BOARD OF STUDIES
NEW SOUTH WALES

HIGHER SCHOOL CERTIFICATE EXAMINATION

1997

SCIENCE FOR LIFE

2 UNIT

Time allowed—Two hours
(Plus 5 minutes reading time)

DIRECTIONS TO CANDIDATES

Section I—General

- Attempt ALL questions.
- **Part A** 10 multiple-choice questions, each worth 1 mark.
  Mark your answers in pencil on the Answer Sheet provided.
- **Part B** 5 questions, each worth 3 marks.
  Answer this Part in the Part B Answer Book.
- Write your Student Number and Centre Number on each Answer Book.
- You may keep this Question Book. Anything written in the Question Book will NOT be marked.

Section II—Modules

- Attempt THREE Modules.
- Each Module is worth 15 marks.
- Answer each Module in a *separate* Module Answer Book.
- Write your Student Number and Centre Number on the cover of each Module Answer Book.
- Write the Course, Module Name, and Question Number on the cover of each Module Answer Book.
- You may ask for extra Module Answer Books if you need them.
- Board-approved calculators may be used.

SECTION I—GENERAL

(25 Marks)

PART A

Attempt ALL questions.

Each question is worth 1 mark.

Select the alternative A, B, C, or D that best answers the question.

Mark your answers in pencil on the Answer Sheet provided.

1. The fingerprint below was found on a murder weapon.

DUE TO COPYRIGHT RESTRICTIONS THIS IMAGE COULD NOT BE REPRODUCED.

The fingerprints below were taken from four suspects. Which suspect's fingerprint is most like the print found on the murder weapon?

DUE TO COPYRIGHT RESTRICTIONS THESE IMAGES COULD NOT BE REPRODUCED.

2. Look at the pie charts below. Chart I shows the major gases contributing to the greenhouse effect. Chart II shows the major sources of methane entering the atmosphere.

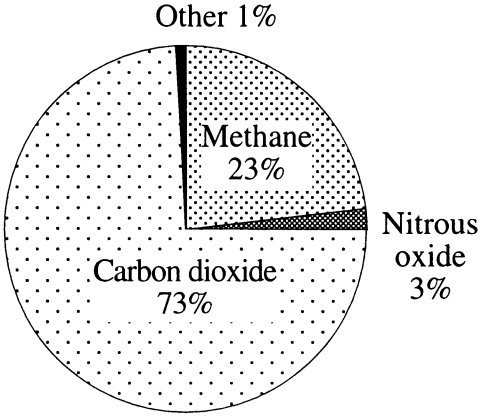


CHART I— MAJOR GREENHOUSE GASES IN ATMOSPHERE

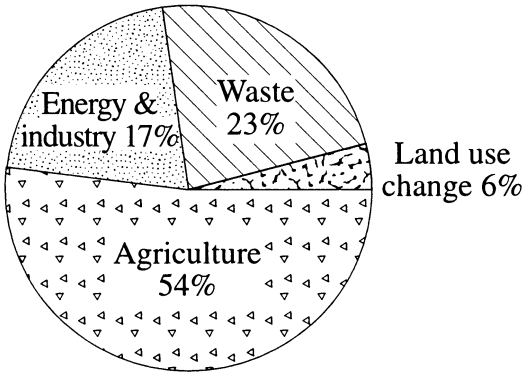


CHART II— SOURCES OF METHANE

'Warming to the issue', National Greenhouse Advisory Committee, 1995, AGPS.

From the charts, we can conclude that

(A) agriculture is a major producer of methane.

(B) agriculture produces the most greenhouse gases.

(C) agriculture is a major source of carbon dioxide.

(D) carbon dioxide does not contribute to the greenhouse effect.

3. The National Health and Medical Research Council and the National Heart Foundation have conducted research on high blood pressure. A researcher claims that applications of this research have led to a halving of strokes, and to a reduced number of heart attacks.

This information suggests that

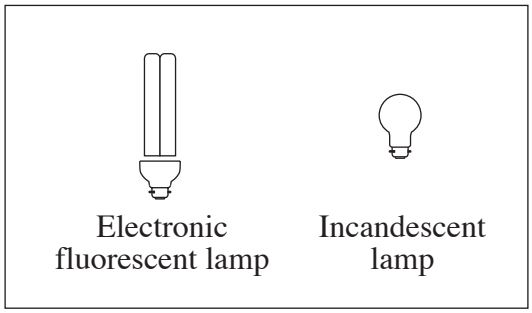
(A) it is more important to spend money on research than on treating people with diseases.

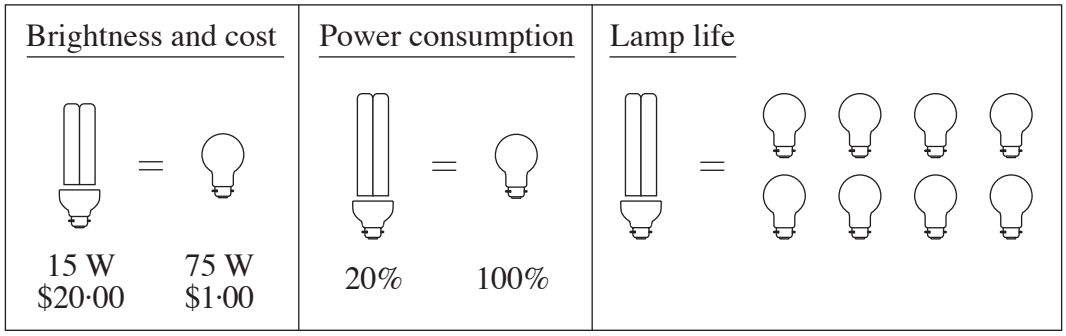
(B) the more money we spend on research the more people we can save.

(C) research on high blood pressure can reduce the incidence of strokes and heart attacks.

(D) if this research on high blood pressure ceases, then people will have shorter lives.

4 . The diagrams below show the results of a comparison of electronic fluorescent lamps and incandescent lamps.





'Issues in Science', Evans & McCann, Heinemann 1993, p73. Courtesy Reed Education.

The diagrams show that electronic fluorescent lamps

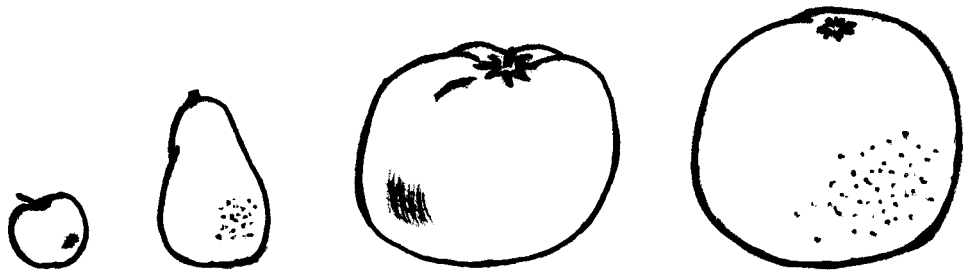
(A) produce more light than incandescent lamps.

(B) use less power than incandescent lamps.

(C) last one-eighth as long as incandescent lamps.

(D) cost less to buy than incandescent lamps.

5 . Below are four scale diagrams of fruit and vegetables. The scale is shown under each diagram.



Apple	Pear	Tomato	Orange
$\times \frac{1}{6}$	$\times \frac{1}{4}$	$\times \frac{1}{2}$	$\times \frac{1}{2}$

From the information above, which fruit or vegetable is the tallest?

(A) Apple

(B) Pear

(C) Tomato

(D) Orange

6 . The first cloning of large vertebrate animals (for example, sheep, chimpanzees) was reported in February 1997. National leaders have asked scientific research institutions to stop this type of research voluntarily, until the moral and ethical issues have been resolved.

This request shows

(A) the power of national leaders to control scientific research.

(B) the way science helps us to understand our natural world.

(C) the influence of society on scientific research.

(D) that science is not concerned with moral and ethical issues.

7 . The following article appeared in a newspaper recently.

