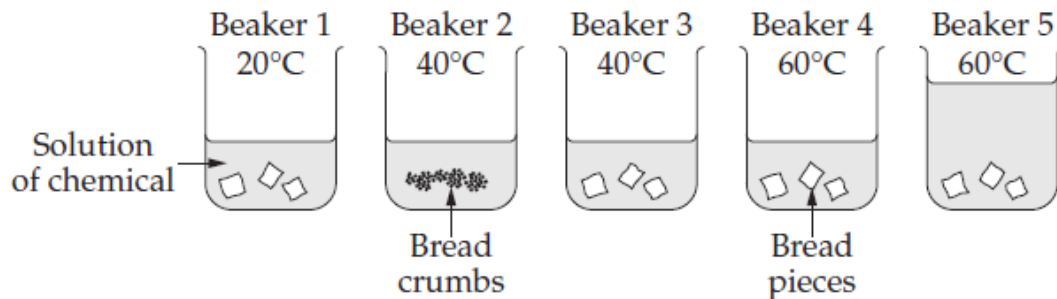
Use this information to answer Questions ii) and iii)

During a conversation with a neighbouring dairy farmer, Charlie suggested that brown cows produce more milk than cows of other colours. Charlie decided to investigate this further by conducting a scientific investigation.

- ii) What would a scientist call Charlie's suggestion?
- (A) An aim
 - (B) A conclusion
 - (C) A hypothesis
 - (D) A method
- iii) What will be the independent variable and the dependent variable in Charlie's investigation?

	<i>Independent variable</i>	<i>Dependent variable</i>
(A)	Amount of milk produced	Colour of cow
(B)	Colour of cow	Type of food
(C)	Colour of cow	Amount of milk produced
(D)	Type of food	Amount of milk produced

- iv) A class had to test the effect of temperature on the speed with which a chemical reacts with bread. They were given a set of beakers with solutions of equal concentration of the chemical to choose from.



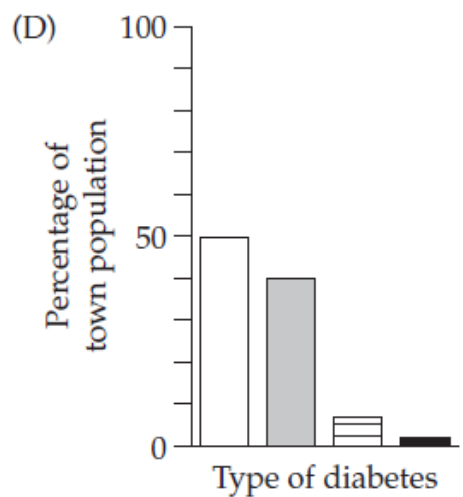
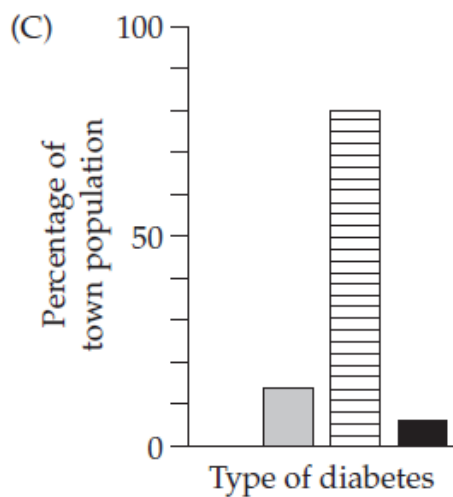
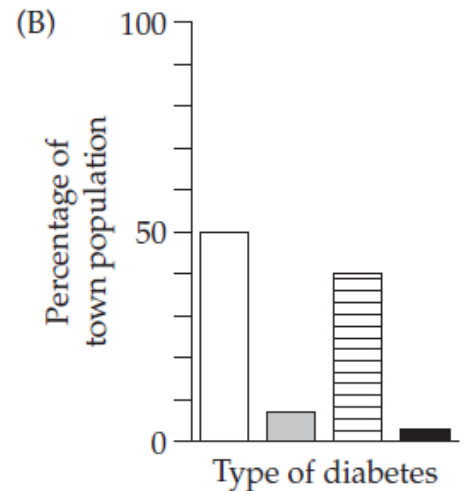
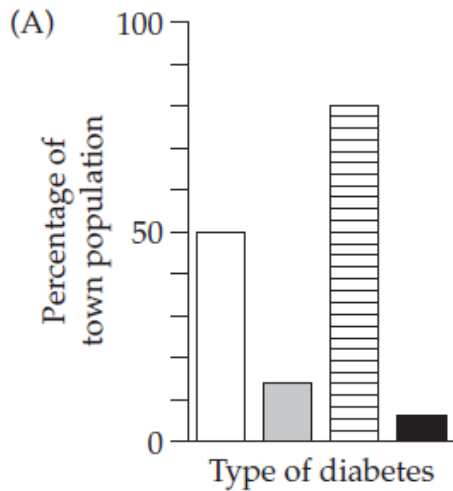
Which combination of beakers should they use to ensure it was a fair test?

- (A) Beakers 1, 2 and 5
(B) Beakers 3, 4 and 5
(C) Beakers 1, 2 and 4
(D) Beakers 1, 3 and 4
- v) What does the data in Table 1, Source B of the Stimulus Booklet show?
- (A) The number of cases of Type 1 diabetes steadily increased.
(B) The number of cases of Type 2 diabetes decreased.
(C) The number of cases of Type 2 diabetes increased.
(D) The number of other cases remained constant.
- vi) Aspartame is used as an artificial sweetener in food. It is claimed to be approximately 200 times sweeter than sugar.

Why is it difficult to test this claim about the sweetness of aspartame?

- (A) It is not safe to taste aspartame.
(B) Some people do not like sweet foods.
(C) It is not ethical to experiment on people.
(D) People respond differently to levels of sweetness
- vii) A survey found that in one town, half of the population had diabetes. Of those who had diabetes, 14% had Type 1 diabetes, 80% had Type 2 diabetes and 6% did not know what type of diabetes they had.

Which graph correctly shows the information for the WHOLE town?



Key

No diabetes
 Type 1
 Type 2
 Other

Use Source C in the Stimulus Booklet to answer Questions viii) – x)

viii) From the information in Table 1 of Source C, which statement about plastics is correct?

- (A) The plastics in toys have a high melting point and weak bonds.
- (B) The plastics in lunch boxes have a low melting point and strong bonds.
- (C) The plastics in kitchen bench tops have a high melting point and strong bonds.
- (D) The plastics in toys and electrical switches have the same type of bonds.

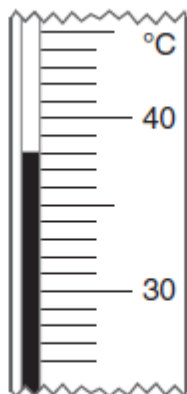
- ix) Which TWO types of plastics contribute most to household waste?
- (A) LDPE and 'Other'
 - (B) LDPE and PVC
 - (C) PETE and PVC
 - (D) PVC and 'Other'
- x) What is the approximate percentage of household waste made up of clingwrap, grocery bags and sandwich bags?
- (A) 5%
 - (B) 10%
 - (C) 20%
 - (D) 45%

Use Source *D* in the Stimulus Booklet to answer Questions xi)

- xi) In 2005, what was the proportion of 69-year-old males with cancer in the population?
- (A) 1500
 - (B) 1500 per 100 000
 - (C) 2000
 - (D) 2000 per 100 000

2) **One word Answers**

- i) What is the reading on the thermometer scale shown?



- ii) According to the graph in Source *D* in the Stimulus Booklet, at what age is the number of cancer cases among men (per 100 000 people) the same as it is among women?

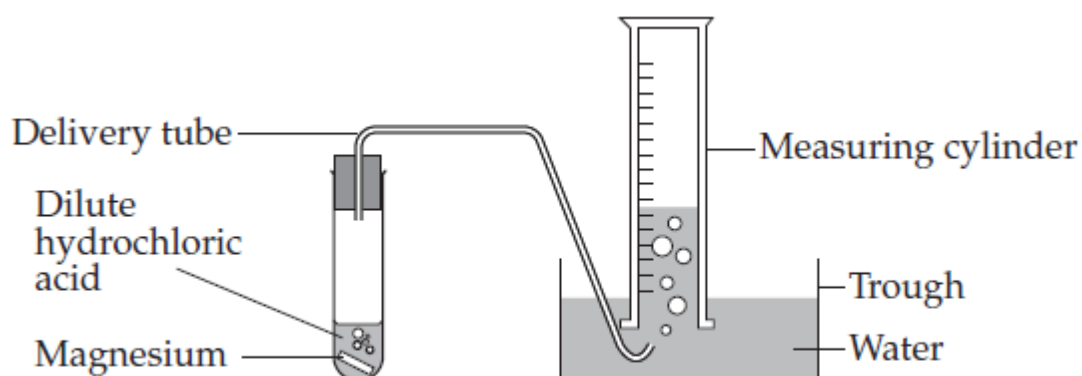
3) **Short Answer Questions**

- i) Explain how aspects of scientific method can be used by scientists to increase our understanding of diseases like Type 2 diabetes.
- ii) A biopolymer has been developed that can be used to make plastic shopping bags. The manufacturer has made the following claim:

'Not only is our product better for the environment, but it is twice as strong as current plastic bags!'

Describe an experimental method that could be used to test the manufacturer's claim about the strength of the bag.

- iii) Outline ONE similarity and ONE difference in the data shown in cancer cases among males and females.
- iv) Explain why scientific research, such as Professor Elizabeth Blackburn's, is of benefit to our society.
- v) A science class performed an experiment as shown in the diagram to investigate the reaction between dilute hydrochloric acid and magnesium.



Explain ONE safety procedure that the students would need to follow when carrying out this experiment.

- vi) During the reaction, a gas is produced.

What are TWO other observations the students could make during this experiment?

School Certificate 2009

1) **Multiple Choice**

i) What is the most appropriate piece of equipment to accurately measure 85 mL of water?

- (A) 10 mL measuring cylinder
- (B) 100 mL measuring cylinder
- (C) 100 mL beaker
- (D) 250 mL beaker

ii) Six steps are involved in applying a scientific process to a problem. In the box below, each step has been given a number, but the steps are not in the correct sequence.

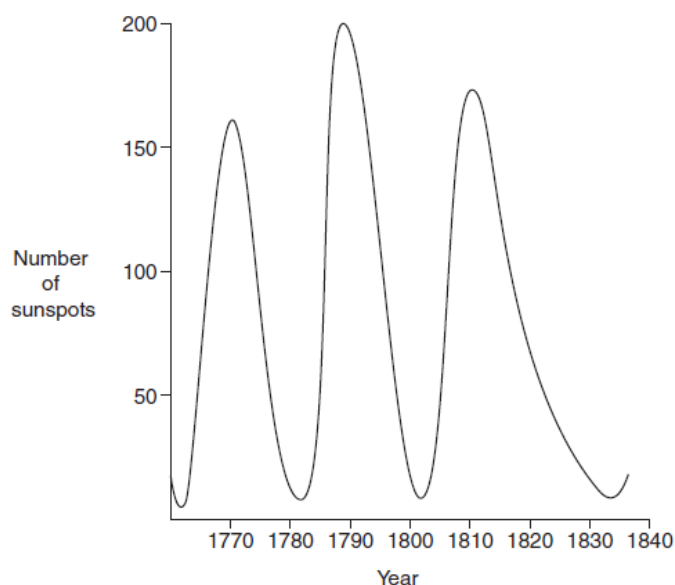
- | | |
|---|--|
| 1 | Gather experimental results |
| 2 | Draw a conclusion |
| 3 | Make a hypothesis |
| 4 | Compare experimental results with the hypothesis |
| 5 | Ask a question |
| 6 | Design and carry out an experiment |

What is the correct sequence of steps?

