BOARD OF STUDIES
NEW SOUTH WALES

1998 SCHOOL CERTIFICATE EXTERNAL TEST–Trial

16 November
Start 12.50 pm

SCIENCE

SECTION 1

QUESTION BOOKLET

General Test Instructions

- Reading time: 10 minutes
- Working time: $1\frac{1}{2}$ hours
- The supervisor will tell you when to begin the test
- This test has TWO sections
- Calculators may be used

Directions for Section 1

1 You should allow about 45 minutes to answer Section 1

2 Section 1: Questions 1–25 (25 marks)

3 Attempt ALL questions in Section 1

4 Calculators may be used in Section 1

5 Complete your answers to Section 1 on the separate Answer Sheet

Instructions for answering questions in Section 1.

- Complete your answers in either blue or black pen, or in pencil.
- **Multiple choice**
  Select the alternative that best answers the question. Fill in the response circle completely.

  Sample 1: 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

  A ○ B ● C ○ D ○

  If you think that you have made a mistake, put a cross through the incorrect answer and fill in the new answer. If you are using pencil you may rub out the incorrect answer and fill in the new answer.

  A ● B ⊗ C ○ D ○

  If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word ***correct*** and drawing an arrow as follows:

  correct ↓

  A ⊗ B ⊗ C ○ D ○

- **Completing the boxes**
  Write firmly and clearly. Your answer must be written from left to right. Use block letters for words. Numbers must be used for numerical answers. Decimal points and negative signs must be clearly shown in separate boxes. Do NOT let any part of the letter or number touch the sides of the answer boxes.

  Sample 2: –7 ÷ 2 = | – | 3 | . | 5 | | |

  Sample 3: How many days are in a week? | 7 | | days

  Sample 4: What is the fifth month? | M | A | Y | | | |

  If you think that you have made a mistake, put a line through the incorrect answer and write the correct one above the box. If you are using pencil you may rub out the incorrect answer and write in the correct answer.

  M A Y

  | ~~J~~ | ~~U~~ | ~~N~~ | ~~E~~ | | |

1. Earthquakes produce seismic waves. Seismic waves transmit

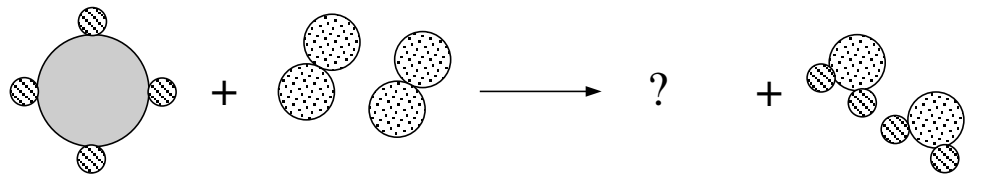
(A) energy.

(B) light.

(C) matter.

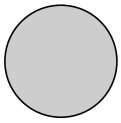
(D) sound.

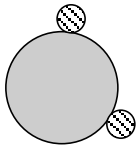
2. This diagram shows methane and oxygen undergoing a chemical change.

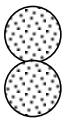


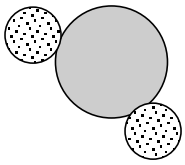
Methane gas Oxygen Chemical *X* Water

Which of the following represents Chemical *X*?

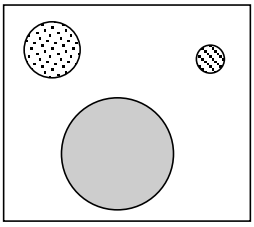
(A) 

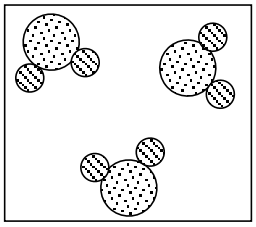
(B) 

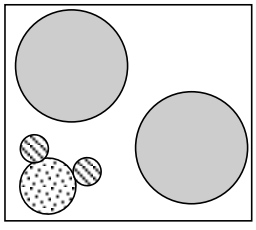
(C) 

