nelson net.

Human Perspectives ATAR Units 1 & 2

Answers

Chapter 1 Investigating human biology

Questions 1.1

Recall knowledge

1 List the two aspects of science.

Answer: Science is a process of inquiry – a way of finding out about human beings, and their living and non-living surroundings.
Science is a body of knowledge – knowledge gained by systematic observation and testing of ideas.

2 Define 'human biological science'.

Answer: Human biology is a body of knowledge relating to humans and is concerned with finding out more about the human species.

3 Define 'psychology', 'biochemistry' and 'cytology'.

Answer: Psychology: The study of human behavior
Biochemistry: The study of the chemistry of living things
Cytology: The study of cells

4 List the methods of investigating.

Answer: Literature review, Observation, Classification, Experimentation

Apply knowledge

5 Explain how physiology relies on a knowledge of anatomy.

Answer: Physiology is the study of the functioning of living things, and anatomy is knowing the structure of the body. To be able to understand how the body works, you require a knowledge of the structure of the body first.

6 Give an example of where observations are used during scientific investigations.

Answer: Students responses will vary. Observations are made using the senses and can be enhanced by using specialised instruments, for example listening to a heartbeat using a stethoscope, classifying bacteria using an electron microscope, making detailed observations in the field with samples taken for further analysis in a laboratory.

7 Explain why a control experiment is an important part of a scientific investigation.

Answer: A control experiment is one in which only one variable is being tested. This enables a comparison to be made between the results from the experimental group and the control group and a confident interpretation of the results can be made.

Questions 1.2

Recall knowledge

1 List the steps in the scientific method.

Answer:

- Identify a problem
- Collect information
- Identify the variables
- Develop a hypothesis
- Test the hypothesis
- Collect and present the data
- Interpret the data
- Evaluate the experiment
- Test again
- Make a conclusion

2 Define 'independent variable', 'dependent variable' and 'controlled variable'.

Answer: Independent variable: the factor being investigated, the factor being deliberately changed to determine how it affect the results.
Dependent variable: the factor that changes due to the changes made to the independent variable.
Controlled variable: the factors being kept the same for both the control and experimental groups in an experiment.

3 Is a baby's birth weight quantitative or qualitative? Justify your answer.

Answer: Quantitative, as it is a measurement and would include a unit.

4 Which variable should be on the horizontal axis of a graph?

Answer: The independent variable is normally plotted on the horizontal axis of a graph.

5 Define ‘validity’, ‘random error’, ‘conclusion’, ‘reliability’, ‘systematic error’, ‘accuracy’ and ‘theory’.

Answer: Validity: The extent to which an experiment tests what it is supposed to test, a fair test of the hypothesis so we can trust the conclusion from the data.
Random error: Unpredictable errors that can occur in all experiments. They occur because no measurement can be made with absolute precision.
Conclusion: A statement made by the scientist determining if the hypothesis is supported or disproved.
Reliability: Refers to how similar the results for trials of the same test are. The extent to which an experiment gives the same result each time it is performed.
Systemic error: Errors that occur because of the way an experiment is designed or due to problems with equipment. They can be reduced by changing the experimental procedure of equipment.
Accuracy: How correct or true the measurements are.
Theory: A theory results from a hypothesis that is supported, with no evidence going against the hypothesis.

Apply knowledge

6 A scientist was testing the effect of caffeine on memory.

a What is the independent variable?

Answer: The independent variable is caffeine.

b What is the dependent variable?

Answer: The dependent variable is memory.

c Write a hypothesis for the test.

Answer: Sample hypotheses include:

- The more caffeine a person consumes, the greater their memory retention will be.
- If a person consumes more caffeine, then their memory will improve.
- The amount of caffeine consumed by a person has no effect on memory retention.
- Similar statements may be acceptable, students must have both variables and show relationship between them.

7 Explain why it is important to collect information in the early stages of a scientific investigation.

Answer: To determine what, if any, information has already been collected by other researchers. This way, the experiment will build on past discoveries and the scientist does not duplicate work already completed.