- (A) 1, 3, 6, 5, 4, 2
- (B) 5, 3, 6, 1, 4, 2
- (C) 5, 6, 3, 1, 2, 4
- (D) 3, 5, 1, 6, 4, 2

Use the graph to answer Questions iii) and iv)

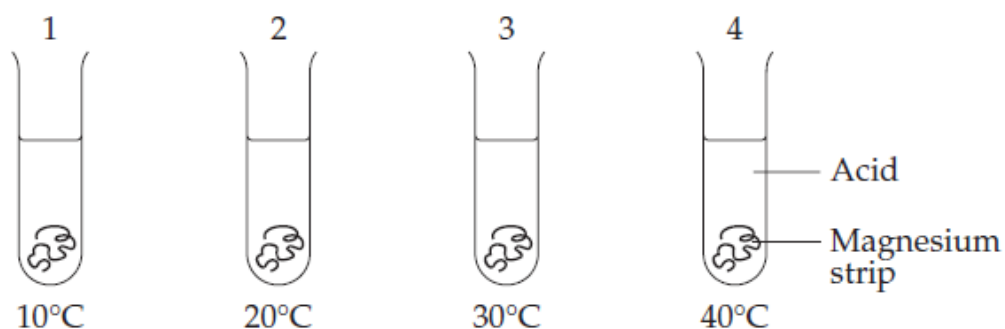
The graph shows the number of sunspots observed over a number of years.



- iii) In which year were the most sunspots observed?
- (A) 1770
 (B) 1782
 (C) 1789
 (D) 1802
- iv) What is the approximate number of years between the peaks of the graph?
- (A) 20
 (B) 40
 (C) 175
 (D) 200

Use this information to answer Questions v) – vi).

Students set up an experiment to see how temperature affects a chemical reaction. Four 2 cm strips of magnesium were placed into four test tubes of acid at different temperatures as shown.



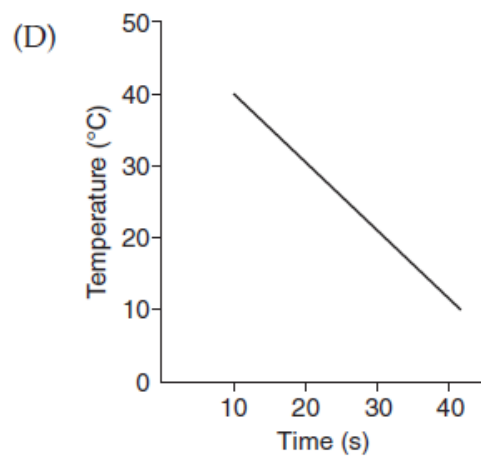
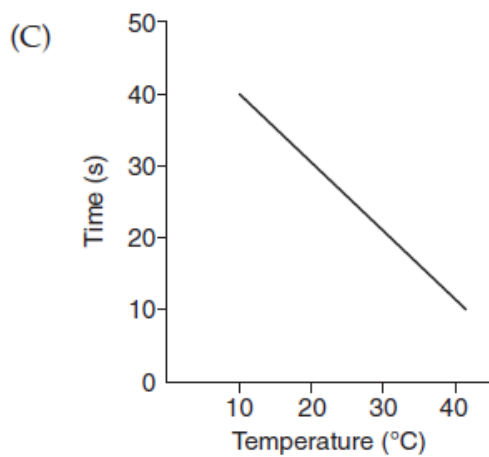
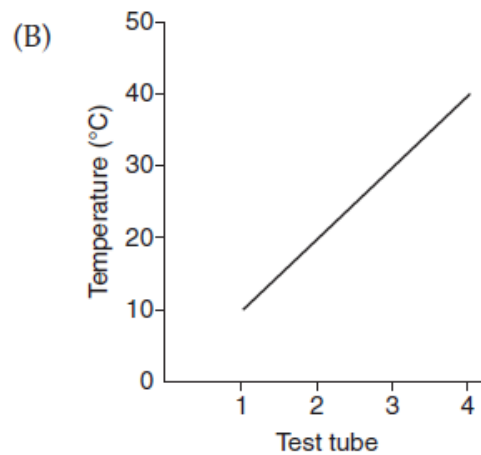
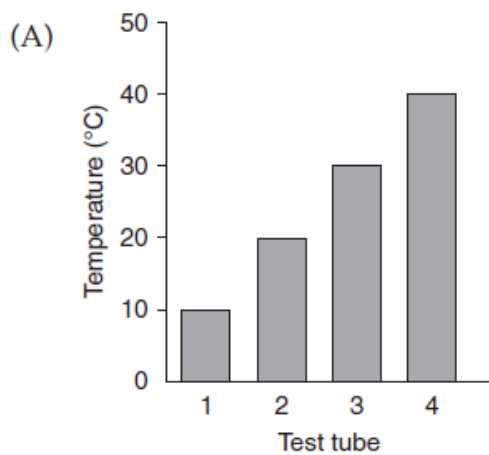
The students timed in seconds how long it took for the magnesium to dissolve. The results are shown in the table.

Test tube	1	2	3	4
Temperature (°C)	10	20	30	40
Time (s)	40	30	20	10

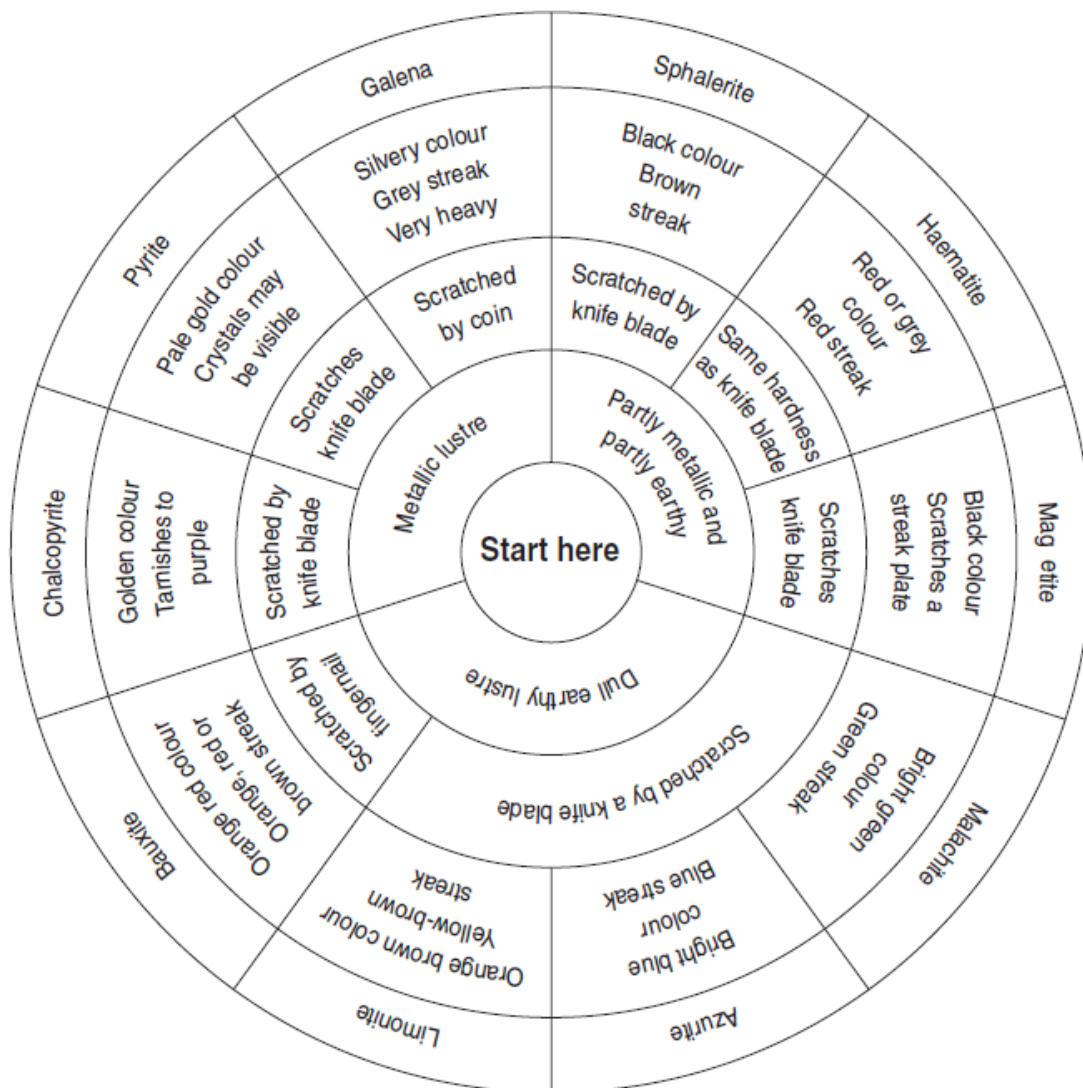
- v) Which alternative correctly identifies the independent and dependent variables in the experiment?

	<i>Independent variable</i>	<i>Dependent variable</i>
(A)	Time	Temperature
(B)	Amount of magnesium	Time
(C)	Temperature	Time
(D)	Temperature	Amount of magnesium

- vi) Which graph best represents the results of the experiment?



vii) The circular key is used to identify some ores.



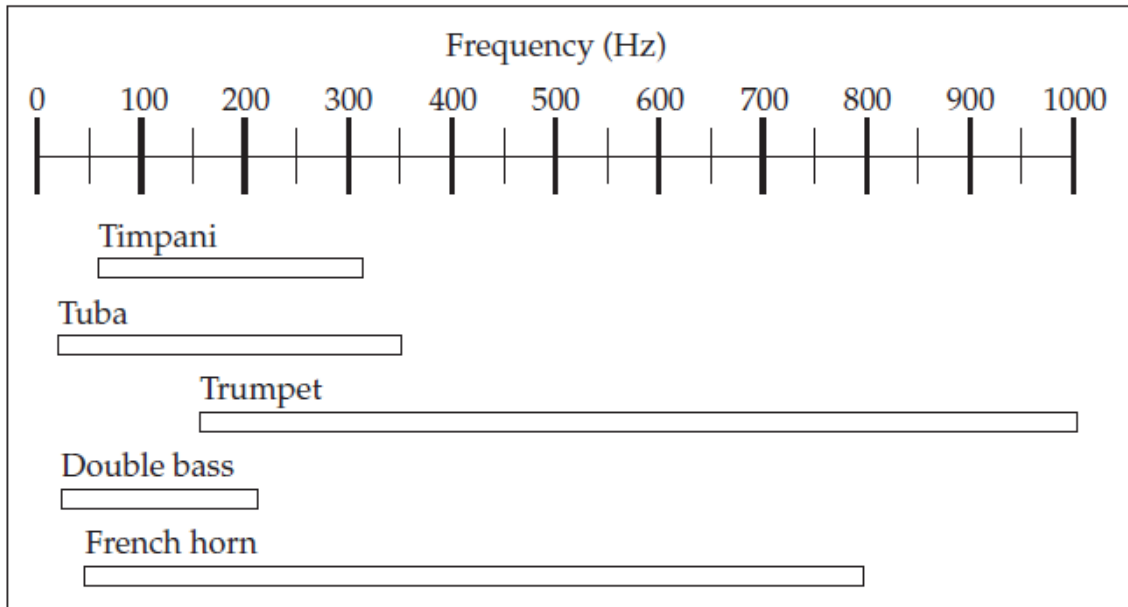
A particular ore is described as partly metallic and partly earthy. It is easily scratched by a knife blade and it has a brown streak.