> SMOKERS GET MORE WRINKLY
>
> Medical proof that smokers really do age faster has been found in a study of identical twins.
>
> Doctors found that smokers' skin was usually 25 per cent thinner and occasionally 40 per cent thinner—and therefore more wrinkly—than their non-smoking brothers or sisters.
>
> It is believed that smoking may release an enzyme which breaks down collagen and elastic tissue in the skin. Blood supply to the top layer of skin may also be restricted. Dr Phil Spectre said the study confirmed in scientific detail the link between smoking and aging.
>
> 'Doctors say they can recognise smokers' faces because they look more wrinkled and haggard,' he said.
>
> Daily Telegraph January 1997

Your teacher asks you to design an experiment, using identical twins, to test the claim that smokers age faster than non-smokers. Which of the following is the best group to include in your experiment?

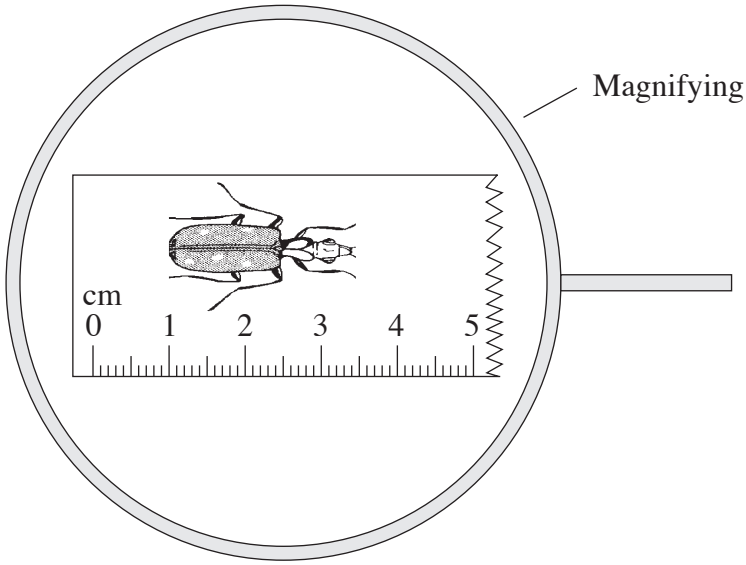
(A) Identical twins with one of each pair smoking and the other non-smoking.

(B) Identical twins with one of each pair injected with collagen.

(C) Identical twins and non-identical twins, half smoking and half non-smoking.

(D) Identical twins, half with thin wrinkly skin when they started smoking.

8 . Colin placed an insect on a ruler. The insect was examined with a magnifying glass (magnification × 10). The diagram shows what he saw under the magnifying glass.



The real length of the insect is closest to

(A) 0·25 cm

(B) 2·5 cm

(C) 3.5 cm

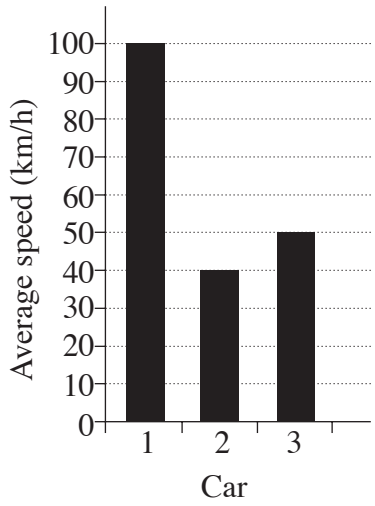
(D) 25 cm

9 . A student measured the time taken for three different cars to travel different distances. The student then calculated the average speed of each car, and put the information in the table below.

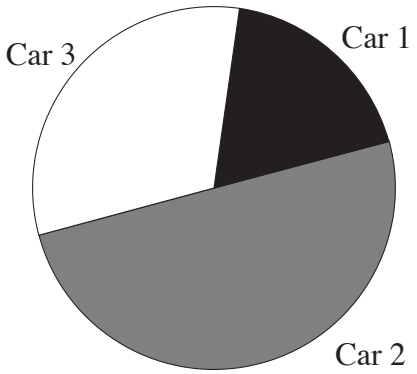
Car	*Time* (hours)	*Distance* (km)	*Average speed* (km/h)
Car 1	1	100	100
Car 2	2	80	40
Car 3	3	150	50

Which of the graphs below best shows the average speeds of the cars?

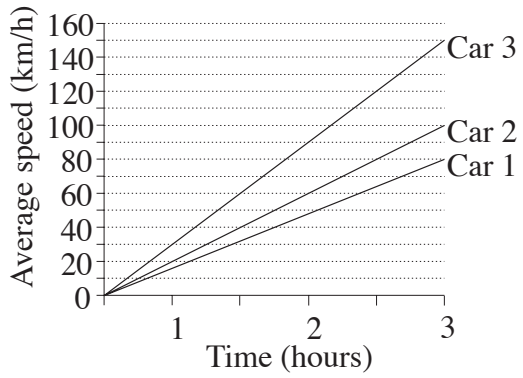
(A)



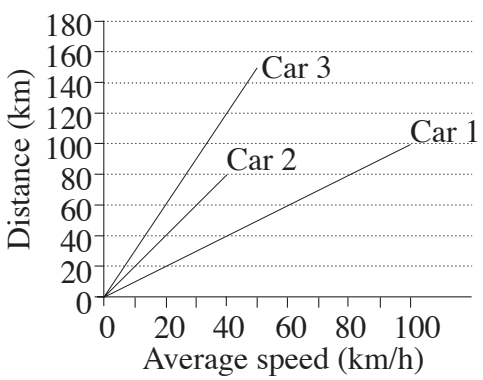
(B)



(C)

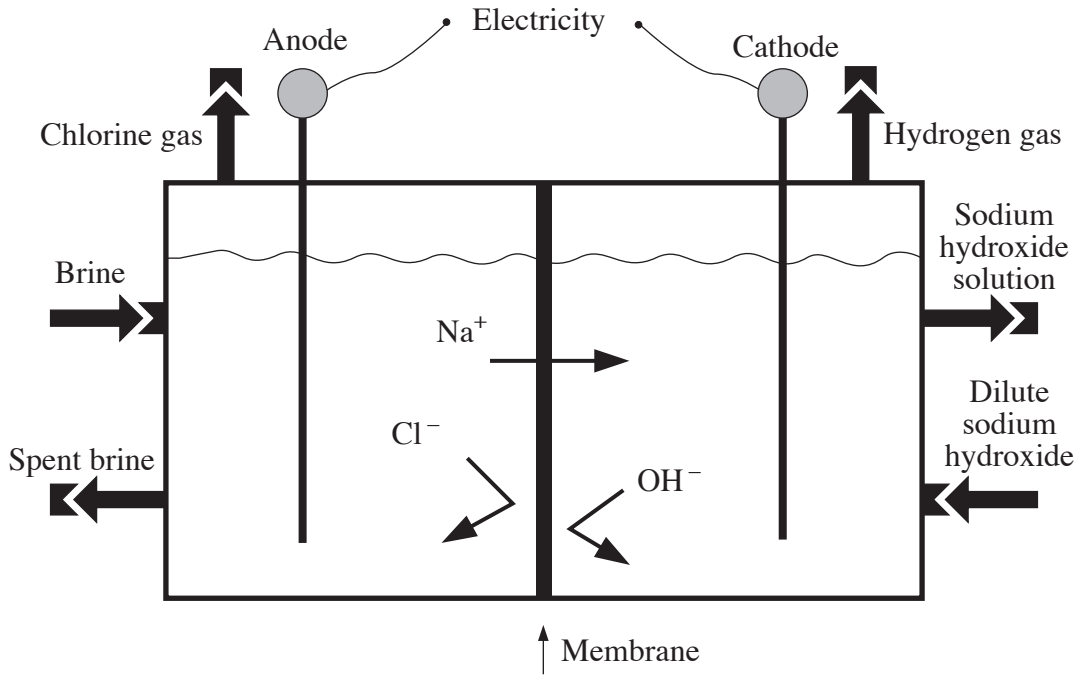


(D)



10.

HOW IS CHLORINE PRODUCED?



The Helix no 38 Oct/Nov 1994. The Helix is CSIRO's magazine for science students.

According to the above information, which of the following correctly lists the inputs and products of this process?