8 Suggest why a hypothesis should be about a single idea.

Answer: A hypothesis should be about a single idea to ensure the experiment remains valid and testable. If there is more than one idea in a hypothesis, the scientist will be unable to determine the relationship between the variables. There may be more than one factor influencing the outcome of the experiment.

9 The hypothesis for an investigation is: 'The darker a person's skin colour, the less likely they are to develop skin cancer.'

a State the independent variable.

Answer: The independent variable is the skin colour of a person.

b State the dependent variable.

Answer: The dependent variable is skin cancer development.

c List five factors that need to be controlled for the investigation to be valid.

Answer:

- Age of the people
- Previous exposure to ultraviolet radiation
- Previous exposure to known carcinogens
- Amount of time exposed to ultraviolet light
- No use of sunscreen
- No other medication that may increase susceptibility to ultraviolet radiation

Students responses will vary; other responses may be acceptable.

d Explain why it is important that a large number of people are included in the investigation.

Answer: A large number of people reduces experimental error and can increase the reliability of the results because it allows for averaging of data sets.

10 What type of graph should be used to represent data about the number of people with different eye colours?

Answer: This is discrete data, so a bar or column graph should be used.

11 Classify each of the following graphs as either a column graph, bar graph, line graph or histogram.

Answer: **a** Column graph; **b** Histogram; **c** Line graph; **d** Bar graph

12 'Systematic errors may produce reliable results'. Discuss whether this statement is true or not.

Answer: This is a true statement; systematic errors result in measurements that will *always* be too high or too low. If the measurements are always the same, it could be said that the experiment is reliable. The only way to fix systematic errors is to change the experimental procedure.

Questions 1.3

Recall knowledge

1 Define 'ethics'.

Answer: Ethics are a set of moral principles or values.

2 List the principles that must be satisfied for an ethically sound investigation.

Answer:

- Voluntary participation
- Informed consent
- Risk of harm
- Confidentiality
- Anonymity

3 Describe a double-blind experiment.

Answer: A double-blind experiment is one where neither the researcher nor the participant knows who is receiving the treatment or the placebo. This reduces any bias due to the placebo effect.

Apply knowledge

4 Explain the difference between confidentiality and anonymity.

Answer: Confidentiality is where the identities of the participants are only revealed to the people directly involved in the study, whereas, with anonymity, the participants in the study remain anonymous to everyone, including the researchers. Anonymity is a stronger guarantee of privacy.

5 Explain why placebos are an important part of medical research.

Answer: A placebo allows for a clear comparison to be made between the experimental and control group in a medical research trial. It involves the subject believing they are receiving the same treatment as everyone else and can remove the placebo effect.

6 During research into a new treatment for breast cancer, one group of patients took a new drug while another group took a placebo under the same regime. The patients in the placebo group showed a slight improvement, while the patients taking the drugs showed signs of kidney failure. Discuss whether or not the research should be continued.

Answer: The research should not be continued because the placebo group should not have had any change to their results, and the experimental group had an adverse effect to their health attributed to the drug they are taking.

Chapter 1 activities

Activity 1.1 Hypothesising

1 *Bacillus anthracis* causes anthrax.

Answer: This is a good hypothesis, because it is a statement containing a single idea that can be tested and it links two variables.

2 Can anthrax be passed from sheep to cattle?

Answer: This is not a hypothesis, because it is a question.

3 If a sheep is injected with *Bacillus anthracis*, it will get anthrax.

Answer: This is not a hypothesis. It is a prediction arising from the hypothesis that *Bacillus anthracis* causes anthrax.

4 To look for *Bacillus anthracis* in the blood of animals with anthrax.

Answer: This is not a hypothesis because it is not written as a statement. It is written as an aim and it does not link two variables.

5 Why does *Bacillus anthracis* cause anthrax?

Answer: This is not a hypothesis, because it is a question.