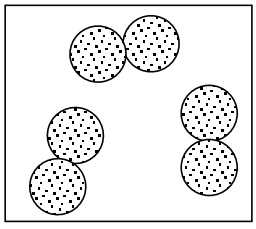
(D) 

3. Which diagram below represents a mixture of two substances?

(A) 

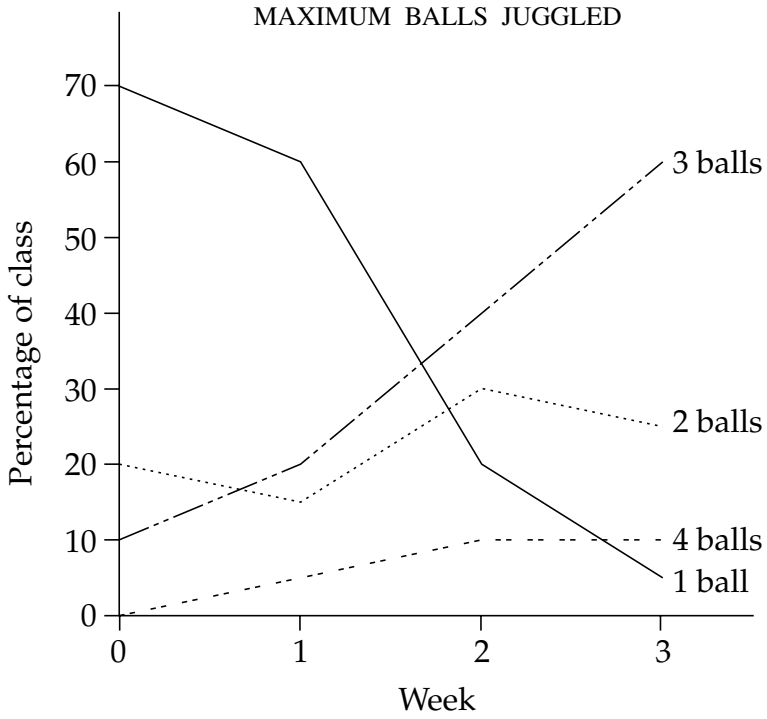
(B) 

(C) 

(D) 

Use the following information to answer Questions 4 and 5.

A science class investigated how people learn new skills. They decided to learn to juggle four tennis balls. Each week they recorded the maximum number of balls each student could juggle. The results are shown in the graph below.