	Inputs	*Products*
(A)	spent brine, sodium hydroxide solution	chlorine gas, brine, dilute sodium hydroxide
(B)	brine, electricity	chlorine gas, dilute sodium hydroxide
(C)	spent brine, electricity	chlorine gas, hydrogen gas
(D)	brine, dilute sodium hydroxide	chlorine gas, hydrogen gas

PART B

Attempt ALL questions.

Each question is worth 3 marks.

Answer all questions in the Part B Answer Book provided.

11. You have just seen the magazine photo below of a killer, screw-worm maggot.

The Helix no 52 Feb/March 1997.
The Helix is CSIRO's magazine for science students.

You are talking to your friend on the telephone and want to describe the maggot to her.

Write a description to tell your friend what the maggot looks like.

12. The passage below was written by a student after completing a practical activity.

> 'We measured how tall the students in our group are. Jackie was tallest (177 cm) and Sam was 169 cm. Kim and Toni were both 153 cm. Sandy's height was exactly halfway between the heights of Jackie and Sam.'

(a) Draw up a table using this information to *rank* the students in order of height.

(b) The table below shows the results for *all* students in the class.

Height range (cm)	*Number in range*
145–149	1
150–154	5
155–159	5
160–164	7
165–169	8
170–174	6
175–179	2
180–184	0

Jackie claims to be the tallest person in the class. Is there enough information given here to decide whether she is correct? Give ONE reason for your answer.

13.

TEENAGERS NOT IMMUNE TO SKIN CANCER

'Many teenagers do not fully understand the health risks associated with sunbaking, and believe there is a safe way to tan', according to a survey published today. 'Almost one-third of teenagers aged fifteen and older believe that they are immune to skin cancer if they use a sun-screen when exposed to the sun', the survey found.

The research team called on governments to direct sun-safe campaigns at young people.

exam committee

You have been asked to design a poster to promote sun-safe practices among teenagers. These practices include wearing a hat and sensible clothing, using sun-screen products, and avoiding the sun during the hottest part of the day.

(a) What is ONE scientific idea you would include on your poster?

(b) Where would you display this poster to have the greatest effect? Give ONE reason for your answer.

(c) What is ONE design idea that you would include to ensure that the poster appeals to young people? Explain your answer.

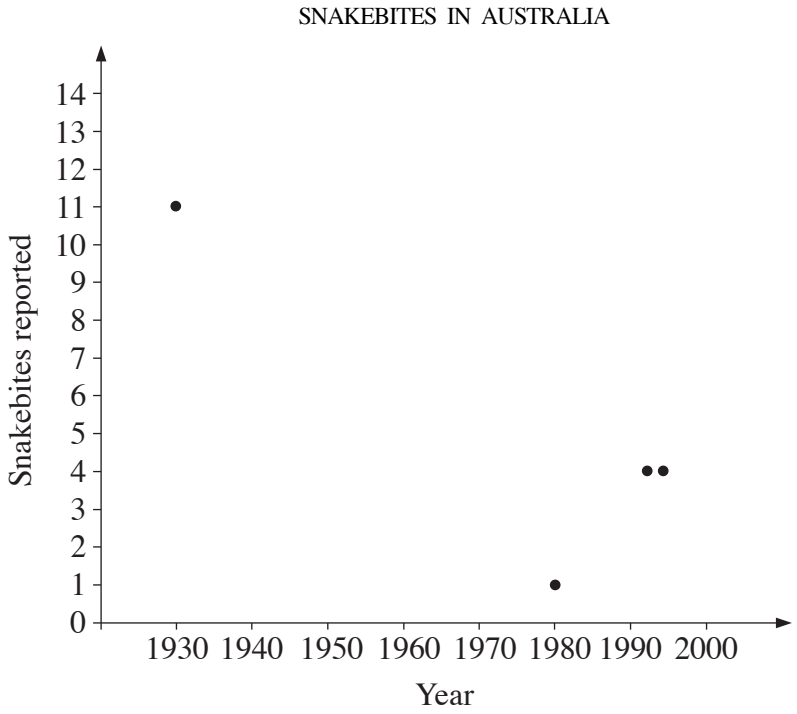
14. When studying Science for Life, you completed a major project. Listed below are some important understandings you developed by doing the major project.

- Science is a search for explanations of the natural world that are open to experimental testing.
- Science, technology, and the applications of science influence, and are influenced by, society.
- Not all problems can be solved by science and technology.

(a) State the title of your major project.

(b) Describe how your project helped you to develop a greater knowledge of ONE of the above understandings.

15. The graph below shows the number of reported snakebites in Australia in 1930, 1980, 1992, and 1994.



Sian Watkins/The Age, January 1996.

(a) Martin estimated that there were 6 snakebites in 1960. A scientist may have doubts about this estimate. Give ONE reason for this.

(b)

SNAKEBITE REPORTS INCREASE IN THE 1990s

Professor Herp attributes a rise in deaths since 1980 to medical students not being taught how to deal with snakebites, hospitals not stocking enough antivenene, poor first aid knowledge among the public, and improved reporting of deaths attributed to snakebites.

From the information above, give ONE reason for the graph showing an increase in the number of snakebites since 1980.

(c) Would you expect the number of reported snakebites in Australia to continue to increase until the year 2000? Explain your answer.

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SECTION II—MODULES

(45 Marks)

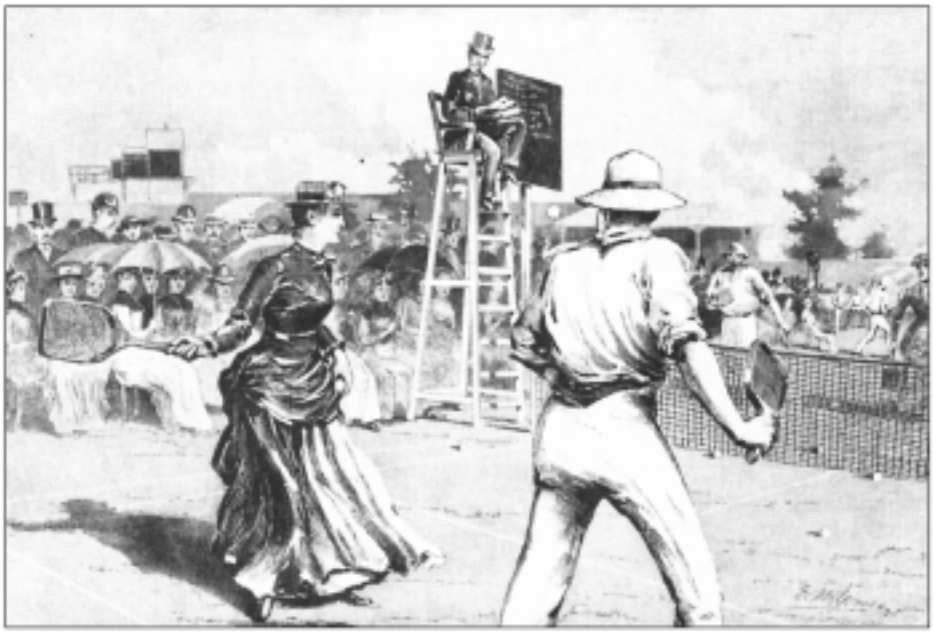
Attempt THREE Modules.

Each Module is worth 15 marks.

Answer each Module in a *separate* Module Answer Book.

QUESTION 16. Fashion and Science **Marks**

(a) **2**



Source: Australian National Library

The above illustration shows the clothing and equipment used by tennis players about 100 years ago. Using sporting equipment, or any other item of fashion you have studied, describe TWO ways science and technology have affected the fashion you have chosen.

(b) A report claims that unisex perfumes have become fashionable. **2**

(i) List TWO survey questions you could use to find out why these perfumes have become fashionable.

(ii) Explain why you would use these TWO questions.

(c) Drink containers have changed a great deal over the years, from bottles, to cans, to cartons. **4**

Using drink containers, or any other fashion item you have studied, answer the following questions.

(i) Name an item which has had a detrimental effect on the environment.

(ii) Give TWO reasons for the changes in this item over the years.

(iii) Describe ONE way in which this item was detrimental to the environment.

(iv) Explain TWO ways in which detrimental effects might be overcome.