6 If a cow is injected with *Bacillus anthracis* and is then kept out of the weather, it will not get anthrax.

Answer: This is not a good hypothesis for two reasons. First, it is a prediction. Second, it states two variables that could affect development of anthrax: injection with the *Bacillus anthracis*, and weather.

7 Injecting blood from a sheep suffering from anthrax into a healthy sheep will transmit the disease.

Answer: This is a good hypothesis, because it is a statement containing a single idea that can be tested and it links two variables. It is also valid to say that it is a prediction based on the hypothesis that *Bacillus anthracis* causes anthrax.

8 Any animal suffering from anthrax will have *Bacillus anthracis* in its blood and will pass the infection on to other animals.

Answer: This is not a good hypothesis, even though it is a statement that can be tested. This is because it contains two ideas (that is, two variables): first, the bacterium in the blood, and second, passing the infection to other animals.

Activity 1.2 Investigating how pollen causes hay fever

1 How could the investigation reported in the article be used to help answer the question, 'What is science?'?

Answer: Science is a process of investigation to find answers to questions. In the investigation described, the scientist is trying to find an answer to the question, 'How can grass pollens that are 20 to 30 microns in diameter cause asthma when only particles of 10 microns or less can get into the lungs?'

2 What sorts of things would you need to know if you wished to repeat Professor Murray's observations in order to verify his results?

Answer: The types of grass pollen tested; how the pollen was collected; how pollen diameter was measured; how water was introduced to the pollen.

3 Professor Murray was involved in both observation by looking at pollen grains under a microscope, and experimentation by checking what happened when water was added to

the pollen. In testing pollen to see what happens when water is added, what control would be needed if the results were to be valid?

Answer: Testing pollen in dry conditions at the same temperature.

4 Can you think of any practical applications for Professor Murray's discovery?

Answer: The development of a drug/substance that stops the reaction of water on pollen when the pollen comes into contact with the moist membranes of the respiratory tract.
People prone to asthma should avoid exposure to grass pollen in wet, damp or humid weather.

5 The results of research often raise new questions to be answered. Suggest two questions that now need to be solved as a result of Professor Murray's research.

Answer: Questions that could be solved include:

- Is it the fungus or the pollen that causes allergies following rain?
- Does grass pollen burst open when in contact with nasal secretions?
- Can the reaction of grass pollen when it gets wet in the respiratory tract be prevented?
- Do the particles inside grass pollen actually find their way into the lungs?
- Do the particles inside grass pollen cause an allergic response?

6 Propose a hypothesis based on one of the questions you suggested in your answer to Question 5.

Answer: Sample hypotheses include:

- The release of fungal spores following rain causes allergies in susceptible people.
- Grass pollen does/does not burst open when in contact with nasal secretions.
- The particles inside grass pollen can/cannot cause an allergic response.
- The particles from grass pollen can enter the lungs.

7 The journalist has written an article describing Professor Murray's results for the general public. What additional information should be included in a report intended for other scientists working on the links between pollen grains and asthma?

Answer:

- The hypothesis being tested
- Details about the sample
- Data from measurements
- Controlled variables
- Method used
- Details about how measurements were made

Activity 1.3 Designing controlled experiments

1 Suggest the hypothesis that Redi was testing.

Answer: Students may suggest many possible hypotheses, such as either of the following:

- Air coming in contact with meat causes maggots
- Flies coming in contact with meat results in maggots

2 List the variables that Redi controlled in his experiments.

Answer: Meat was placed in all flasks. All flasks were set up at the same time. It is also implied that all flasks were left for the same amount of time. We may also assume that all the flasks were left in the same place, so all were at the same temperature.