4. At the start of their investigation, the percentage of the class that could juggle more than one ball was

(A) 10%

(B) 20%

(C) 30%

(D) 70%

5. From the results, which statement is most justified?

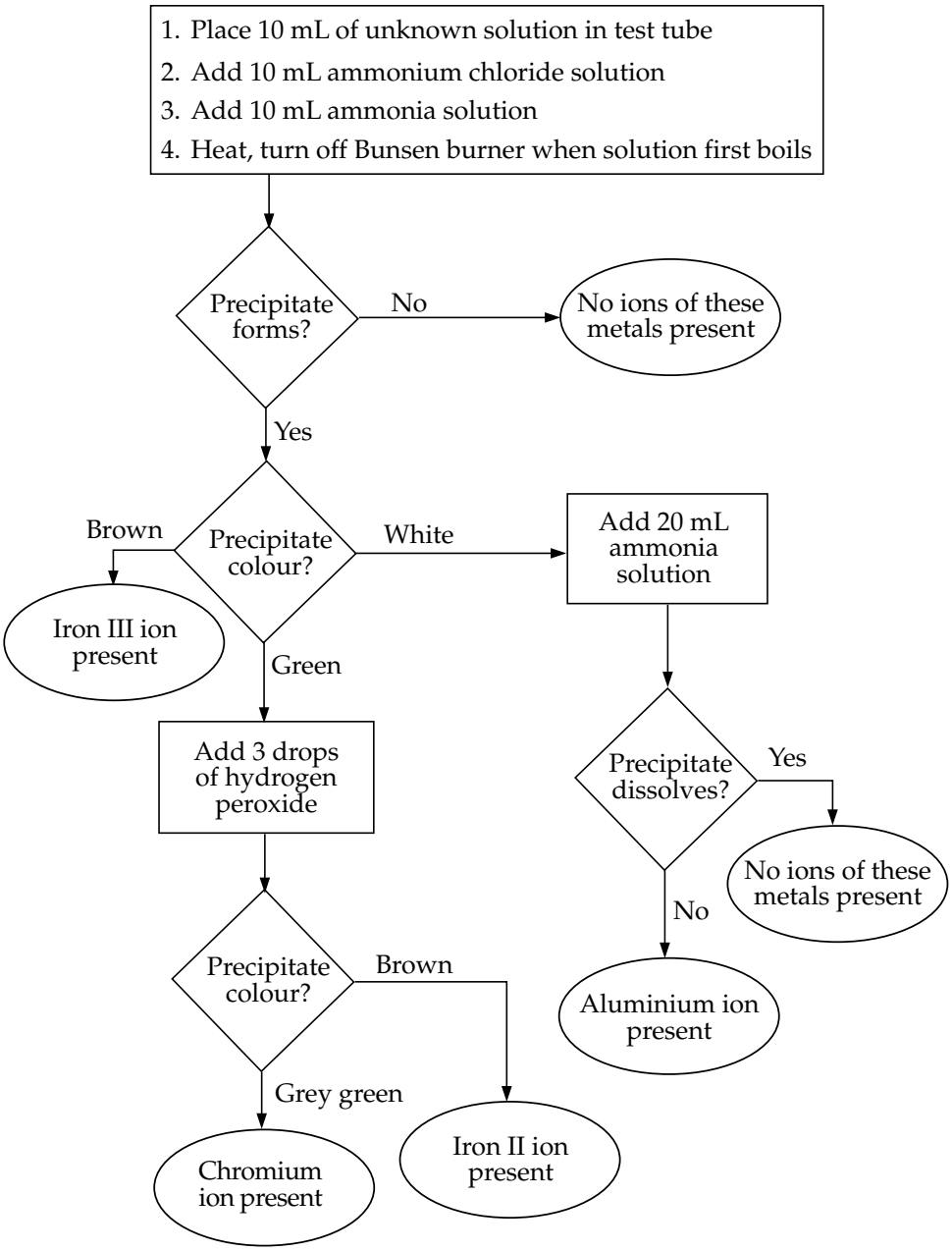
(A) Most students learnt to juggle more balls.

(B) With practice, all students will learn to juggle four balls.

(C) To juggle four balls, you must first learn how to juggle three balls.

(D) Those who practised most learnt how to juggle four balls.

6. The flowchart shows one way an unknown solution can be tested to see if it contains ions of aluminium, chromium or iron.



10 mL of ammonium chloride and 10 mL of ammonia solution were added to an unknown solution and it was heated in a test tube until it boiled. A precipitate (solid) formed which was greenish in colour. This changed to brown after three drops of hydrogen peroxide were added to the test tube.

Which ion was present in the unknown solution?

(A) Aluminium ion

(B) Chromium ion

(C) Iron II ion

(D) Iron III ion

Use the following information to answer Questions 7 and 8.

Bacteria in Our Mouths

Many types of bacteria exist in small numbers in our mouths. When teeth are not brushed in the morning, bacteria called *S. mitis* will cover the teeth by that evening. If teeth are not brushed for one day, rod-shaped bacteria called *F. nucleatum* will appear and attach to *S. mitis*. The population of *F. nucleatum* reaches a maximum after five days of no brushing. *F. nucleatum* produce chemicals containing sulfur, which is one cause of bad breath.

P. gingivalis multiply and attach to the surface of the *F. nucleatum* bacteria. After one week of no brushing, a large population of *P. gingivalis* will have grown. After two weeks of no brushing, *T. denticola* will be observed in large numbers and they attach themselves to *F. nucleatum* and *P. gingivalis*. If no brushing occurs for three weeks, then bacterial cells will be 20 deep. This layer may be as thick as 0.1 mm, which is visible to the naked eye.