QUESTION 16. (Continued) **Marks**

(d) A new student has arrived at your school from overseas and seems confused by some of the fashions and habits at your school. **2**

Choose ONE activity at your school that is popular among students.

(i) Name the activity you have chosen.

(ii) Explain how cultural heritage has influenced this activity.

(iii) Explain why this activity may not be popular in another country.

(e) The use of plastics as materials for the manufacturing industries (for example, clothing, packaging, sporting) has been a feature of the twentieth century. **5**

Below are some figures on the amount of plastic found at a large rubbish dump.

Year	*Amount of plastic* (tonnes)
1900	0
1930	1
1960	10
1990	40
2020	…

(i) Draw a graph of the data given in the above table.

(ii) Predict the amount of plastic rubbish at the dump in the year 2020.

(iii) Explain how you worked out your prediction.

QUESTION 17. Horticulture **Marks**

(a) Particular plant structures are useful and essential to people. For the plants listed, *or* THREE plants you have studied, complete a table like the one below, to show the part of the plant and how it is used. **3**

Name of plant	*Part of plant*	*How used by people*
beetroot	root	food
cotton plant		
eucalypt		
tea tree		

(b) You are considering growing your own tomatoes instead of buying them from the supermarket. **4**

(i) List TWO reasons for growing your own tomatoes.

(ii) You are unsure how to grow your tomatoes (in the ground, in pots, or hydroponically). Design an experiment to test which will be the best method.

(c) Fruit fly is a common problem for fruit growers in the summer months. Two methods of controlling fruit fly are: **4**

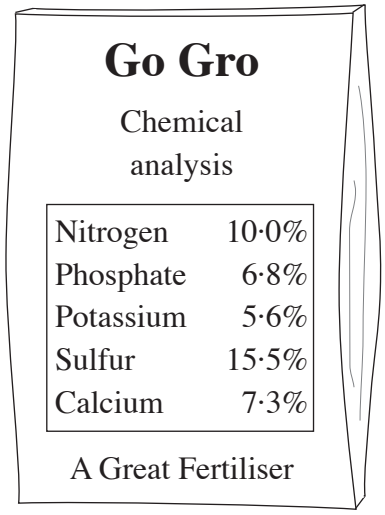
(i) spraying the fruit on the trees with an insecticide;

(ii) placing one trap baited with sugar-water in *each* fruit plant.

Give ONE advantage and ONE disadvantage of each method of controlling the fruit fly. Explain your answers.

QUESTION 17. (Continued) **Marks**

(d) Below is the chemical analysis for 100 g of 'Go Gro' fertiliser. **4**

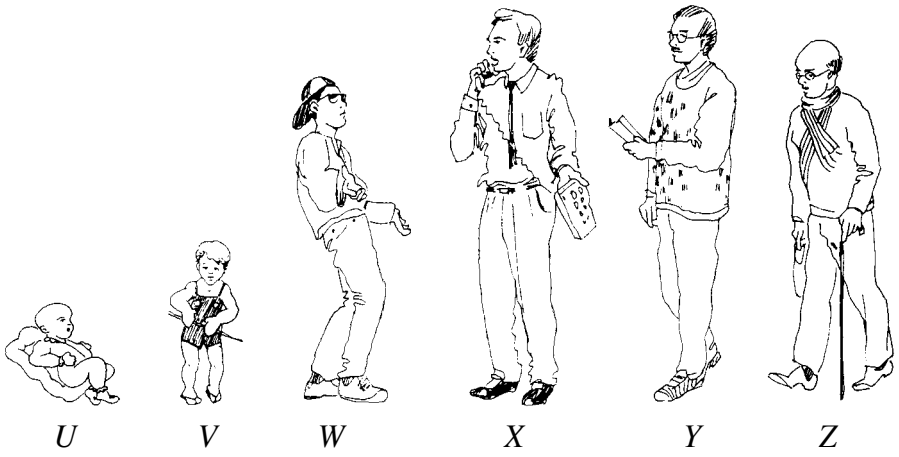


(i) Draw a labelled graph for the composition of this fertiliser.

(ii) A crop of wheat was found to be in need of 3·4 g of additional phosphate per square metre. How many grams of 'Go Gro' would you apply per square metre?

QUESTION 18. The Human Body **Marks**

(a) The diagram below shows a person at six different stages of development. The stages have been labelled *U*, *V*, *W*, *X*, *Y*, and *Z*. **3**



'Managing life', R Riddell, Longman Cheshire 1991, p293.
Courtesy Addison Wesley Longman, www.awl.com.au

(i) Write down TWO stages from the diagram (*U*, *V*, *W*, *X*, *Y*, or *Z*).

(ii) Name these TWO stages.

(iii) Choose TWO features of a male or female person, and describe how these features change as the person develops between these TWO stages.

(b) A recent newspaper article claimed that: **2**

- on average, women live six to ten years longer than men;
- men have higher rates of injury and death at work or during sport;
- men are more likely to drink too much alcohol;
- men are more likely to commit suicide;
- men are less likely to visit a doctor.

Use the information above to:

(i) explain ONE way differences in lifestyles can lead to a difference in physical health between men and women;

(ii) explain ONE way differences in lifestyles can lead to a difference in emotional health between men and women.

(c) The government is concerned that too many people are not immunising their children against diseases such as polio, rubella, and measles. **2**

Dr Ian Jabberee explained: 'Immunisation helps the body to use its own defences to destroy disease-causing organisms'.

Is immunisation a *prevention* or a *cure* for disease? Explain your answer.

QUESTION 18. (Continued) **Marks**

(d) Each year 5750 new cases of prostate cancer are diagnosed in Australian men. This represents a lifetime risk of 1 in 8. A student says: **1**

'There are eight boys in the classroom. Therefore one of us must have prostate cancer right now.'

Do you agree with this statement? Explain your answer.

(e) Humans have an impact on the biosphere now and in the future. **3**

(i) Explain what the term 'biosphere' means.

(ii) Describe TWO ways that people can reduce their impact on the biosphere.

(f) Your best friend is not feeling well and complains: **4**

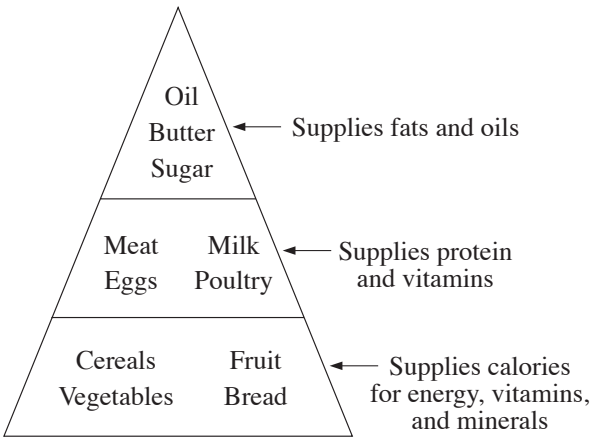
'My hair is dull and brittle and my tongue is swollen. My skin is flaky and my nails keep breaking off. I think I must be eating the wrong foods.'

Use the tables given below to answer the following questions.

Part of body	*Symptoms*	*Probable diet deficiency*
Hair	Lack of shine, dull, brittle	Protein Calories
Skin	Dry flaky, patchy	Protein B vitamins
Nails	Brittle	Protein
Lips	Very red, swollen	Vitamins
Tongue	Sore, purple	Vitamins
Gums	Bleeding	Vitamins Calcium

'Managing life', R Riddell, Longman Cheshire 1991, p51, p143.