3 What other variables do you think Redi should have controlled?

Answer:

- The quantity and type of meat used
- That only one type of fly came into contact with the meat
- The volume of the flasks used
- That all flasks were made of the same material
- The environmental temperature
- That all flasks were left in the same location (to provide consistent exposure to light/dark)

4 What conclusion could Redi draw from his experiment?

Answer: Students may draw either of the following conclusions:
Maggots are caused by flies that come in contact with the meat. Air does not cause maggots in meat. Maggots in meat do not develop by spontaneous generation; they develop from contact between meat and flies.

5 Make a list of further questions to be answered that arise as a result of Redi's experiments.

Answer: Further questions may include the following:

- How do flies cause maggots in meat?
- Do flies cause maggots in foods other than meat?
- Do all types of fly cause maggots?
- Is the development of maggots from flies affected by environmental conditions such as temperature or light?

6 What was Pasteur's independent variable?

Answer: Exclusion of microorganisms, which was achieved by sterilising by boiling and filtering to remove bacteria

7 What was Pasteur's dependent variable?

Answer: Growth of microorganisms

8 List the variables that Pasteur would have controlled so he could make a valid conclusion from his experiment.

Answer:

- Type and amount of nutrient broth
- How the bacteria were filtered from the air
- Type and size of the flasks
- Temperature
- All flasks set up at the same time
- All flasks left for the same amount of time

Activity 1.4 Testing a hypothesis

1 Suggest one prediction that can be made from this hypothesis. To test the hypothesis, 12 adults were kept in a room (Room 1) at 22°C for 12 hours. The subjects were then transferred to a second room (Room 2), where they were kept for another 12 hours at 10°C. The group consisted of six men and six women, all the same age. They were fed an identical diet in Rooms 1 and 2. After the 12 hours in each room, the level of hormone X in each subject's blood was determined.

Answer: If the hypothesis is true then (any of the following):

- increase in environmental temperature causes a decrease in the level of hormone X in the blood
- if environmental temperature stays the same the level of hormone X will be constant
- environmental temperature determines the level of hormone X in the blood.

2 Why were six men and six women used for the experiment, instead of just one of each sex?

Answer: Several subjects were used in case one subject was unusual or abnormal in some way. When results are averaged the effects of individual differences on the result should be reduced.

3 What was the experimental test?

Answer: Placing the subjects in a room at 10°C for 12 hours and then testing the level of hormone X in the blood

4 What was the control test?

Answer: Placing the subjects in a room at 22°C for 12 hours and then testing the level of hormone X in the blood

5 What was the independent variable?

Answer: The temperature of the room

6 What was the dependent variable?

Answer: The level of hormone X in the subjects' blood

7 What variables were controlled (according to the description of the experiment)?

Answer:

- Equal numbers of males and females
- All subjects of the same age
- All given an identical diet
- All in rooms 1 and 2 together
- All in the rooms for the same period of time

8 Can you think of any other variables that should have been controlled? If so, explain why.

Answer:

- State of health of the subjects: If a subject were suffering from a medical condition, it could affect his or her hormone levels.
- Body mass index of subjects: Being severely under or overweight could affect a subject's hormone levels.
- Physical fitness of subjects: Fitness could affect a subject's hormone levels.
- Amount of water drunk by subjects during the experiment: Level of hydration of the body could affect a subject's hormone levels.
- Amount of clothing worn by subjects.

9 Do you think the experiment would have been a fair test?

Answer: Answers will vary. Students may argue that the experiment was a fair test because all subjects were exposed to the same conditions for the same length of time. However, they may also argue that the experiment was not a fair test because of the uncontrolled variables listed in response to Question 8.

10 What results would have supported the hypothesis?

Answer: If all/most subjects showed an increase in the level of hormone X in the blood after exposure to the cold room, the hypothesis would be supported.

11 What results would have disproved the hypothesis?

Answer: If all/most subjects showed no change or a decrease in the level of hormone X in the blood after exposure to the cold room, the hypothesis would be disproved.

Activity 1.5 Testing the product claims for Hairnu

• What will be your independent variable?

Answer: Whether Hairnu is used or not

• What will be your dependent variable?