7. According to this information, which bacteria are *directly* responsible for bad breath?

(A) *S. mitis*

(B) *F. nucleatum*

(C) *P. gingivalis*

(D) *S. mitis* and *F. nucleatum*

8. To maintain clean teeth by using an antibacterial mouthwash alone, the mouthwash needs to be able to kill at least

(A) *S. mitis.*

(B) *F. nucleatum.*

(C) *F. nucleatum* and *P. gingivalis.*

(D) *S. mitis*, *F. nucleatum* and *P. gingivalis.*

9. When rods made from ebonite, glass and perspex are rubbed with different materials they become charged. There are two types of charge, positive and negative. These charges interact as shown in the table below.

	Positive	*Negative*
Positive	repel	attract
Negative	attract	repel

Students investigating the interactions between charged ebonite, glass and perspex rods recorded their results in the table below.

	Glass rod	*Ebonite rod*	*Perspex rod*
Glass rod	repel		
Ebonite rod		repel	attract
Perspex rod	repel		repel

The students are told the glass rod has a positive charge. They can deduce that the ebonite rod has a

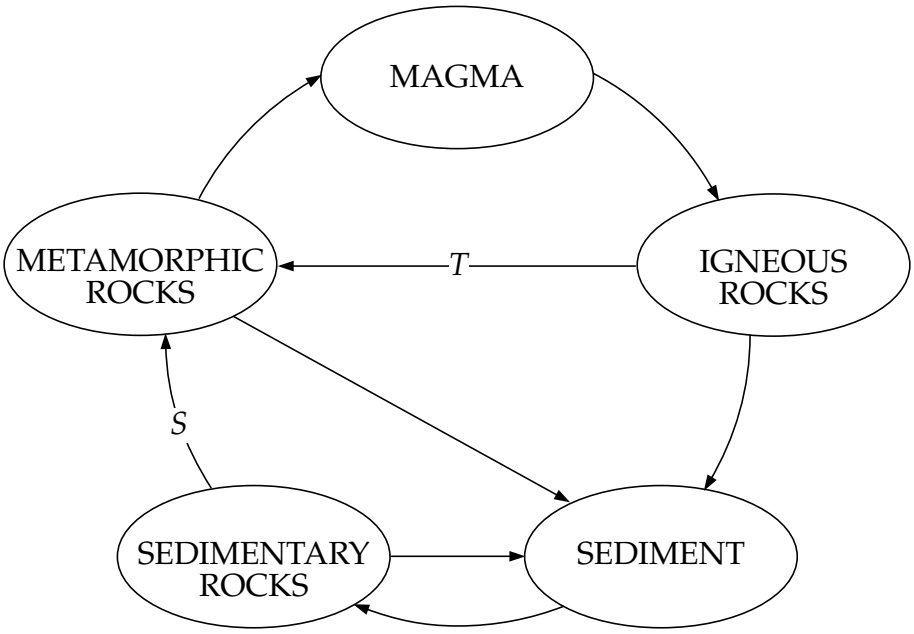
(A) positive charge and will repel the glass rod.

(B) positive charge and will attract the glass rod.

(C) negative charge and will repel the glass rod.

(D) negative charge and will attract the glass rod.