THE HEALTHY DIET PYRAMID

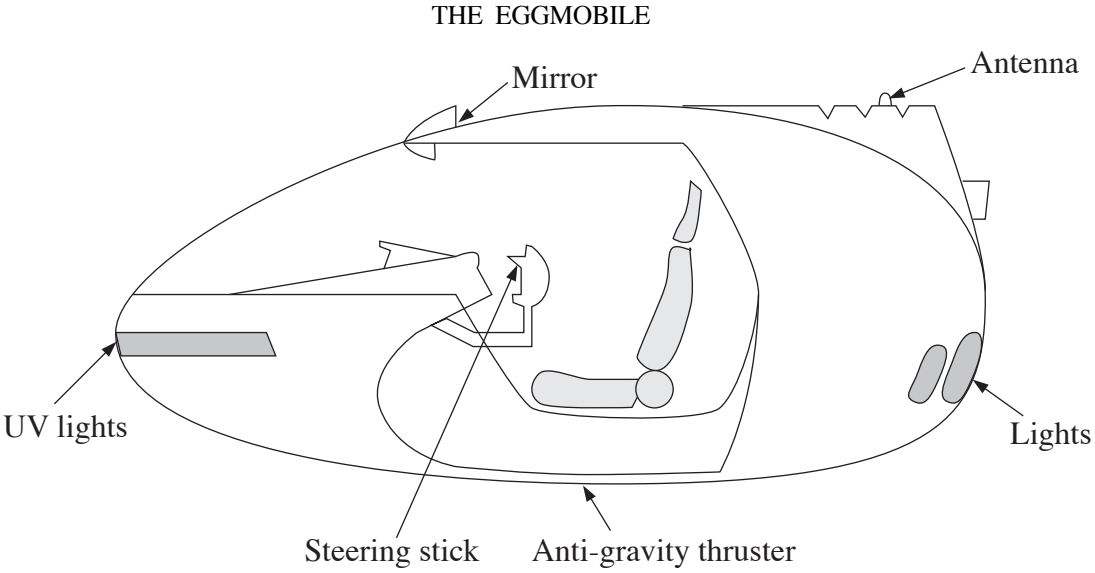


(i) What part of your friend's diet is most likely to be deficient? Explain your answer.

(ii) What advice would you give your friend so that she can improve her diet? Explain your answer.

QUESTION 19. Science Fiction **Marks**

(a) The sketch below is for a spacecraft from a science fiction story. **4**



(i) Write a description of this spacecraft in about FIVE lines.

This sketch of the spacecraft shows some ideas that cannot be validated by current scientific knowledge.

(ii) Name ONE device, from any science fiction you have studied, that is not yet part of everyday life.

(iii) Name the film, book, or comic in which the device was described or used.

(iv) Do you think this device is likely to become part of everyday life in the future? Give ONE reason for your answer.

(b) A researcher finds a living thing that does not look human. It is able to talk and can drive strange machines that hover above ground. **2**

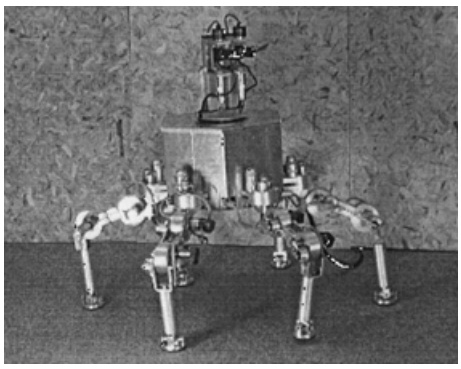
(i) Suggest ONE way in which you could find out whether the living thing is a visitor from space.

(ii) Some humans seem to have a fear of the unknown. How might this fear affect the way in which humans react to the living thing?

QUESTION 19. (Continued) **Marks**

(c) The pictures below show a robot from science fiction and a robot that has been made and works. **5**

DUE TO COPYRIGHT RESTRICTIONS THIS IMAGE COULD NOT BE REPRODUCED.



NASA

(i) From the pictures above, identify TWO ways that the robots are similar, and suggest why they have this similarity.

(ii) The science fiction robot has two legs, whereas the real robot has six legs. Suggest ONE reason for this difference.

(iii) Many researchers who work in robotics are trying to build a robot that can walk on two legs. Suggest ONE reason why these researchers are trying to build a two-legged robot.

(iv) 1. Name ONE device or idea that came from science fiction, *other than robots*, that is *now* part of everyday life.

2. How has this device or idea influenced people's lives?

(d) In a science fiction novel, a character, Mr Beegood, is zapped with ACME grow waves by the evil genius Dr Boyland. Dr Boyland's plan is for Mr Beegood to grow and grow until his head goes up high into the atmosphere where there is little oxygen and he will die a slow death. The grow waves cause Mr Beegood to double in height every thirty minutes. Mr Beegood was two metres tall when he was zapped. **4**

(i) Draw a labelled graph to show how Mr Beegood grows over the first two-and-a-half hours after being zapped.

(ii) Give ONE reason why Mr Beegood is unlikely to double in size every thirty minutes.

QUESTION 20. Science of Toys **Marks**

(a) You have been asked to choose a toy that is suitable for the five to seven years age group. **4**

(i) Name and briefly describe your toy.

(ii) Choose TWO features of your toy.

Copy and complete the table.

Feature of toy	*Describe how it:*
	1. *assists mental development*
	2. *assists physical development*

(iii) What is ONE safety feature that you would need to consider when choosing a toy for the five to seven years age group? Explain your answer.

(b) Parents can promote certain values through the toys they choose for their children. **2**

'If you want to break down sex role stereotypes, give your daughter some typically *boy* toys, and your son some typically *girl* toys', said an expert in child development.

Do you agree with this expert's statement? Give TWO reasons to support your decision.

(c) A toy available for sale recently is described below. **5**

'Secret Diary: electronic personal organiser with a telephone directory, calendar, calculator, diary, and clock that tells the time anywhere in the world.'

The parents who chose the toy felt it was a good way to introduce children to some of the technology that will affect their lives.

(i) What do you think makes a good toy?

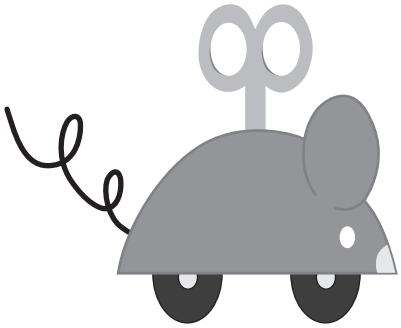
(ii) Is the Secret Diary a good toy? Explain your answer.

(iii) Toys like the Secret Diary were not available 50 years ago. People only used a paper diary with a key and lock. Use a toy *other than* diaries to describe how toys have changed in the last fifty years.

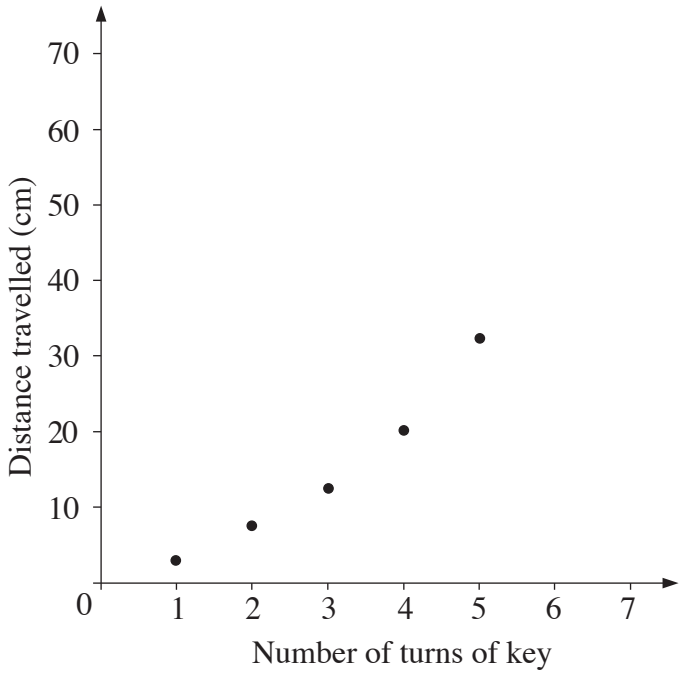
(iv) Explain how TWO branches of science have been used to improve the toy you described in part (c) (iii).

QUESTION 20. (Continued) **Marks**

(d) Alec was playing with a wind-up toy. Alec measured the distance the toy travelled when wound up by a different number of turns of the key (for example, one turn, two turns, . . .). **4**



The graph below shows the results of this activity.



(i) Make a table in your Answer Book to show the information in the graph.

(ii) Describe how the number of turns affects the distance the toy travels.

(iii) Predict how far the toy will travel if Alec winds the key seven times.