Answer: Quantity or density of new hair growth on the scalp

• State the hypothesis that you are testing.

Answer: Valid hypotheses include:

- Hairnu causes new hair to grow on a bald scalp
- Hairnu increases the density of hair in areas of the scalp where hair growth is sparse

• What variables will you need to control?

Answer: Four variables need to be controlled:

- the same volume of Hairnu must be used on all subjects
- the same concentration of Hairnu must be used on all subjects
- Hairnu must be applied to all subjects in the same way
- hair growth must be measured at the same time interval after application of Hairnu.

• How will you provide a control test so that you will be able to see whether Hairnu does what it claims to do?

Answer: Have a group of subjects that do not use Hairnu but use a solution that does not contain any Hairnu.

• How will you measure your results?

Answer: Count the number of hair follicles in a given area of the scalp before and after use of Hairnu or the control solution.

• How many people will you need to test to get a reliable result?

Answer: At least 10 people in each of the experimental and control groups.

• Draw a table to show how you would present your data.

Answer: See page 10 for rules to be observed when drawing up a table.

• What results would support your hypothesis? What results would disprove your hypothesis?

Answer: The hypothesis would be supported if subjects in the experimental group showed much better hair growth than the control group over the period of the experiment.
The hypothesis would be disproved if there were no difference in hair growth between the two groups.

Activity 1.6 Tabulating data

1 What were the independent and dependent variables in the students' experiment?

Answer: Independent variable: Temperature (°C) of the emulsion
Dependent variable: Time (hours and minutes) for the protein and oil to be completely digested

2 Draw up a table to show the data they collected.

Answer:

Table 1 Time taken for digestion of oils and proteins at varying temperatures

Temperature of flask (°C)	Proteins	Oils
27	6 hours 40 minutes	7 hours 35 minutes
29	6 hours 5 minutes	7 hours 20 minutes
32	4 hours 35 minutes	5 hours 15 minutes
34	5 hours 20 minutes	6 hours 45 minutes
36	3 hours 10 minutes	4 hours 50 minutes
38	9 hours 25 minutes	12 hours 50 minutes

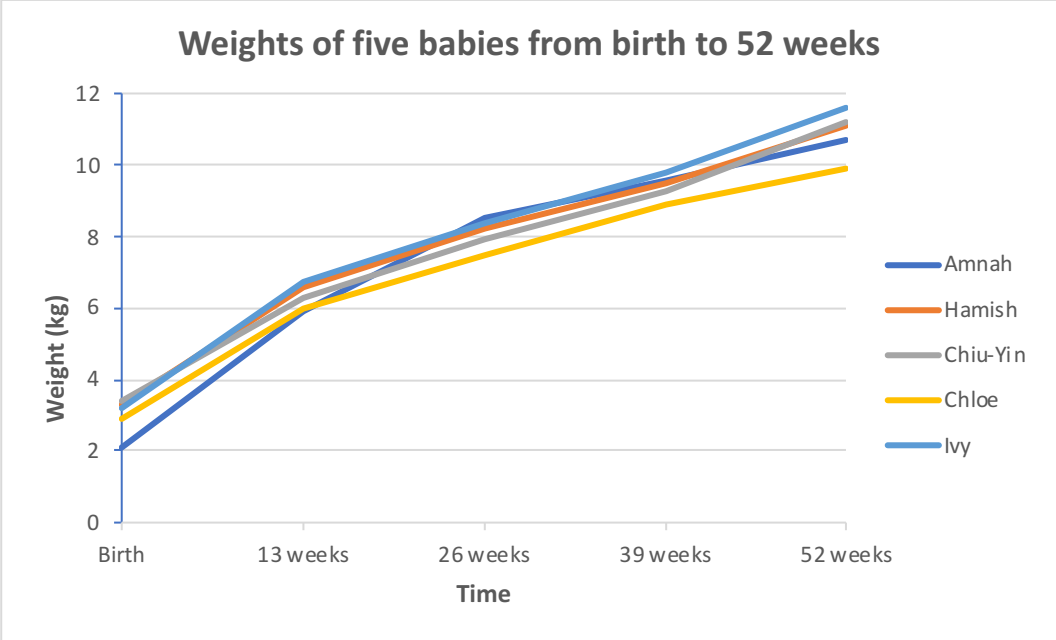
Activity 1.7 Graphing

1 a What is the dependent variable and what is the independent variable?