What is the name of the ore?

- (A) Haematite
- (B) Limonite
- (C) Magnetite
- (D) Sphalerite

Refer to the chart to answer Questions viii) – ix).

The chart shows the range of frequencies that some musical instruments can produce.



viii) Which instrument has the smallest frequency range?

- (A) Double bass
- (B) French horn
- (C) Timpani
- (D) Tuba

ix) Which frequency can be produced on four of the five instruments?

- (A) 100 Hz
- (B) 325 Hz
- (C) 400 Hz
- (D) 750 Hz

Refer to Source B in the Stimulus Booklet to answer Questions x) – xiv)

x) Which drink has the highest concentration of calcium salts?

- (A) Bottled water
- (B) Pineapple/orange drink
- (C) Soft drink
- (D) Sports drink

- xi) Which drink contains equal concentrations of potassium salts and calcium salts?
- (A) Bottled water
 (B) Pineapple/orange drink
 (C) Soft drink
 (D) Sports drink
- xii) How many milligrams of potassium salts are found in 200 g of sports drink?
- (A) 15
 (B) 30
 (C) 40
 (D) 80
- xiii) Which option correctly describes what happens to salts in the body?

	<i>Salts enter the blood from</i>	<i>Salts are removed from the blood in</i>
(A)	Small intestine	Bladder
(B)	Large intestine	Bladder
(C)	Small intestine	Kidney
(D)	Large intestine	Kidney

- xiv) How did Student 2's time for the run change from Day 1 to Day 2?
- (A) It increased by 5 seconds.
 (B) It decreased by 30 seconds.
 (C) It increased by 15 seconds.
 (D) It decreased by 20 seconds.

Refer to Source C in the Stimulus Booklet to answer Questions xv) - xvii)

- xv) What is the highest setting on the volume control of a MP3 player that is unlikely to cause hearing loss?
- (A) 40%
 (B) 65%
 (C) 80%
 (D) 100%

xvi) What is the minimum loudness of a 2000 Hz sound that person Y can hear?

- (A) 0dB
- (B) 40 dB
- (C) 50 dB
- (D) 70 dB

xvii) Person Y played their MP3 player at the loudness of a normal conversation.

Which frequencies can they hear?

- (A) All
- (B) None
- (C) Less than 4000 Hz
- (D) Greater than 4000 Hz

2) **One word Answers**

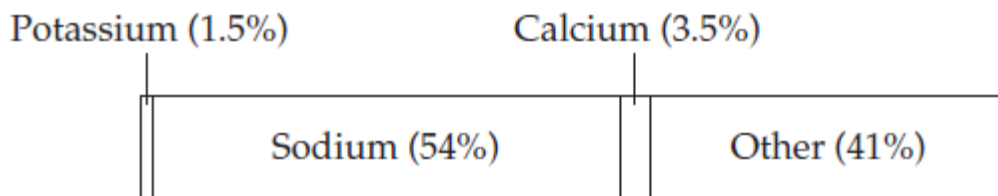
Refer to Source C in the Stimulus Booklet to answer Question i)

i) Ear muffs must be used when operating a jack hammer. By how many decibels must the loudness of sound be decreased to prevent hearing loss?

3) **Short Answer Questions**

Refer to Source B in the Stimulus Booklet to answer this question.

This divided bar graph shows the percentage composition of dissolved salts in blood.



i) Construct a divided bar graph to show the percentage composition of dissolved salts in urine.

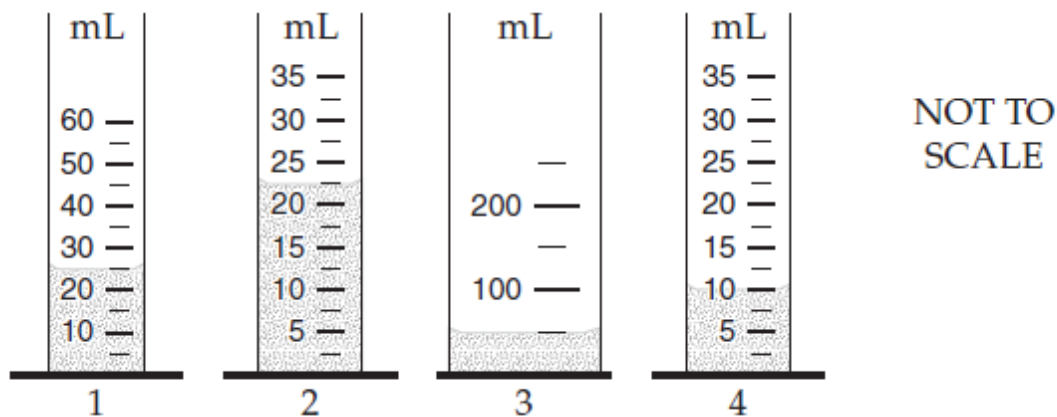
Refer to Source B in the Stimulus Booklet to answer question i) – v)

- ii) Name ONE variable that was held constant in the students' experiment.
 - iii) Outline TWO features of the scientists' experiment that show they have followed correct experimental method.
 - iv) What conclusion can be drawn from the scientists' experiment?
 - v) How can the processes used in science help us make informed judgments about claims made in the mass media?
- vi) Name a scientific theory and explain how a specific piece of evidence supports this theory.

School Certificate 2008

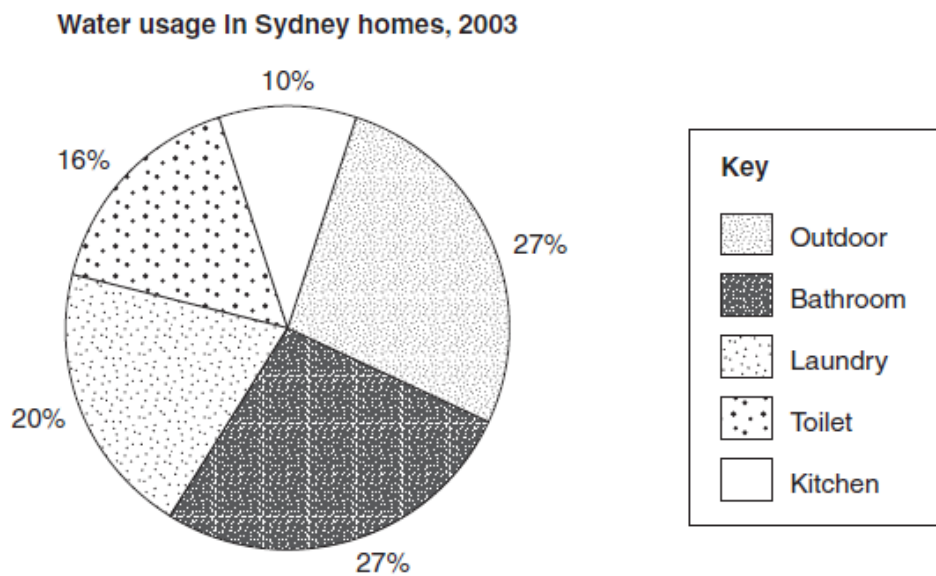
1) **Multiple Choice**

- i) Which of the following measuring cylinders contains the largest volume of water? The cylinders are not drawn to scale.



- (A) 1
- (B) 2
- (C) 3
- (D) 4

Use the sector graph to answer Questions ii) and iii)



Graph Courtesy of Sydney Water Corporation, 2008

ii) What percentage of the water used in Sydney homes in 2003 was used to flush toilets?

- (A) 10
- (B) 16
- (C) 20
- (D) 27

iii) Which of the following combinations uses the most water?

- (A) Bathroom and toilet
- (B) Bathroom and kitchen
- (C) Laundry and toilet
- (D) Outdoor and kitchen

iv) The table provides information from a box containing breakfast cereal

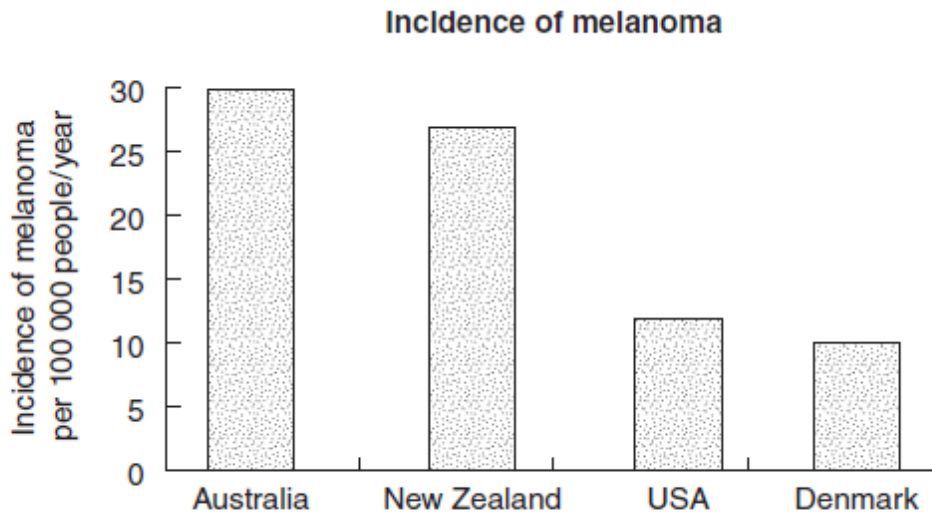
<i>Component</i>	<i>Amount per 100 g</i>
Carbohydrate	83 g
Energy	1800 kJ
Fat	3 g
Protein	8 g

How much protein would be contained in a 50 g serving of this breakfast cereal?

- (A) 3 g
- (B) 4 g
- (C) 8 g
- (D) 83 g

Refer to the graph and information to answer Question v)

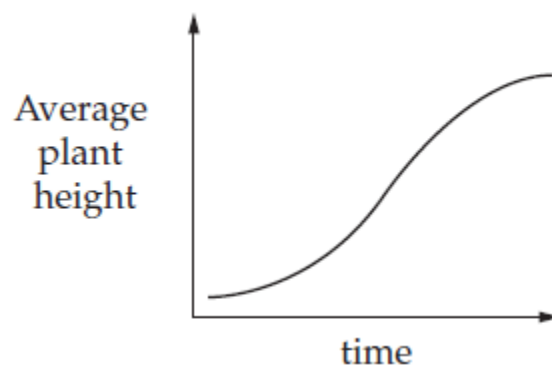
Melanoma is a skin cancer caused by exposure to the sun



If Australia's present population is 20 million people, how many cases of melanoma will occur this year?