QUESTION 21. Sport Science **Marks**

(a) 'At least half of the 9000 athletes who competed at the 1988 Olympics in Seoul, Korea, used anabolic steroids in training', say medical and legal experts. **2**

DUE TO COPYRIGHT RESTRICTIONS THIS IMAGE COULD NOT BE REPRODUCED.

Drugs such as anabolic steroids can enhance the physical fitness of athletes. Describe TWO harmful consequences for Peter's health if he started to take performance-enhancing drugs.

(b) (i) Name a sport you have studied. **2**

(ii) Describe ONE way in which the fitness level of an athlete in this sport can be improved.

(iii) Is there a preferred age range for athletes in this sport? Explain your answer.

(c) The table below shows the vertical jump scores for boys and girls in four sports. **5**

Sportsperson	*Sex*	*Vertical jump* (cm)
Basketballer	M F	60 55
Sprint cyclist	M F	75 55
Jockey	M F	40 35
Soccer player	M F	49 39
Volleyball player	M F	65 53

(i) From the data in the above table, draw a labelled graph so that the vertical jump scores of boys and girls can be more easily compared.

(ii) What is ONE trend you can infer from the data?

(iii) Suggest ONE explanation for this trend that is suggested by the data.

QUESTION 21. (Continued) **Marks**

(d) 'There is no such thing as a perfect body shape for a marathon runner', says Professor Morph. **3**

(i) Name a sport.

(ii) Is there a perfect body shape for this sport? Give ONE reason for your answer.

(iii) List TWO factors other than body shape that should be considered in choosing to take up the sport you have named.

(iv) Give ONE reason for considering *each* of these factors.

(e) Students were given an activity to investigate the influence of a physics principle on body movement and position in sports, as shown below. **3**

Activity	*Spin speed*
Investigating the effect of limb position on spin.	Sit on a swivel chair with your legs and arms outstretched. Get someone to spin you slowly, and then quickly pull in your arms and legs.

(i) Describe ONE way that this experimental design can be improved.

(ii) Name ONE sport that you have studied.

(iii) Briefly describe how ONE physics principle can be applied to this sport.

(iv) Describe how the application of this physics principle can improve the skill of an athlete.

QUESTION 22. Disasters **Marks**

(a) **3**

> GRANVILLE DISASTER REMEMBERED
>
> Twenty years have passed since a train crashed at Granville, killing 83 passengers and injuring 213 others.
>
> On 18 January 1997 a memorial wall of granite was unveiled. It is to serve as a lasting memorial to each of those who lost their lives that bright sunny morning 20 years ago.

(i) This disaster happened over twenty years ago. Do you think that the building of this memorial will help those who survived the disaster? Explain your answer.

(ii) What are TWO other ways that people coping with a disaster can be helped?

(b) (i) Disasters may result from failure of people, failure of technology, and failure of materials. **4**

Use examples to explain how *each* of the above can contribute to disasters.

(ii) For ONE of the disasters in part (b) (i):

1. name the disaster;

2. state how the disaster could have been prevented.

(c) Below is a table outlining some major volcanic eruptions of the 1900s and the estimated casualties for each eruption. **4**

Volcano	*Country*	*Year*	*Estimated casualties*
Pelee	West Indies	1902	36 000
Kelut	Indonesia	1919	5 000
Lamington	Papua New Guinea	1951	3 000
Agung	Indonesia	1963	3 800
Nevado del Ruiz	Columbia	1985	22 000

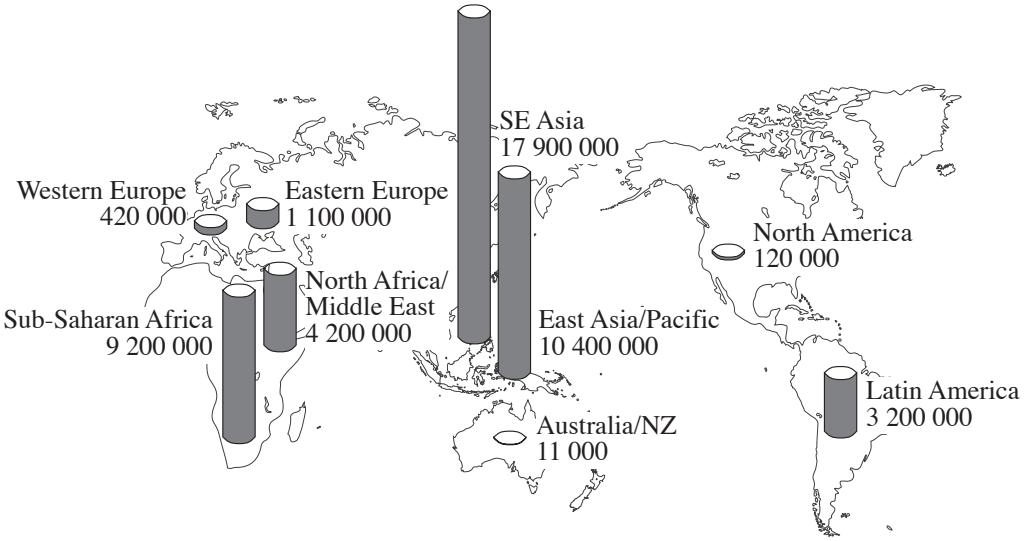
'Volcanoes', GB Lewis, Aust. Geological Survey Organisation 1995

(i) Draw a labelled graph to show the year that each eruption occurred and the estimated casualties for each eruption.

(ii) Give ONE reason for the differences in casualties for volcanic eruptions.

QUESTION 22. (Continued) **Marks**

(d) **4**



Here are some facts about tuberculosis (TB).

- TB has been present in humans for the last 20 000–30 000 years.
- 33% of the world's population is infected with the bacterium that causes TB.
- Almost 3 million people died of TB in 1995.
- TB spreads rapidly in overcrowded, poorly housed populations.
- One person with TB on average infects 10–15 people per year.
- Drugs are less able to kill the TB bacteria than before.

'It is in the best interests of wealthy countries such as Australia to help less-developed countries fight tuberculosis before your own countries become the battlefield', says a doctor from the World Health Organisation.

(i) For tuberculosis or any natural disaster you have studied:

1. Name the disaster;

2. Describe how Australia could help reduce the effects of the disaster.

(ii) Tuberculosis is much more of a problem in less-developed countries than in Europe, Australia, or North America. Suggest TWO reasons why the disease has spread more rapidly in some countries than in others.

QUESTION 23. Managing Natural Resources **Marks**

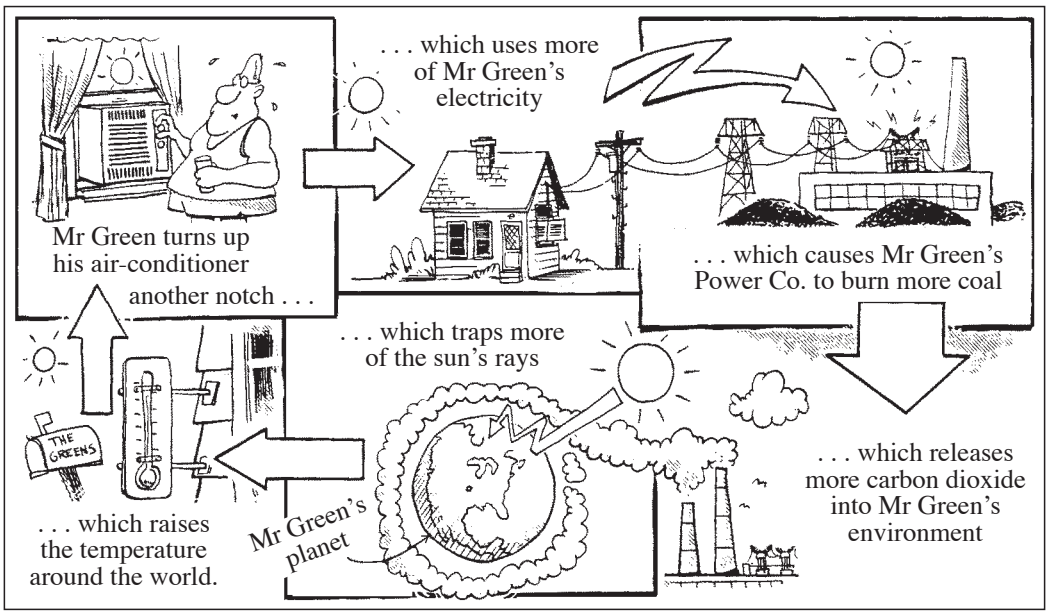
(a) Choose ONE natural resource you have studied that is not equally accessible to all people. **3**

(i) Name the resource.