Answer: Dependent variable: Weights of babies (kg); Independent variable: Time

b Plot the data as a graph in the most appropriate manner.

Answer:



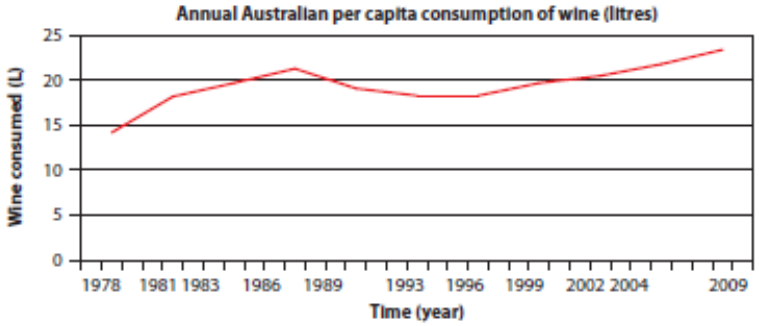
2 a Identify the dependent and independent variables in these data.

Answer:

Dependent variable: Alcohol consumed – litres; Independent variable: Time – year

b Plot the data as a graph in the most appropriate manner.

Answer:



Chapter 1 review questions

Recall

1 a What is science?

Answer: Science is both a process of inquiry and a body of knowledge, gained by systematic observation and testing of ideas.

b Why is human biology a science?

Answer: Human biology is a science because it is a body of knowledge relating to humans that has been built up by discoveries made by successive generations of scientists.

2 a Describe a hypothesis.

Answer: A hypothesis is a possible explanation or solution to a problem. Hypotheses are testable.

b Why do scientists make hypotheses?

Answer: A hypothesis is a tentative explanation for observations. By proposing a hypothesis, the scientist can then test it to see whether the explanation is valid. Scientists must design experiments so that the results will either support or disprove their hypotheses.

3 a Define 'literature review'.

Answer: A literature review involves reviewing books, scientific journals and the internet to find out what information relating to the subject under investigation has been collected and published by others.

b When would you carry out a literature review?

Answer: A literature review would be carried out once a scientist decides to investigate a problem. Thus, the scientist can build on past scientific work in the specific field of investigation, and not duplicate work previously done.

4 List the characteristics of a good hypothesis.

Answer: It is usually a positive statement, it can be tested, it is as short as possible, and it links two variables.

5 Describe the two types of experimental error, including how the effects of each type can be minimised.

Answer:

Random errors: Unpredictable errors caused by lack of precision in measuring

Minimising random errors: Take several measurements and find the average

Systematic errors: Caused by experimental design

Minimising systematic errors: Critically evaluate experimental design and change the design if necessary.

6 List the ethical principles that must be satisfied in any research project.

Answer:

• Voluntary participation

• Informed consent

• No risk of harm to subjects or investigators

• Confidentiality

• Anonymity

Explain

7 Use an example to explain why classification is an important part of science.

Answer: Classification places things in groups based on their characteristics. It serves to facilitate scientific study and make communication easier. For example, taxonomic classification of animals allows scientists to discuss primates, without the requirement to describe what primates look like.

8 Explain why an experiment must have a control.

Answer: A control is necessary for the scientist to be able to compare the results with the experiment in which the only difference is the one variable being tested. Without a control, the scientist would be unable to say that the results were due to changes in the experimental variable.