- (A) 30
- (B) 600
- (C) 6000
- (D) 30 000

vi) Students studied the growth of 100 corn seeds and graphed the results



Which alternative correctly identifies the independent and dependent variables in their investigation?

	<i>Independent variable</i>	<i>Dependent variable</i>
(A)	time	height
(B)	height	time
(C)	time	number
(D)	height	number

2) **One word Answers**

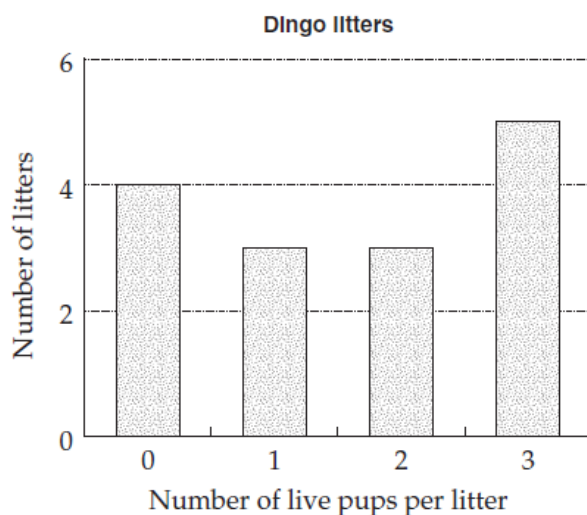
Refer to Source A in the Stimulus Booklet to answer Questions i) and ii).

- i) How many more milligrams of mercury are emitted by coal power stations to run an incandescent bulb compared to a CFL bulb over 5 years? Give your answer to the nearest whole number.
- ii) What is the saving in electricity costs per year if a CFL bulb is used instead of an incandescent bulb?
- iii) Refer to Source B in the Stimulus Booklet to answer Question iii).

What is the length to the nearest metre of the whale pictured?

Use this graph to answer Questions iv) and v)

- iv) A biologist was studying the number of live pups born to female dingoes in a particular area. The results were graphed. A litter is the term used for a group of babies born at the same time.



- iv) How many litters were counted?
- v) What is the total number of live pups counted?

Use the table to answer Questions vi – vii)

Four groups of students (*A*, *B*, *C* and *D*) carried out identical experiments to test reaction time. The results of their experiments are shown.

	<i>Reaction time (seconds)</i>		
<i>Student results</i>	<i>Trial 1</i>	<i>Trial 2</i>	<i>Trial 3</i>
<i>Group A</i>	20	22	21
<i>Group B</i>	22	25	21
<i>Group C</i>	21	23	29
<i>Group D</i>	20	25	25

- vii) Which group has the least reliable set of results?
- viii) Calculate the average reaction time for *Group A*.

3) **Short Answer Questions**

- i) Australian scientists have made contributions to society. Describe the effect of one of these contributions on people’s lives.

Use the information below to answer questions ii) – iv)

During your course you carried out first-hand investigations (experiments) to answer scientific questions. You have been asked to present a report on one of these investigations to your class.

- ii) State the problem, hypothesis or question that you tested.
- iii) Identify what you measured or observed.
- iv) Briefly describe the features of your investigation that are examples of good experimental design.

In your answer, include:

- how you carried out your investigation to obtain reliable results
- safety considerations
- how you recorded and analysed your results
- your conclusion

1) **Multiple Choice**

i) The diagram represents a bacterial cell.

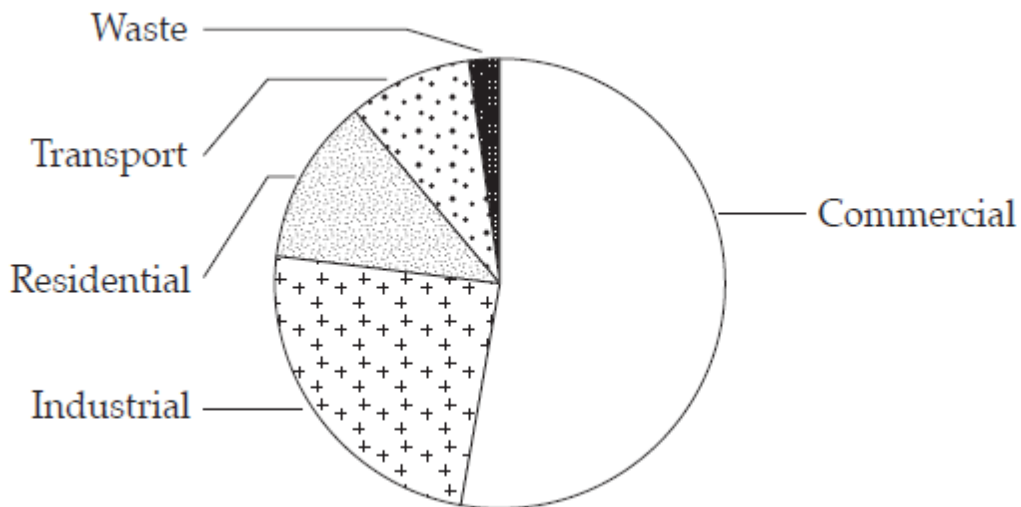


Scale
|-----|
Scale length = 0.1 microns

What is the length of the bacterial cell?

- (A) 0.2 microns
- (B) 0.5 microns
- (C) 0.55 microns
- (D) 0.6 microns

ii) The sector graph shows the five main sources of greenhouse gases emitted by the city of Sydney in 2004.



What approximate percentage did industrial activities contribute?

- (A) 26
- (B) 33
- (C) 53
- (D) 69

- iii) When people are exposed to wind, the wind speed affects the temperature that they feel. The chart shows the temperature they feel.

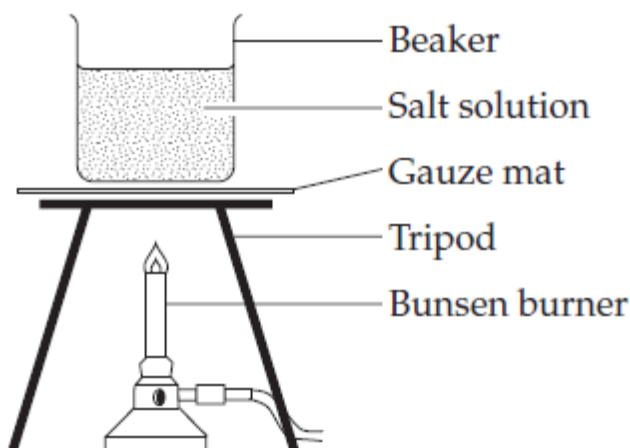
		Temperature felt ($^{\circ}\text{C}$)							
Wind speed (km/h)	60	-3	-7	-17	-24	-32	-39	-47	-54
	40	0	-7	-14	-21	-28	-35	-42	-49
	20	4	-2	-8	-14	-20	-26	-32	-39
	10	7	4	-2	-7	-12	-18	-23	-28
	10	5	0	-5	-10	-15	-20	-25	
		Actual air temperature ($^{\circ}\text{C}$)							

What is the temperature felt when the air temperature is -10°C and the wind speed is 20 km/h?

- (A) 4°C
- (B) -12°C
- (C) -20°C
- (D) -23°C

Use the following information to answer Questions iv) to vi).

The diagram shows some apparatus used to measure the boiling point of a salt solution



- iv) Where should the end of a thermometer be placed to accurately measure the temperature of the salt solution?
- (A) On the bottom of the beaker
 - (B) Close to the surface of the solution
 - (C) As far from the Bunsen flame as possible
 - (D) In the centre of the solution in the beaker

- v) The salt solution was made as follows:
- 200 millilitres of water was added to the beaker
 - 5 grams of salt was added to the water
 - A glass rod was used to stir the salt until it was dissolved.

When is the safest time to make the salt solution?

- (A) When the Bunsen burner has a blue flame
 (B) When the beaker is placed on the gauze mat
 (C) Before the beaker is placed on the gauze mat
 (D) After the thermometer has been placed in the beaker
- vi) Which laboratory equipment would you use to measure the quantity of water and the quantity of salt?

	<i>Equipment to measure quantity of water</i>	<i>Equipment to measure quantity of salt</i>
(A)	200 mL beaker	mass balance
(B)	measuring cylinder	mass balance
(C)	measuring cylinder	150 mL beaker
(D)	250 mL beaker	measuring cylinder

Use the following information to answer Questions vii) – viii).

As part of a class genetics investigation, a student collected data on eye colour of members of her extended family.

- vii) Which type of graph would NOT be suitable for presenting the student's data?
- (A) Line
 (B) Sector
 (C) Histogram
 (D) Divided bar

- viii) The student must also enter her family data into a computer to perform some mathematical calculations and produce the graph.

Which application should she use?

- (A) A spreadsheet
- (B) A simple database
- (C) A table in a word-processing document
- (D) A presentation program (such as PowerPoint)

- ix) The student wanted to include data on her great grandmother's eye colour in her investigation. Her mother told her that her great grandmother's eye colour was brown. Photographs of her great grandmother and a diary description written by her great grandfather both confirmed the information provided by her mother.

Which of the following judgements can be made of the data she collected?

- (A) It was reliable because she had obtained the information from her family.
- (B) It was reliable because she compared it with observations or information from a number of sources.
- (C) It was not accurate because she had to compare it with information from secondary sources.
- (D) It was less accurate because she had to compare it with observations or information from a number of sources.

- x) What is the control in a first-hand investigation?

- (A) Repetition of the investigation
- (B) A variable that is changed throughout the investigation
- (C) A variable that is kept the same throughout the investigation
- (D) The situation or condition to which the investigation is compared

- xi) Which is an example of a first-hand investigation?

- (A) Using historical records to describe changes in hair fashions
- (B) The inheritance of hair colour in the royal families of Europe
- (C) Using magazine pictures to see hair colour changes with age
- (D) Measurements of hair length to determine hair growth rates

2) **One word Answers**

Refer to Source A in the Stimulus Booklet to answer Question i).

- i) Calculate how many eggs a female cane toad could produce in two years.

Refer to Source *B* in the Stimulus Booklet to answer Questions ii) to v)

- ii) What was the atmospheric carbon dioxide level in 1995?
- iii) What was the increase in the concentration of atmospheric carbon dioxide between 1980 and 2000?
- iv) What is the average increase in surface temperature (in°C) caused by the presence of Earth's atmosphere?
- v) Rocks are one place where scientists think carbon dioxide may be stored. Name the other place where carbon dioxide can be stored.

3) **Short Answer Questions**

- i) The scientists carried out a controlled experiment that supported the hypothesis:

Cane toads are attracted to UV light.

Describe a method for a controlled experiment to test this hypothesis.

- ii) Many important discoveries have been made by teams of scientists.