10. This diagram shows a simplified rock cycle.



Processes *S* and *T* may occur as a result of high temperatures and

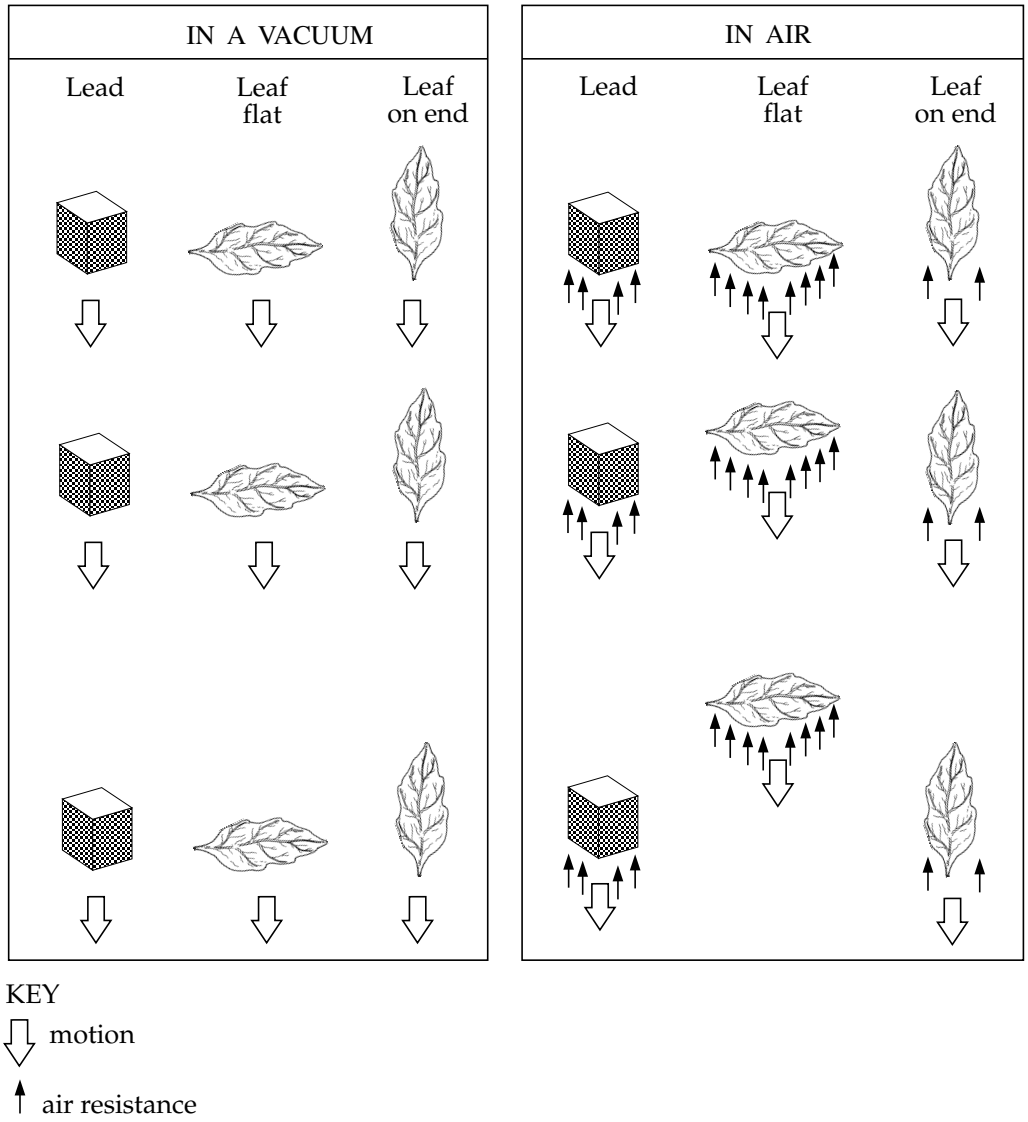
(A) deposition.

(B) erosion.

(C) pressure.

(D) solidification.

11. A piece of lead and two identical leaves were dropped in a vacuum. The same piece of lead and leaves were then dropped from the same height in air. The diagrams below show one student's drawings of the results of the experiment.



Using this student's drawings, what hypothesis do the results of this experiment support?

(A) Heavy objects fall faster in a vacuum than in air.