9 Why is repetition important in scientific investigation?

Answer: Repetition is important in scientific investigations because it ensures that the results of an experiment are reliable. It also ensures that, when the results of many trials are averaged, the scientists have minimised the effect of any chance or anomalous results that may influence the overall result.

10 The results of experiments are expressed as measurements whenever possible. Explain the reason for this.

Answer: Measurements give a quantitative result that is less likely to be affected by bias, as qualitative observations would be.

11 Explain the difference between a hypothesis and a scientific theory.

Answer: A scientific theory is formed when a hypothesis has been tested many times and no evidence against the hypothesis has been found. The hypothesis is the beginning of the process of developing a scientific theory. When the hypothesis has so much supporting evidence that it is generally accepted, it becomes a theory.

12 a Explain the difference between the experimental group and the control group in an experiment.

Answer: An experimental group is the group that is being exposed to the experimental treatment. The control group is identical to the experimental group in every way but is not exposed to the experimental treatment.

b What is the purpose of the control group?

Answer: The control group gives a 'base line' reading. This group shows what is 'normal' and what happens in the experimental set-up without the effect of the experimental treatment. Thus its results are used as a comparison. Without the control group the investigator would not be able to say that the result was due to changes in the independent variable.

13 A university study was conducted to investigate the effect of altitude on breathing rate. Use this example to:

a explain the difference between the independent and dependent variables in an experiment

Answer: The independent variable is the factor being investigated, in this instance, the change in altitude. The dependent variable is the factor that changes due to the changes made to the independent variable. In this instance, it is the change in breathing rate.

b describe the controlled variables in an experiment.

Answer: Controlled variables are factors kept the same so that the results can be attributed to the independent variable. In this example, the following factors would need to be controlled: age and gender of participants, level of activity performed, no pre-existing respiratory illness.

Apply

14 a Explain the difference between the validity and the reliability of the results of an experiment.

Answer: An experiment is said to be valid if it tests what it set out to test; while reliability refers to the extent to which an experiment can give the same results each time it is conducted.

b How would you make sure that the results of an investigation are valid?

Answer: The results of an investigation are valid if there is only one variable tested in the experiment. A scientist would have to check for uncontrolled variables, because these would make an investigation invalid.

c How would you make sure that the results of an experiment are reliable?

Answer: The results of an experiment are reliable if repeated tests give the same results each time they are used in the same way. Thus, reliability can be tested by repeating an experiment many times.

15 a Suggest a hypothesis that Dr Bean was testing.

Answer: Rate of nail growth changes as a person ages.

b State the independent and dependent variables.

Answer: Independent variable: Time; Dependent variable: Nail growth

c List some of the variables that should have been controlled in Dr Bean's study.

Answer:

- How often the fingernails were cut or broken
- Diet
- Use of hand creams
- Always measuring nail from the same place
- Measuring the thumbnail on same hand each time
- The time of day when the measurement was made

d Describe one source of random error in the investigation.

Answer: Many answers are acceptable. For example:

- Reading the instrument used for measuring
- When the measurement was taken
- Measuring from exactly the same place each time

e Measure the length of your thumbnail. Assume that your thumbnail grows at the same rate as that of the 32-year-old Dr Bean. How long did it take the tip of your thumbnail to grow from the cuticle to its present position?

Answer: Calculation: Days (predicted for nail to have grown) = current length of thumbnail (mm) ÷ 0.123 mm

f Do you think your fingernails and toenails grow at the same rate? Propose a hypothesis and outline an investigation that you could do to test your hypothesis.

Answer: Students may answer yes or no – no correct answer.
Hypothesis: Toenails and fingernails grow at the same rate. Or, fingernails and toenails grow at different rates. File a horizontal line on your thumbnail and toenail just above the cuticle (the strip of skin at the base of the nail). Record how long it takes the mark to reach the tip of the thumbnail/toenail and the distance from the cuticle to the tip. Compare the two growth rates. Repeat several times to make sure the results are reliable.