Explain ONE advantage that results from scientists working in a team.

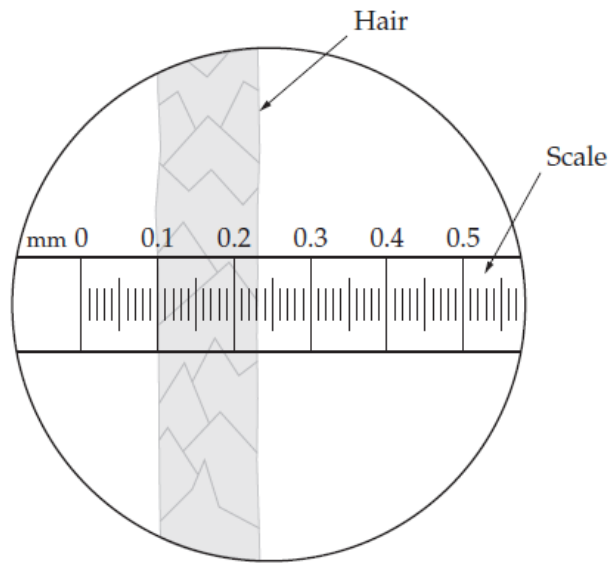
School Certificate 2006

1) **Multiple Choice**

- i) If a student's shirt caught fire in the laboratory, what would be the best way to put out that fire?

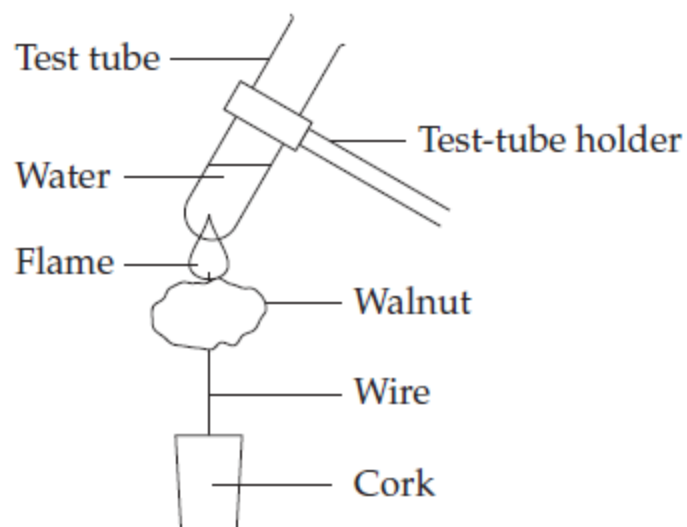
- (A) Roll the student in a fire blanket
- (B) Use a fire extinguisher on the student
- (C) Throw a bucket of water on the student
- (D) Throw sand from a fire bucket on the student

- ii) The diagram shows a human hair as seen through a microscope.



What is the thickness of the hair?

- (A) 0.0013 mm
(B) 0.013 mm
(C) 0.13 mm
(D) 1.3 mm
- iii) Nathan wanted to investigate how much energy is contained in a walnut. He burned one 3 gram walnut to heat a test tube containing 20 mL of water, and measured the change in temperature.

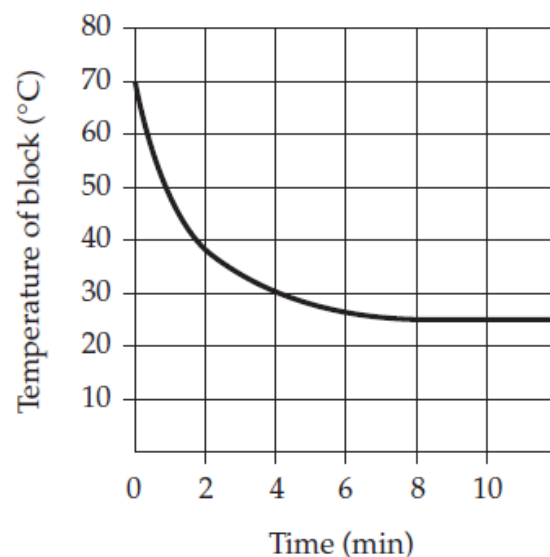


Which of these would improve Nathan's procedure so that his results will be more reliable?

- (A) Use heavier walnuts
 - (B) Use more than one thermometer
 - (C) Repeat the investigation under the same conditions
 - (D) Use cold water at the beginning of the investigation
- iv) Tom has collected information about the characteristics of 1000 students. He wants to use a computer to organise the information so that he can quickly find out which students have a particular set of characteristics.

What tool is best for this task?

- (A) Database
 - (B) Flow chart
 - (C) Graph
 - (D) Table
- v) Mary heated a copper block to 70°C and then cooled it in a waterbath to 25°C. She measured the temperature of the block every minute as it cooled. Mary's results are shown in the graph.

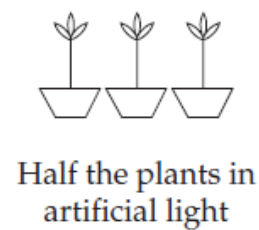
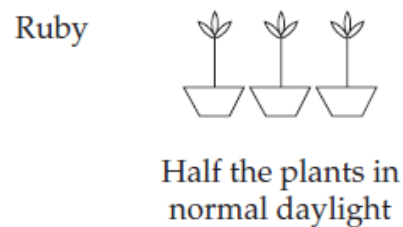
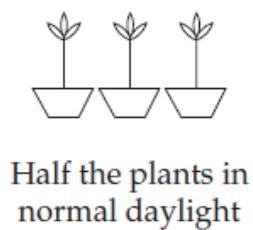
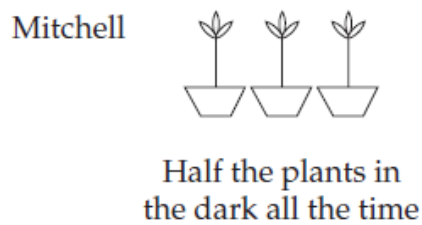
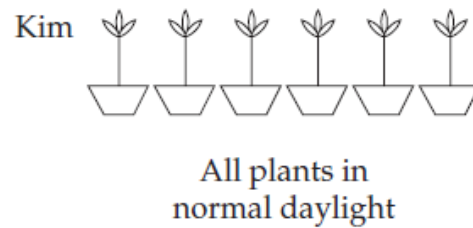
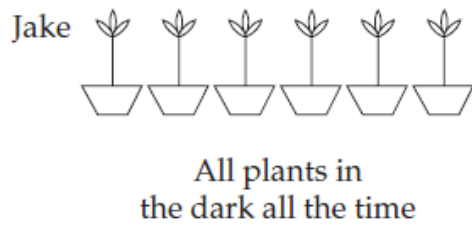


How long did it take for the block to cool to 25°C?

- (A) 6 minutes
- (B) 8 minutes
- (C) 10 minutes
- (D) 11 minutes

- vi) Four students investigated whether plants need light to survive. They each set up identical plants in different conditions.

Each student's experiment is shown in the diagram.



Which student has used a suitable control?

- (A) Jake
- (B) Kim
- (C) Mitchell
- (D) Ruby

- vii) John has built a trap for cockroaches (an insect found around homes). John does not want his trap to kill or attract other insects. He wishes to put some chemicals in the trap to attract and kill the cockroaches. The table lists some chemicals and their effects on cockroaches and other insects.

<i>Chemical</i>	<i>Effect on cockroaches</i>	<i>Effect on other insects</i>
<i>W</i>	Kills	None
<i>X</i>	Attracts	Attracts
<i>Y</i>	Attracts	None
<i>Z</i>	Kills	Kills

Which chemicals should he select?

- (A) *W* and *X*
- (B) *W* and *Y*
- (C) *X* and *Z*
- (D) *Y* and *Z*

Questions viii) – x) refer to Source *A*.

- viii) Which piece of equipment would you use to accurately measure 50 mL of water?

- (A) *O*
- (B) *P*
- (C) *S*
- (D) *T*

- ix) In an investigation to heat a liquid, the pieces of equipment labelled *M*, *P* and *Q* were selected.

What other piece of equipment is also required?

- (A) Gauze mat
- (B) Test-tube holder
- (C) Thermometer
- (D) Watch glass

- x) In the investigation of the decomposition of a solid compound, Alex selected the equipment labelled *M*, *R* and *Q*.

What other piece of equipment should Alex also select?

- (A) *N*
- (B) *O*
- (C) *P*
- (D) *T*

Use the Stimulus booklet to answer question xi) and xii)

- xi) Study the food web. Which organism do krill eat?

- (A) Fish
- (B) Plankton
- (C) Seals
- (D) Squid

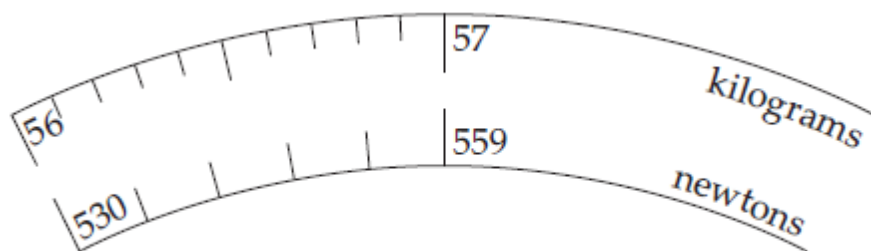
- xii) An adult whale washed up onto the beach. Its length was 14 m and its weight was 62 tonnes.

Which type of whale is it most likely to be?

- (A) Blue
- (B) Humpback
- (C) Minke
- (D) Southern Right

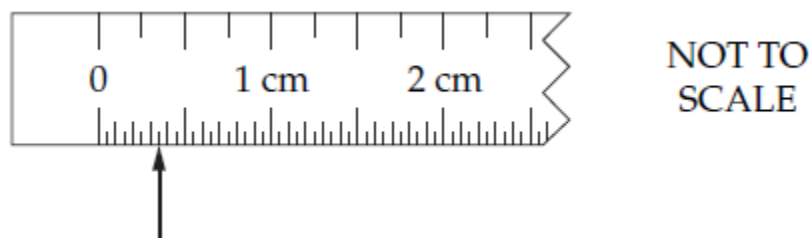
2) **One word Answers**

- i) Refer to Source A. Identify the piece of equipment labelled *O*.
- ii) What word is used to describe a statement that can be tested experimentally?
- iii) The diagram shows a scale on a measuring instrument.



What is the unit of weight shown on the scale?

iv) The diagram shows part of a ruler.



What is the reading in millimetres indicated by the arrow?

3) **Short Answer Questions**

Use this information to answer the questions below.

Source A in the Stimulus Booklet shows some of the equipment referred to in this question. Brendan conducted an investigation in which he:

- mixed two solutions
- filtered the precipitate which formed
- placed some of the solid into a crucible (labelled *N*)
- heated the crucible with a Bunsen burner (labelled *M*) to dry the solid.