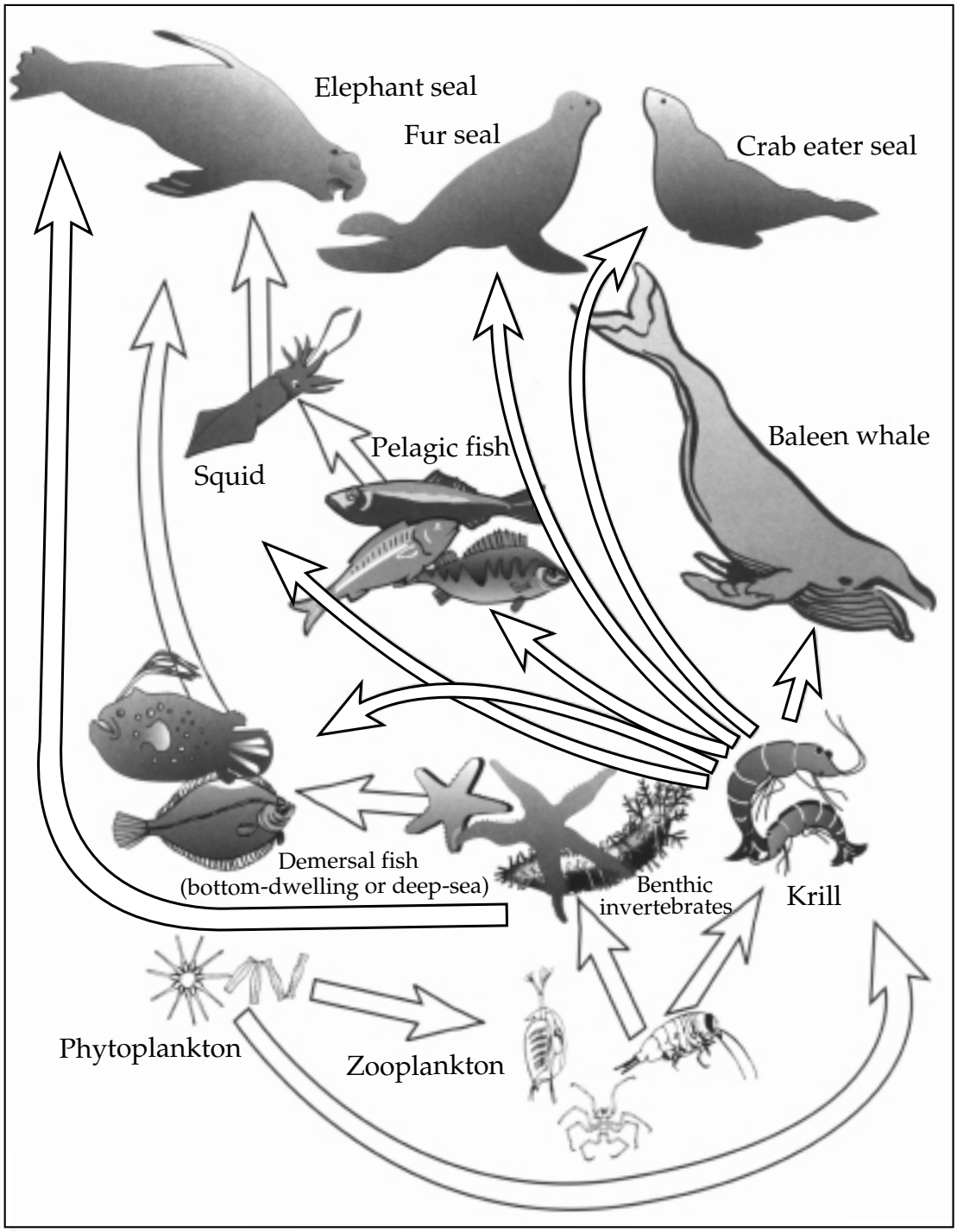
(B) The shape of the object affects how quickly it falls.

(C) Greater surface area slows the rate of fall of an object.

(D) Increased air resistance slows the rate of fall of an object.

Use the following information to answer Questions 12 and 13.

ANTARCTIC FOOD WEB



12. An increased population of baleen whales will most likely cause the number of pelagic fish to

(A) decrease because they are eaten by baleen whales.

(B) decrease because they compete with baleen whales for krill.

(C) increase because they are not directly connected to the baleen whale in the food web.

(D) increase because they are eaten by squid.