(ii) Describe the effect on people of *not* having this resource.

(iii) What is ONE way that this resource could be made more accessible to *all* people?

(b) The cartoon suggests that Mr Green's actions have an impact on the greenhouse effect. **4**



'The 'Green' house effect explained', Joe Heller, Green Bay Press-Gazette

(i) Mr Green turns up his air-conditioner. How does this contribute to the greenhouse effect?

(ii) Do you agree that the actions of ONE person can make a difference to the use of resources? Give ONE reason to support your answer.

(iii) What is ONE way Mr Green can keep cool without using his air-conditioner?

(iv) Give ONE example of a renewable resource that we can use instead of coal.

QUESTION 23. (Continued) **Marks**

(c) The amount of water needed to produce 500 g of a variety of foods is shown in the table. **6**

Food	*Litres of water needed to produce 500 g of food*
Beef	50 000
Chicken	1700
Rice	1000
Wine	550

Food	*Litres of water needed to produce 500 g of food*
Wheat	500
Alfalfa	450
Carrots	350
Potatoes	250

If the population of the world continues to grow, people will use 70 per cent of accessible fresh water by 2025.

(i) Use the information in the table to suggest ONE way you could change your eating habits to save water. Explain your answer.

A typical Australian meal of chicken stir-fry would contain chicken, rice, alfalfa, carrots, and wine.

(ii) Draw a graph showing the number of litres of water used to produce 500 g of each of the foods in the meal.

(d) Scientific data about kangaroos are listed below: **2**

- Kangaroos are harvested for food and leather.
- Kangaroo numbers have increased as people have provided more water from dams and bores, and killed dingoes that eat kangaroos.
- Harvesting of kangaroos can reduce their numbers.
- Kangaroo meat is very low in fat and free from harmful chemicals.

Some students gave their opinion on the harvesting of kangaroos:

JAN I reckon it's okay—the kangaroo can survive with little food or water and the padded foot causes less erosion—as long as they're never endangered and are killed painlessly.

DOUG They are beautiful, wild animals. How can we kill and eat a national symbol that is on our coins and our coat of arms? The population of kangaroos should be left alone to find its own natural balance.

(i) Which of these students' arguments do you think is best supported by scientific data? Explain your answer.

(ii) Do you think that decisions about resource management should be based only on scientific data? Explain your answer.

QUESTION 24. Marine or River Studies **Marks**

(a) **1**

> REDUCTION IN TUNA QUOTA CALL REJECTED
>
> The Federal Government has rejected a call from conservation groups to reduce trade in Southern Bluefin Tuna, a species international bodies regard as critically endangered.
>
> Australia, New Zealand, and Japan annually set the global quota with the support of the Commission for Conservation of Southern Bluefin Tuna established in 1994 to regulate the amount of Bluefin Tuna caught annually.
>
> Daily Telegraph January 1997

People use the ocean as a resource for food.

What is ONE consequence of Bluefin Tuna fishing?

(b) In the Murrumbidgee Irrigation Area, river water is used to irrigate grape vines. There are a number of ways in which the grape vines can be irrigated such as: **4**

Drip irrigation	Where a water pipe is strung along the grape vine line and drippers are placed in the pipe to deliver slowly an exact amount of water to each plant.
Flood irrigation	Where water is pumped from canals into the vineyard and flows along shallow ditches next to each row of grape vines.

In both cases, water is a resource for food production.

(i) State ONE advantage of drip irrigation compared with flood irrigation.

(ii) Some farmers prefer one method of irrigation over the other. Design an investigation that seeks to find out why farmers prefer one method of irrigation.

(c) Living things are made mainly of water. **3**

(i) Give ONE reason why access to clean fresh water is important to:

1. plants;

2. animals.

(ii) 1. Name ONE water-based waste.

2. State ONE problem that disposing of this waste has on other living things.

QUESTION 24. (Continued) **Marks**

(d) (i) State ONE recreational activity that uses water. **2**

(ii) Describe ONE effect on this recreational activity if the water becomes dangerously polluted.

(iii) Is pure water needed for this recreational activity? Give ONE reason for your answer.

(e) For the past five years, local students in South Australia have been surveying rubbish washed up on the beach of Anxious Bay. **5**

The survey is along 26 kilometres of coastline.

Year	*Total amount of rubbish* (kg)	*Amount of rubbish per kilometre* (kg/km)
1992	390	15
1995	150	5·7
1996	180	?

(i) Calculate the amount of rubbish per kilometre collected in 1996.

(ii) Draw a graph showing the amount of rubbish per kilometre collected in 1992, 1995, and 1996.

(iii) Since 1990, international shipping regulations have made dumping of rubbish at sea illegal.

Have these regulations been successful? Explain your answer.

QUESTION 25. Biotechnology **Marks**

(a) A scientist claimed that eelgrass appears to inhibit the growth of algae in sea water. **3**

(i) What evidence is there in the photograph below to support the scientist's claim?

(ii) A problem for boat owners is that the hulls of their boats become covered with algae. This is called fouling. A scientist has suggested that chemical extracts from eelgrass can prevent fouling. TWO ways are proposed to test this suggestion.

Investigation 1. Conduct a carefully controlled experiment in the laboratory using chemical extracts from eelgrass.

Investigation 2. Conduct a long-term experiment using chemical extracts from eelgrass that are painted on the hulls of boats.

State ONE advantage of each type of investigation.

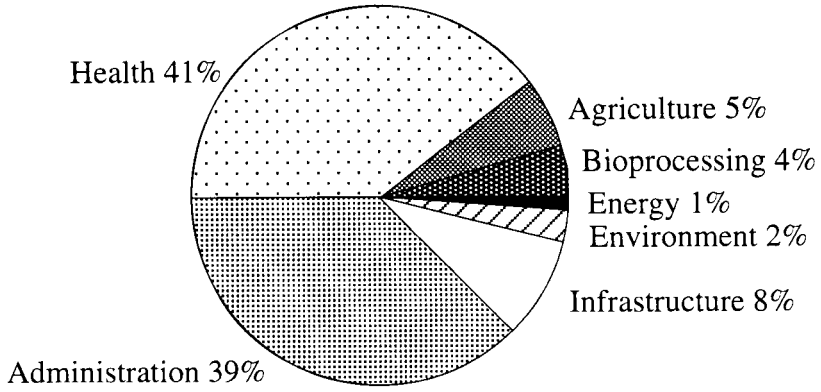
(b) Use an example of biotechnology to show how it can: **2**

(i) control a biological system;

(ii) repair a biological system.

QUESTION 25. (Continued) **Marks**

(c) In the USA in 1994, $5000 million was spent in biotechnology research. The pie chart below shows the percentage of money spent on five types of research in biotechnology, as well as on infrastructure and administration. **5**



'Biotechnology for the 21st c: New Horizons', US Office of Science and Technology Policy

(i) From the pie chart, what percentage of the total budget was spent on the five types of biotechnology research?

(ii) Construct a labelled bar graph showing the amount of money spent on the five types of biotechnology research.

(iii) What is ONE advantage of presenting this information as a pie chart, rather than as a bar graph?

(d) **5**

Dr Boot noted the influence of biotechnology on humans by pointing out that, from 3000 BC to AD 1770 the life expectancy of humans increased by only 15 years. Since AD 1770, humans' life expectancy has increased by 40 years.

(i) According to Dr Boot, over what period was there the greater increase in human life expectancy?

(ii) 1. Do you think biotechnology has contributed to this increase in life expectancy?

2. Explain your answer.

(iii) Biotechnology, like all fields of research, requires consideration of ethical issues.

1. Suggest ONE ethical issue that researchers need to consider when using biotechnology to increase human life expectancy.