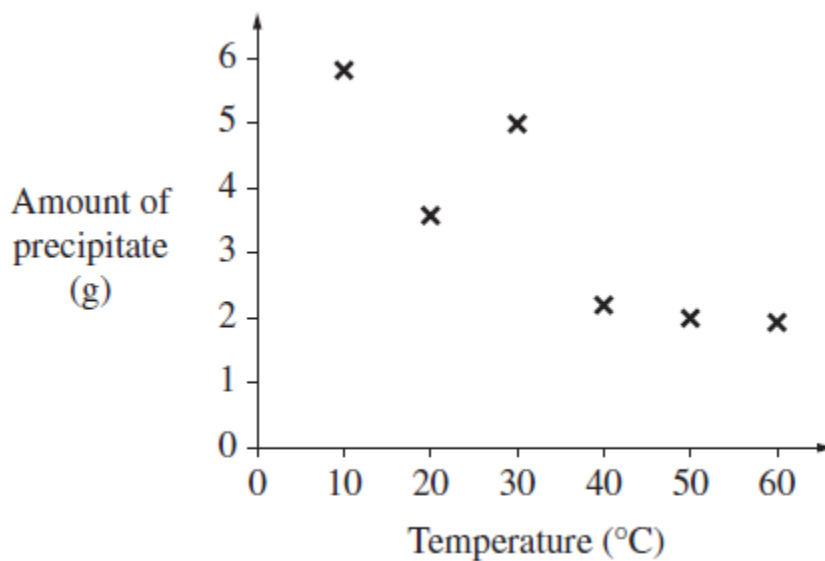
i) Explain why the crucible (labelled *N*) is a more appropriate choice than a beaker (labelled *P*) to dry the solid.

Brendan then wanted to know if the temperature at which the two solutions were mixed affected the amount of precipitate produced.

ii) In the table, list the variable(s) he should keep the same and those that he should change, in order to conduct the investigation.

<i>Variables</i>	
<i>Keep the same</i>	<i>Change</i>
.....
.....

- iii) Brendan produced a graph of results from his investigation



State a conclusion that Brendan could draw from the results of his investigation.

- iv) Brendan explained to another student that he was concerned about the accuracy of his data at 30°C.

State a possible cause for the result at 30°C.

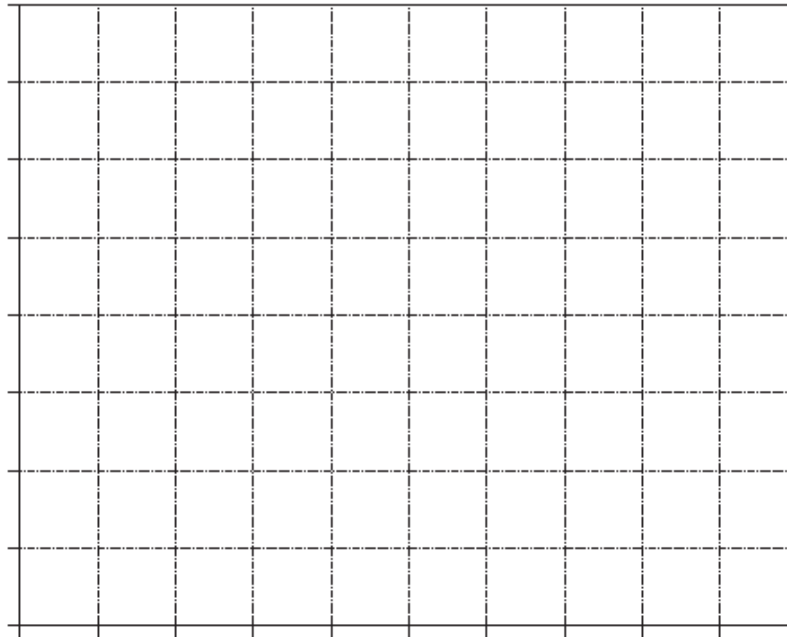
- v) Brendan's teacher said that the precipitate was not to be washed down the sink when he cleaned up after conducting his investigations.

Suggest a reason for the teacher's instruction.

- vi) Refer to Source C in the Stimulus Booklet.

How does the information in Table 1 support the statement that Southern Right whales were easier to kill than Minke whales?

- vi) Draw the most appropriate graph to compare the populations of Blue, Humpback and Southern Right whales in 1994.



School Certificate 2005

1) **Multiple Choice**

- i) An earthworm has been drawn half its actual size



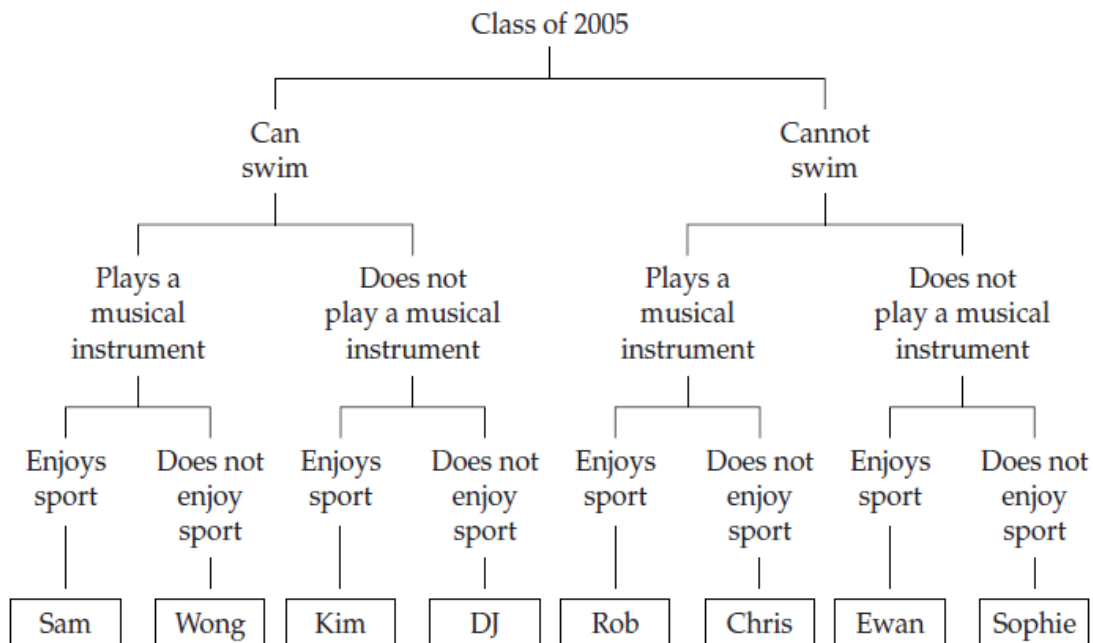
What is the actual length of this earthworm?

- (A) 2.25 cm
 - (B) 4.5 cm
 - (C) 9.0 cm
 - (D) 18.0 cm
- ii) A television advertisement says 'New Smile toothpaste prevents tooth decay'.

Which of the following provides the best evidence that this advertising claim is correct?

- (A) 'New Smile' contains chemicals.
- (B) 'New Smile' is a health care product.
- (C) 'New Smile' has been tested experimentally.
- (D) 'New Smile' has been promoted on television

Use this diagram to answer Questions iii) – iv)



iii) How would you best describe Rob?

- (A) Enjoys sport, plays a musical instrument, can swim
- (B) Enjoys sport, plays a musical instrument, cannot swim
- (C) Enjoys sport, doesn't play a musical instrument, can swim
- (D) Enjoys sport, doesn't play a musical instrument, cannot swim

iv) One of the students recently broke the school swimming record for 100 m.

Which of these students would that most likely have been?

- (A) Chris
- (B) Ewan
- (C) Sam
- (D) Sophie

v) A manufacturer is about to advertise a new jam called 'Superspread'. Which of the following statements about this jam CANNOT be tested in a scientific way?

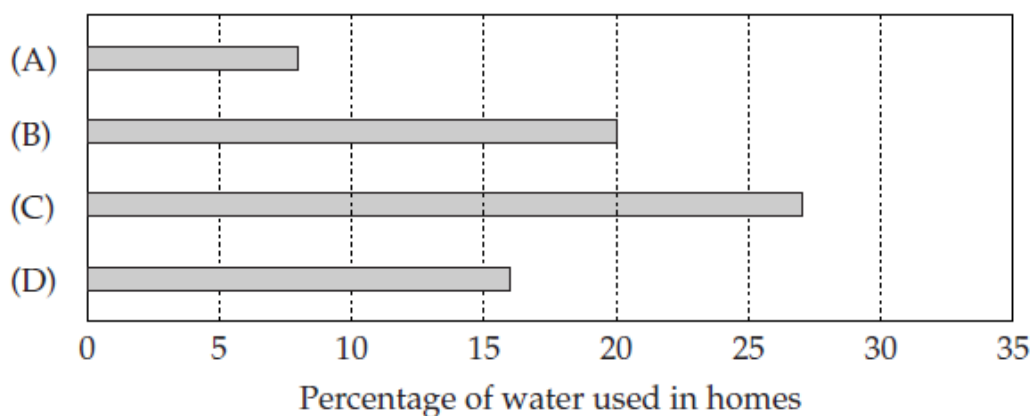
- (A) 'Superspread' contains vitamin C.
- (B) 'Superspread' is made from fresh fruit.
- (C) 'Superspread' is the tastiest jam you can buy.
- (D) 'Superspread' can be stored longer than other jams.

Use the table to answer questions vi) and vii)

The table shows average water usage for various activities.

<i>Activities</i>	<i>Percentage of water used in homes</i>
Having baths	2
Cooking	8
Toilet flushing	16
Clothes washing	20
Showering	24
Gardening	27
Other	3

vi) In the graph, which bar represents water used for clothes washing?



vii) Which of the following would MOST reduce water use in homes?

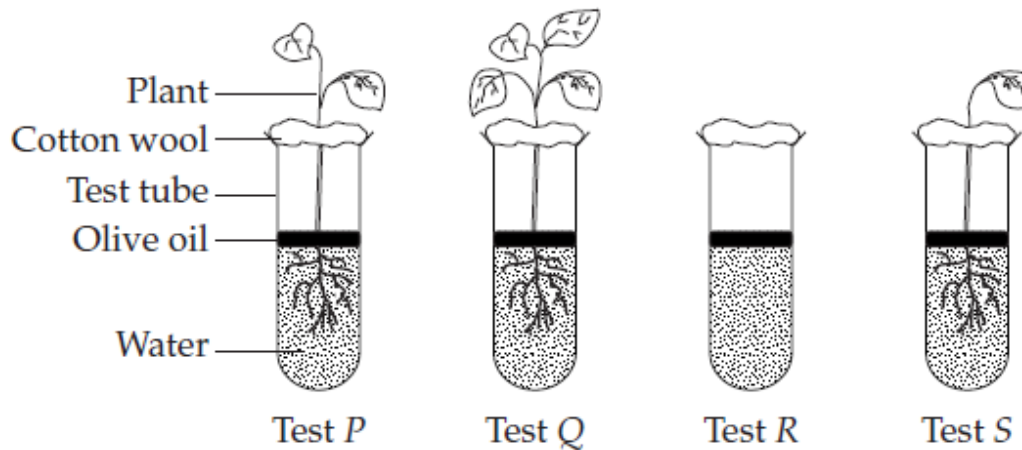
- (A) Cooking without water
- (B) Showering instead of having baths
- (C) Using half as much water in the garden
- (D) Flushing toilets only with used clothes – washing water

viii) What is the MAIN reason for arranging readings in tables?