16 Suppose you wished to find out whether people could tell the difference between normal instant coffee and decaffeinated instant coffee.

a Propose a hypothesis and outline a blind experiment that you could do to test your hypothesis.

Answer: There are two possible hypotheses.

- People are able to tell the difference between normal instant coffee and decaffeinated instant coffee.
- People are not able to tell the difference between normal instant coffee and decaffeinated instant coffee.

Experiment: Give a group of people unlabelled samples of normal coffee and decaffeinated coffee and ask them which is which.

b How could you make your experiment into a double-blind experiment?

Answer: To make it into a double-blind experiment, in addition to the subjects not knowing which sample was normal and which decaffeinated, the person handing them the samples would also not know which was which.

17 a What was the independent variable in this experiment?

Answer: The type of tablet given to the subjects – Presslo or a sugar tablet

b What was the dependent variable in the experiment?

Answer: The blood pressure of the subjects

c List four variables that were controlled in the experiment.

Answer: Any four of the following.

- Age of the subjects – between 50 and 55 years
- All subjects had high blood pressure
- All subjects were otherwise healthy
- The tablet was given at the same time each day
- Blood pressure was measured and recorded at the same time each day
- Both groups included males and females (in equal numbers)

d List two variables that were not controlled in the experiment.

Answer: Any two of the following:

- Physical fitness of the subjects
- Body build or body mass index of the subjects
- Diet of the subjects
- Amount of exercise done by subjects during the experiment
- Daily activities of the subjects

e What was the purpose of the control group?

Answer: The control group was a necessary comparison. If the blood pressure of the subjects taking Presslo was lowered, one could not say that this was caused by the Presslo unless there was a control group not taking Presslo whose blood pressure did not change.

f Why did the scientists have so many people in each group?

Answer: A few subjects may have an atypical response to the drug. By using a large group of subjects, the scientists minimised the effect that the few subjects may have on the overall result of the experiment. This minimised the effect of chance variables that could not be controlled. In essence, this means the more subjects, the more reliable the results of the experiment.

Extend

18 Why are reports of scientific investigations published?

Answer: Reports are published so that scientists working on similar hypotheses can compare their work with others or build on other scientists' knowledge. Reports also enable other scientists to repeat the investigation and so test the reliability of the results.

19 Why do scientists use such a lot of technical terms?

Answer: Scientists all over the world use technical terms, or 'scientific terminology', so that precise meanings can be conveyed with little chance of ambiguity or misunderstanding between colleagues and other scientists.

20 Is history a science? Is music a science? Give reasons for your answers.

Answer: History is not a science, although scientific methods may be used to investigate historical situations. History is subject to interpretation and analysis, but cannot be measured, tested and trialled.
The production of musical sounds can be considered a science because it is based on observation (listening), is tested and trialled, can be measured, and is constantly evolving as new sounds are discovered, and new instruments/systems developed. However, the appreciation of music is not a science, because it is a matter of opinion – different people have different tastes in music.

21 a Find out how the ancient Greeks and Romans tried to stop the spread of malaria.

Answer: By draining swamps and preventing people from living near swamps or stagnant water.

b Use resources to find out what causes malaria.

Answer: Malaria is caused by a parasite (a protozoan, or single-celled animal) that multiplies in red blood cells. The parasite is introduced into the blood by the bite of a mosquito infected by the parasite.

c What were some of the experiments that were done to determine the cause of malaria?

Answer: Autopsies of victims; microscopic examination of blood from people who did and did not have malaria; observing stomach contents of mosquitoes that had bitten malaria patients; experiments involving bird malaria – transfer of the parasite by mosquitoes from bird to bird.

d Which scientists were instrumental in discovering the cause of malaria? How was their discovery communicated to others?

Answer: Ronald Ross received the Nobel Prize in 1902 for discovering how mosquitoes transferred the parasite from one person to another. Charles Laveran discovered the malarial parasite in 1880. Patrick Manson made important discoveries about the life cycle of the parasite.