2. Name ONE biotechnology you have studied. Describe ONE ethical issue linked with this biotechnology.

(iv) Briefly describe ONE way in which biotechnology has been applied to *EITHER* plants *OR* animals.

QUESTION 26. Communications **Marks**

(a) In video conferencing, both visual and verbal messages are transmitted over a telephone line. **2**

(i) Name ONE other form of communication you have studied.

(ii) Use a table to show ONE similarity and ONE difference between video conferencing and your other form of communication.

(b) **5**

BEATING THE BUNNY BUGS

Hold still, Bunny, this could save your life!

The Huang family, alarmed by a newspaper report on the death of a pet rabbit from the *calici* virus last week, have had their pet bunny vaccinated against the disease.

A veterinarian said that although rabbit breeders had rushed to get their rabbits immunised as soon as they became aware of the introduced virus, pet owners had been slower to do so.

'We've had the rabbit for around three months now and we recently decided to get him both desexed and vaccinated', said Givie Huang.

Sun Herald January 1997

(i) What form of communication would you use to warn pet owners about the *calici* virus?

(ii) Explain why this is an effective method of communication.

(iii) Describe how you would conduct an investigation to find out how effective your communication method has been.

(c) (i) Name ONE form of communication. **5**

(ii) For this form of communication, state how each of the following is done.

1. Coding
2. Sending
3. Receiving
4. Decoding
5. Minimising noise

QUESTION 26. (Continued) **Marks**

(d) **3**

USELESS

The Helix no 35 Apr/May 1994. The Helix is CSIRO's magazine for science students.

COMMUNICATION AND CULTURE

A computer is just one example of technology that can be very useful if it's used in the right place at the right time. But how much use would a computer be to a nomadic Masai tribeswoman in east Africa?

In fact, some scientists believe a computer might be worse than useless to such a person. It might actually be bad for them. A computer is not just a gadget, it is also a piece of western culture. To make use of it the Masai tribeswoman might have to change her entire traditional culture.

She might have to give up roaming and settle down in a permanent house. She might have to find a way of earning cash to pay for the computer, and for the electricity, maintenance, and software. She might have to give up a lifestyle in which she can cater for all her own needs, and instead become part of the worldwide trading culture.

The Helix no 35 Apr/May 1994. The Helix is CSIRO's magazine for science students.

(i) What is the main message conveyed by the photograph above? Explain your answer.

(ii) Do you think it is appropriate to encourage the use of modern communication equipment in regions like east Africa? Give TWO reasons for your answer.

QUESTION 27. Consumer Science **Marks**

(a) Many advertisements for toothpastes and toothbrushes feature dentists or glamorous models. **4**

(i) Give TWO advantages of having a dentist in an advertisement for toothpaste and toothbrushes. Explain your answer.

(ii) Give TWO advantages of having models in an advertisement for toothpaste and toothbrushes. Explain your answer.

(b) There is a lot of competition between different producers of cola soft drinks. **2**

A group of students investigated whether consumers' choices are based on taste. Here is the outline of their investigation.

- They supplied a number of different brands of cola.
- The drink was in the original can or bottle.
- The students first asked the people doing the taste test if they were regular cola drinkers.
- The survey was done in one shopping centre for one week.

(i) What is ONE good feature of their research method? Explain your answer.

(ii) What is ONE weakness in their research method? Explain your answer.

(c) Below is a table of information relating to various types of electric lamps. **4**

Lamp	*Light output* (unit)	*Useful life* (hours)	*Cost in* (cents/hour)
10-watt fluorescent	41	5000	0·2
40-watt incandescent	10	1000	0·5
50-watt mercury	33	8000	0·6

'Issues in Science', Evans & McCann, Heinemann 1993, p71. Courtesy Reed Education.

(i) Draw a graph of the cost in cents per hour for these lamps.

(ii) How much does it cost to run a 40-watt incandescent lamp for 10 hours?

QUESTION 27. (Continued) **Marks**

(d) Technology used for the production or delivery of goods and services often has detrimental environmental consequences. Choose ONE product or service you have studied. **3**

(i) Name the product or service.

(ii) State TWO detrimental environmental consequences of making or using this product or service.

(iii) Suggest ONE alternative product or service that will have less detrimental effect on the environment.

(e) **2**

Split Personality car

Meet the Owdi O4 Duo, a car with two power sources, one for city use and one for the open road.

There's a 21 kW electric motor to power the rear wheels for clean, zero-emission driving around the city, and a 1·9 litre diesel engine to drive the front wheels when more power is needed. On the open road, the Duo switches to the diesel engine (that can also run on modified canola oil) giving the car a top speed of 170 km/h and the amazing economy of 4·1 litres per 100 km at a steady 90 km/h.

The Helix no 35 April/May 1994. The Helix is CSIRO's magazine for science students.

(i) What is ONE technological advance of the Owdi O4 Duo over existing motor cars?

(ii) Give ONE advantage to the consumer of this technological advance.

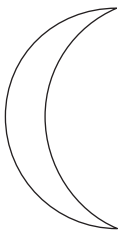
QUESTION 28. Space Science **Marks**

(a) During the 1980s, there was much excitement about launching space vehicles from northern Australia, especially the Cape York Peninsula spaceport. **2**

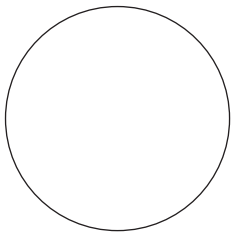
(i) Suggest ONE reason why Australia is a good place to launch space vehicles.

(ii) The development of these space-launching facilities has not occurred in Australia. Suggest ONE reason *other than cost* for this.

(b) The table below shows the degree to which Mercury shows a crescent at different times of the year. A full disc is 100 per cent. **5**



CRESCENT



FULL DISC

Date	*% crescent for Mercury*
1 May	17
31 May	18
15 June	47
30 June	85

(i) Use a labelled graph with a title to show these data.

(ii) Draw a diagram of Mercury as you would see it on 15 June.

QUESTION 28. (Continued) **Marks**

(c) **3**

WHAT DID THE MOON MISSIONS DO FOR PEOPLE ON EARTH?

Aside from the tremendous cultural changes brought about by viewing the Earth from space, there have been thousands of spin-offs from the Moon missions. A few of them are listed below.

Cordless tools such as drills and hand-held vacuum cleaners were derived from implements developed for the astronauts to use while collecting material on the Moon.

The lunar roving vehicle used a unistick controller. Now this type of controller gives increased mobility to severely handicapped people, allowing them to accelerate, brake, and steer a vehicle with one hand.

A spray-on coating for steel was developed from spacecraft heat shields that brought the astronauts safely through temperatures as high as 2500°C.

Courtesy Colin Burgess. Sky & Space June 1996, vol 9 no 1 issue 36 p57.

(i) Name ONE spin-off from space exploration NOT listed above.

(ii) Describe how this is used in everyday life.

(iii) The spray-on coating helped to solve a problem of space travel.

1. Name ONE other space travel problem.

2. Explain how science has solved this problem.

(d) **5**

THE GLOBAL POSITIONING SYSTEM (GPS)

After World War II, ground-based radio navigation systems were set up. These systems allowed accurate navigation over long distances but the radio waves were blocked by mountains, and they would not 'bend' over the horizon to follow the curvature of the Earth. The most common system in use today is GPS satellites. These satellites broadcast signals that can be picked up by small receivers on the ground, in the air, or at sea. Using the distance to at least three satellites, the receiver can provide an accurate position 'fix'.

Sky & Space June 1996, vol 9 no 1 issue 36 p29

(i) What is ONE difficulty experienced in the use of ground-based radio systems?

(ii) Why is GPS a better system than ground-based systems?

(iii) What is ONE way satellites have increased our knowledge of the Earth?

(iv) A journalist suggests that satellites are dangerous to humans because they might 'fall out of the sky'. You decide to find out how many people in Australia agree with this view.

Why would you survey 4000 randomly selected Australians, rather than every person in New South Wales?

(v) GPS satellites are placed in orbit by the robotic arm of the space shuttle. What is the main advantage of using the space shuttle, rather than conventional rockets, for example Saturn V rockets?

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