13. Phytoplankton begin the food web shown. What type of organisms are phytoplankton?

(A) Animal

(B) Bacterium

(C) Decomposer

(D) Plant

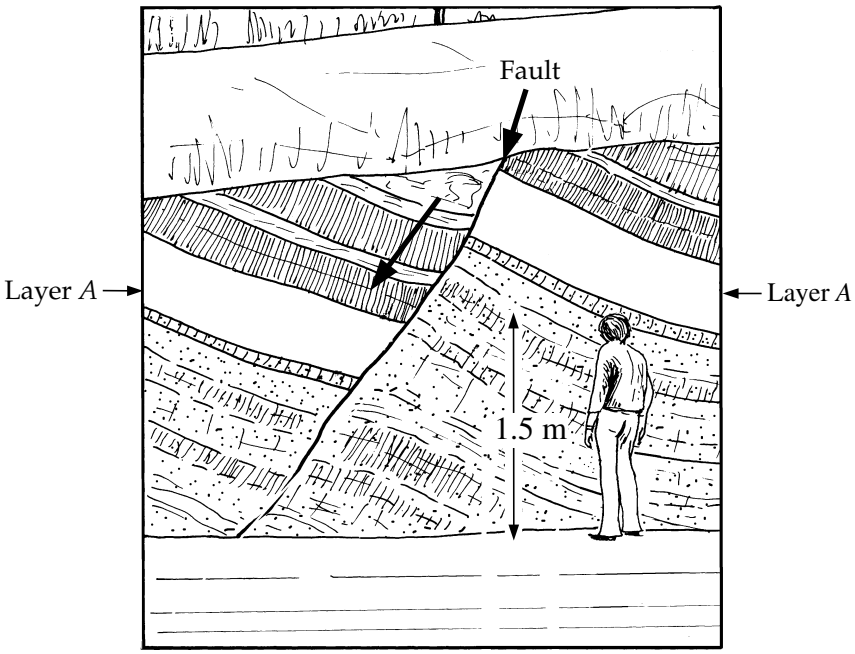
Use the following information to answer Questions 14 and 15.

Plants make their own food by photosynthesis using energy and two non-living materials from their environment. One of the non-living materials is carbon dioxide.

14. Name the other non-living material used in the process of photosynthesis.

15. What is the source of energy for photosynthesis?

16. This diagram represents rock layers that have been moved by a fault. The rock layers on the left of the fault moved downwards.



The person is 1.5 metres tall. How far, in metres, has layer *A* been moved along the fault?

17. 280 million years ago all the continents were joined as one large continent, as shown in diagram *P*.

P

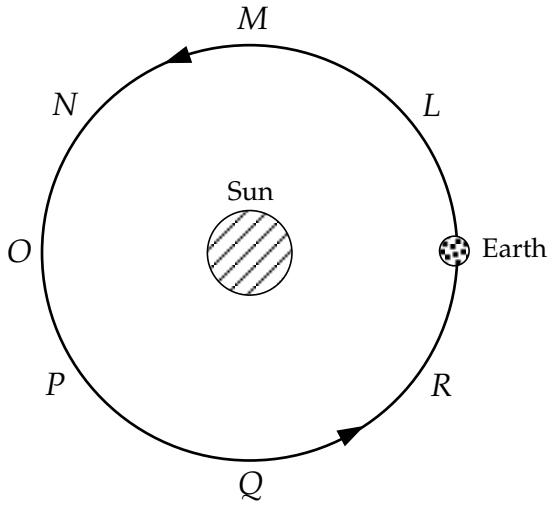
Over time this continent broke up and moved apart into the continents we know today.

Diagrams *Q*, *R* and *S* show three other positions of the continents between the past and today. The diagrams are not necessarily in correct order.

Q *R* *S*

Starting with *P*, list the diagrams in correct sequence.

18. This diagram shows the orbit of the Earth around the Sun.



A human pregnancy started when the Earth was in the position shown in the diagram above. The baby is born after a normal pregnancy.

Which letter is closest to the position of the Earth in its orbit when the baby is born?