- (A) To organise data
- (B) To keep written work neat and tidy
- (C) To provide for a large number of readings
- (D) To increase the accuracy of the experiment.

Use the following information about an experiment to answer Questions ix) – xi).

Four tests, *P*, *Q*, *R* and *S*, were set up at the same time and placed in the same location. Cotton wool supported the plants and olive oil prevented water loss from the test tubes. The tests were then left for two days.



- ix) Which variable was changed in this experiment?
- (A) Volume of water
 - (B) Size of the test tube
 - (C) Features of the plant
 - (D) Thickness of the olive oil layer
- x) Which question is most likely to be answered by doing this experiment?
- (A) Do plants need leaves to grow?
 - (B) Do plants carry out photosynthesis?
 - (C) Do plants grow in water with olive oil?
 - (D) Do plants lose water through their leaves?
- xi) Which test is the control?
- (A) *P*
 - (B) *Q*
 - (C) *R*
 - (D) *S*

xii) Which of the following would improve the method of the experiment?

- (A) Include a plant in Test R.
- (B) Remove oil from one test tube.
- (C) Repeat the experiment five times.
- (D) Place the test tubes in different locations.

Use the information in the table to answer Questions xiii) – xiv)

Products of crude oil

<i>Product</i>	<i>Boiling range at sea level (°C)</i>	<i>Number of carbon atoms</i>
Petrol	40–200	5–12
Kerosene	200–300	12–16
Diesel	250–350	15–18
Lubricating oil	320–370	16–20

xiii) Which of the following products is boiling at 270°C and has 17 carbon atoms?

- (A) Petrol
- (B) Kerosene
- (C) Diesel
- (D) Lubricating oil

xiv) Which of the following products could be a gas at 100°C?

- (A) Petrol
- (B) Kerosene
- (C) Diesel
- (D) Lubricating oil

- xv) Two spring balances, X and Y, each have a mass of 200 grams. A mass of 100 grams is attached to spring balance Y, as shown in Diagram P. Spring balance Y with the 100-gram mass is then connected to spring balance X, as shown in Diagram Q.

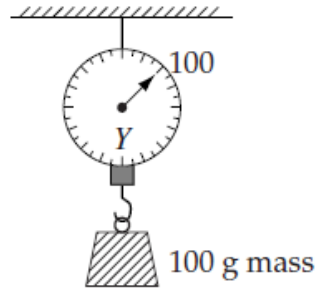


Diagram P

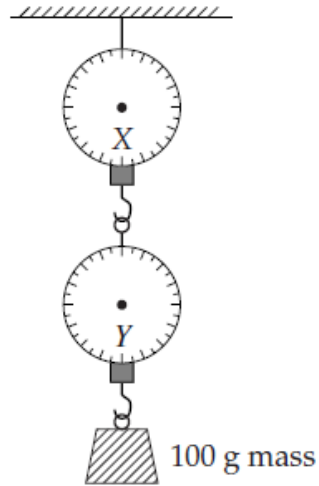


Diagram Q

What would be the reading on each spring balance in Diagram Q?

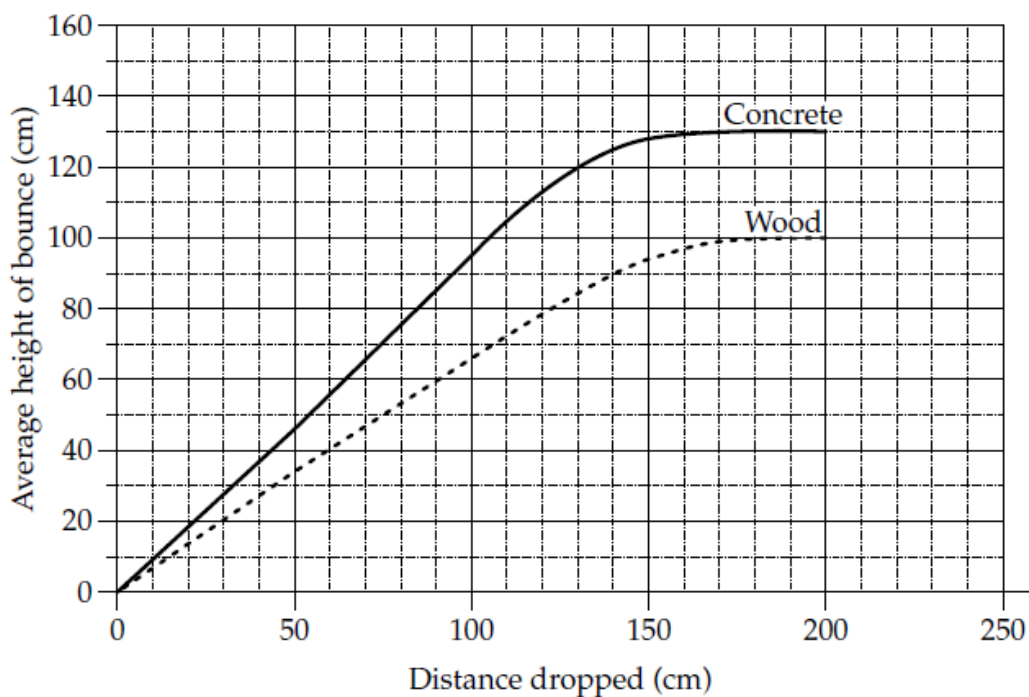
	Spring balance X (g)	Spring balance Y (g)
(A)	200	100
(B)	300	100
(C)	300	300
(D)	500	300

2) **Short Answer Questions**

Susi and George decided to investigate how the height to which a ball bounces varies with different surfaces. They dropped a tennis ball from different heights onto a concrete floor and a wooden floor.

They produced a table and graph of their results.

<i>Distance ball dropped (cm)</i>	<i>Average height of bounce of ball on concrete floor (cm)</i>	<i>Average height of bounce of ball on wooden floor (cm)</i>
50	46	34
100	Y	66
X	128	94
200	130	100



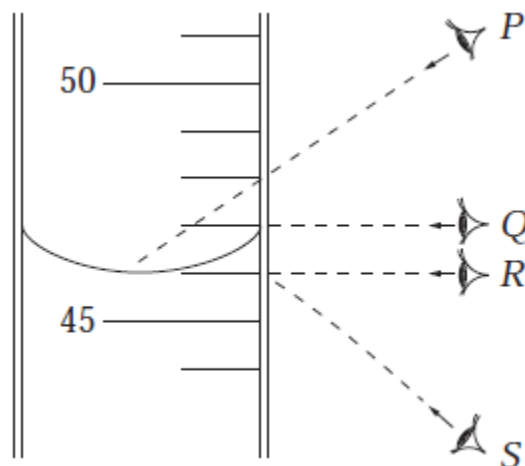
- i) What is one piece of equipment that Susi and George could have used to take their measurements?
- ii) Identify TWO variables that would need to have been kept constant when carrying out this experiment.

- iii) Two pieces of data are not shown in the table.
They are marked *X* and *Y*.
Use the graph to determine the values of *X* and *Y*.
- iv) The tennis ball was now dropped from a height of 250 cm onto the concrete floor.
Using the graph, predict how high in centimetres you would expect it to bounce.
- v) What evidence is there that Susi and George dropped the ball from each height more than once?
- vi) What are TWO conclusions Susi and George could make from their results?

School Certificate 2004

1) **Multiple Choice**

- i) The diagram shows liquid in a measuring cylinder



From which position should the reading be taken to give the most accurate volume of the liquid?

- (A) *P*
- (B) *Q*
- (C) *R*
- (D) *S*

Use the following information to answer Questions ii) and iii)

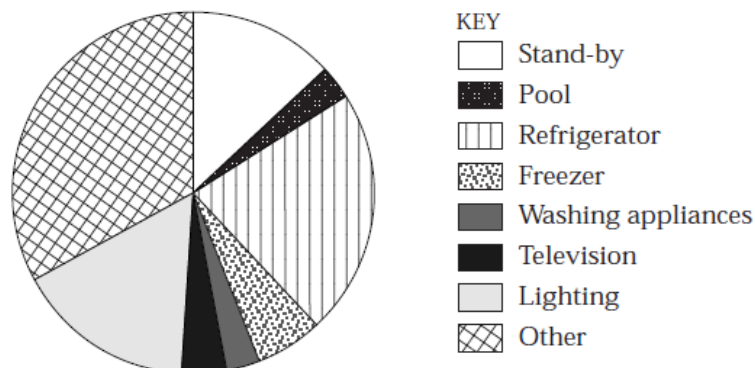
Phan and Erika carried out an experiment using a remote-controlled car travelling in a straight line. The table shows the students' experimental results.

<i>Time</i> (seconds)	<i>Total distance travelled</i> (metres)
0	0
10	10
20	15
30	20
40	25
50	25

- ii) Which of the following is the best piece of equipment to measure distance in this experiment?
- (A) Stopwatch
 - (B) 30 cm ruler
 - (C) Metre ruler
 - (D) 50 m tape measure
- iii) Phan and Erika used their results to calculate the speed of the car. What units should they use for speed?
- (A) Metres
 - (B) Metres per second
 - (C) Seconds
 - (D) Square metres

Use the graph to answer Questions iv) and v)

The graph shows data about the use of electricity in Australian homes.



- iv) Which of the following uses the most electricity in Australian homes?
- (A) Freezer
 - (B) Lighting
 - (C) Stand-by
 - (D) Television
- v) Approximately what percentage of electricity in Australian homes is used by refrigerators and freezers?
- (A) 10%
 - (B) 25%
 - (C) 60%
 - (D) 90%

Use the table to answer Questions vi and vii)

The table shows data about various cancers in Australia in 1983 and 1997.

<i>Type of cancer</i>	<i>New cases</i>		<i>Related deaths</i>	
	<i>1983</i>	<i>1997</i>	<i>1983</i>	<i>1997</i>
Melanoma	3 779	8 378	627	913
Colon	7 201	11 240	2 788	3 542
Breast	5 389	10 181	2 033	2 602
Lung	6 090	7 833	5 405	6 663
Leukaemia	1 476	2 026	959	1 216
Prostate	3 714	9 737	1 394	2 448
Gynaecological	2 982	3 638	1 197	1 314

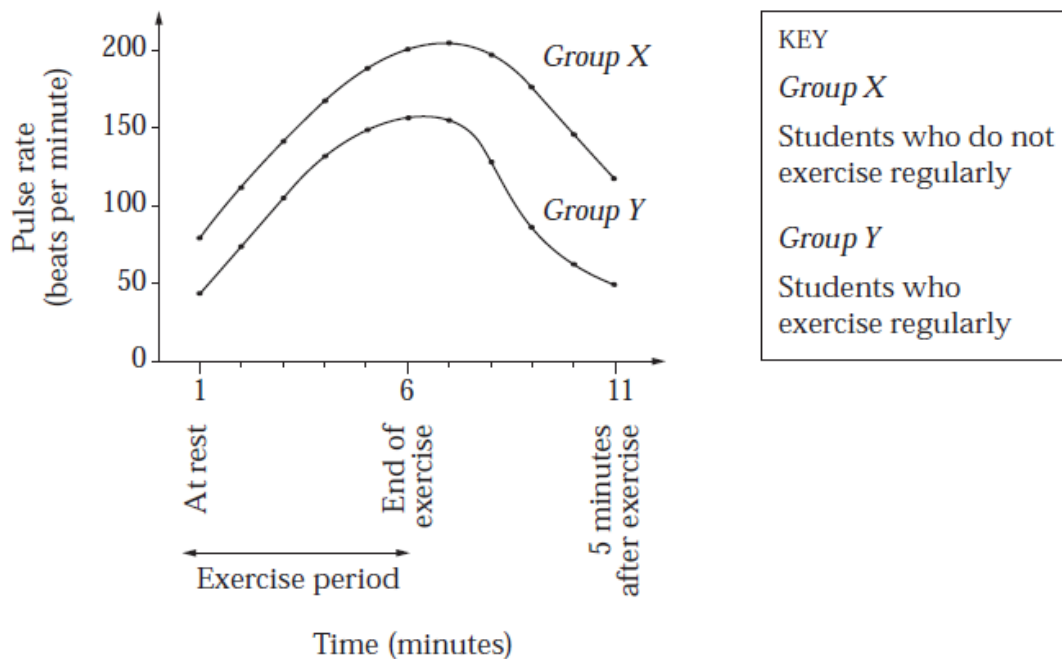
- vi) Which type of cancer had most *Related deaths* in 1997?
- (A) Breast
 - (B) Gynaecological
 - (C) Lung
 - (D) Prostate
- vii) Comparing 1983 to 1997, which type of cancer had the greatest increase in *New cases*?
- (A) Breast
 - (B) Colon
 - (C) Lung
 - (D) Prostate

viii) Which of the following is usually a feature of a reliable experimental design?

- (A) A large sample size is used.
- (B) Only one variable is kept the same.
- (C) The procedure cannot be copied by other scientists.
- (D) There are many variables which are not kept the same.

Use the following information to answer Questions ix) and x)

The graph shows the results from an experiment to see the effect of exercise on pulse rates.



ix) What is one trend in these results?

- (A) Pulse rates increased throughout the experiment.
- (B) Pulse rates decreased throughout the experiment.
- (C) Pulse rates remained constant throughout the experiment.
- (D) Pulse rates increased, then decreased, during the experiment.

x) What conclusion about the students in this experiment can be drawn from these results?

- (A) Regular exercise lowers pulse rate.
- (B) Regular exercise has no effect on pulse rate.
- (C) People who do regular exercise have a higher pulse rate.
- (D) People who do not regularly exercise have a lower pulse rate.

- xi) Chris wished to investigate the effects of nutrient *N* on plant growth. She set up the following pots for her experiment.

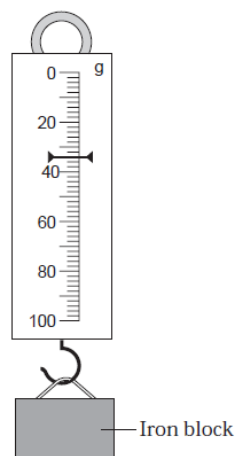
<i>Pot</i>	<i>Contents</i>	
1	10 grass seeds	no nutrient <i>N</i>
2	10 radish seeds	no nutrient <i>N</i>
3	1 grass seed	nutrient <i>N</i>
4	1 radish seed	nutrient <i>N</i>
5	1 grass seed	no nutrient <i>N</i>
6	1 radish seed	no nutrient <i>N</i>
7	10 grass seeds	nutrient <i>N</i>

Which of the following groups of pots should Chris have used to get the most valid results?

- (A) Pots 1 and 7
- (B) Pots 2 and 7
- (C) Pots 2, 4 and 6
- (D) Pots 3, 4, 5, 6

2) **One word Answers**

- i) In which step of a formal scientific report are observations and measurements recorded?
- ii) What is the mass, in grams, of the iron block?



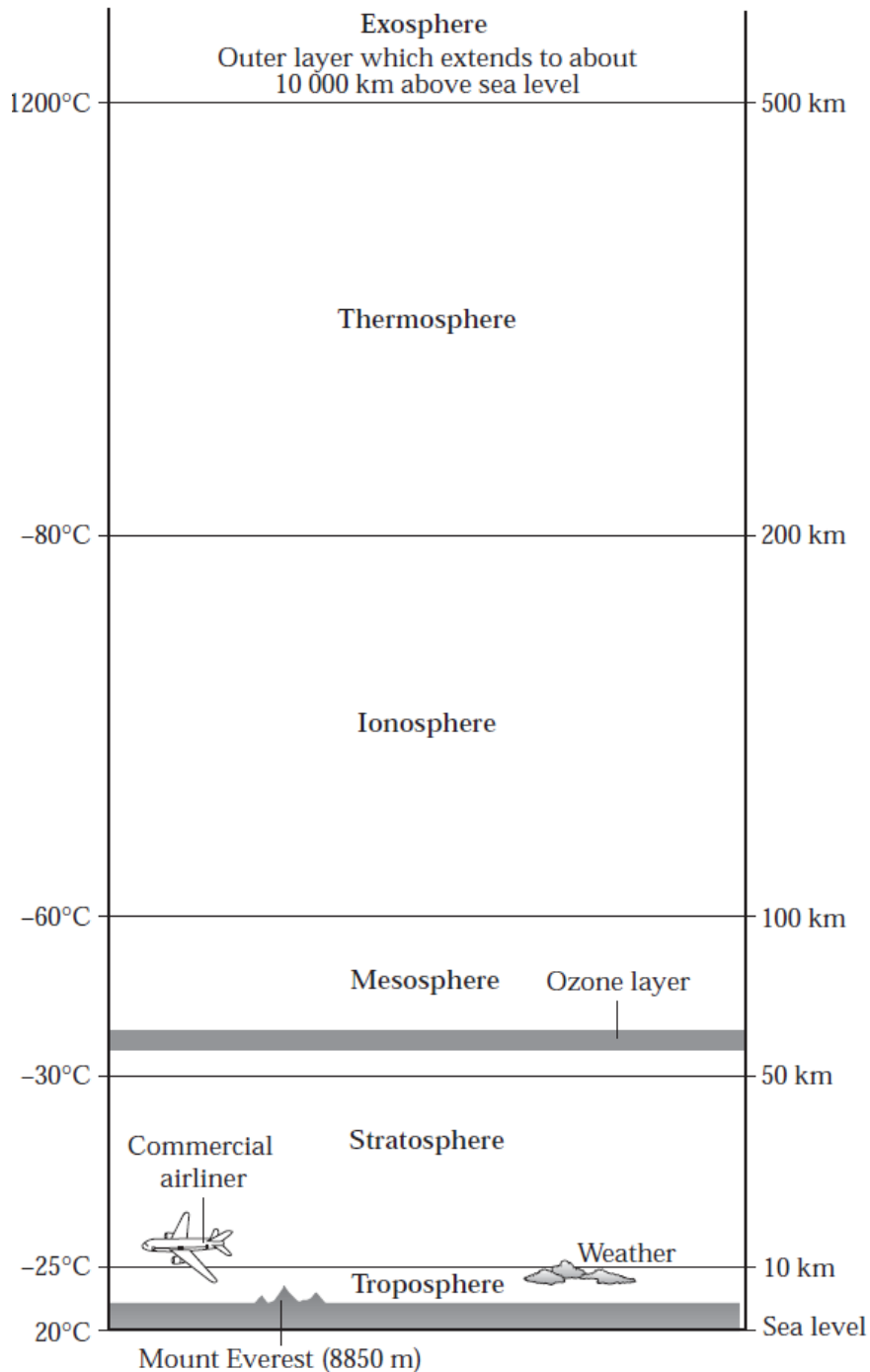
3) **Short Answer Questions**

- i) Melissa suggested that coffee in plastic cups stays hot longer than thick tomato soup in plastic cups.

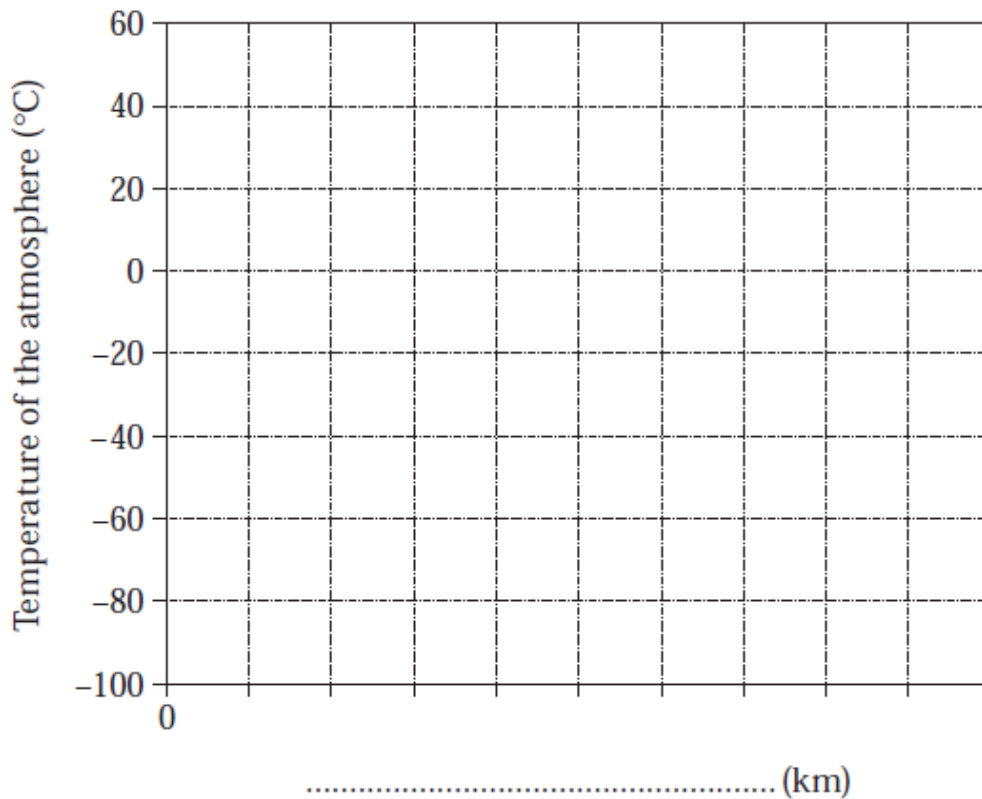
Plan a safe experiment to test this idea.

Use the diagram below to answer the following questions

The diagram shows the layers of Earth's atmosphere. Not all parts of the diagram are drawn to scale



- ii) Using the information in the diagram, graph the temperature changes from sea level to the top of the ionosphere.



- iii) Using the information in the diagram, calculate the difference in temperature between 200 km and 500 km above sea level.
- iv) In the diagram, the Mesosphere has been drawn to scale. Estimate the height of the ozone layer above sea level
- v) Using the information in the diagram, suggest ONE reason why commercial aircraft fly mainly in the stratosphere.