19. The acceleration due to gravity can be calculated using the following equation:

$$a = \frac{2h}{t^2}$$

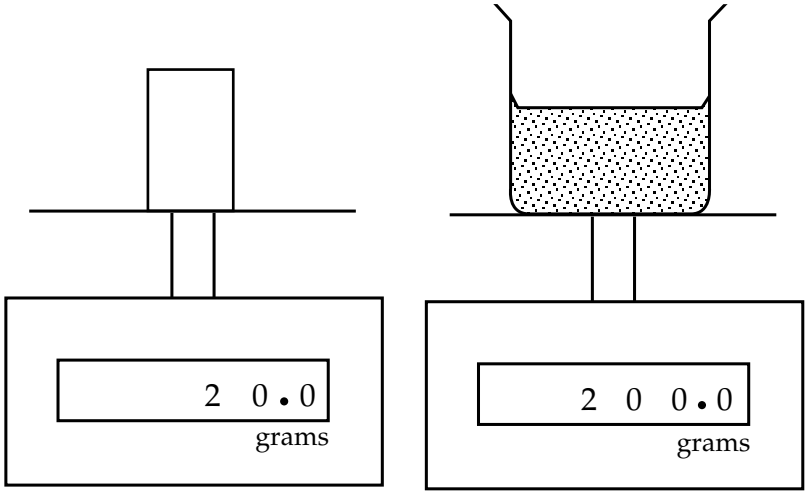
a = acceleration (metres/second/second)
h = height (metres)
t = time (seconds)

An astronaut investigated the acceleration due to gravity on the Moon. The astronaut dropped a rock from a height of 2.00 metres and measured that it took 1.58 seconds to fall to the surface of the Moon.

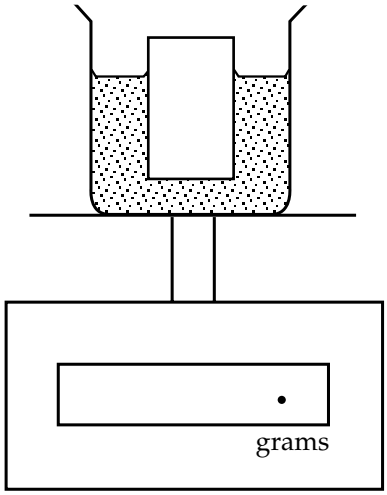
What is the acceleration due to gravity on the Moon?

Give your answer in metres/second/second, (m/s/s) to two decimal places.

20. The diagrams show a block of wood on a mass balance and a beaker of water on another balance.



The wooden block was then placed in the water in the beaker. It floated with 75% of its volume under water.

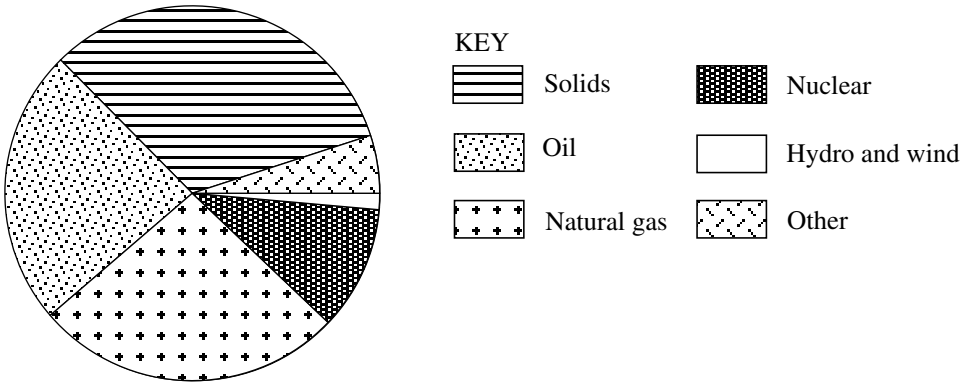


What was the reading on the balance?

Use the following information to answer Questions 21 and 22.

Energy Production and Consumption for Selected Countries, 1994							
		Australia	*Canada*	*Japan*	*Holland*	*Britain*	*USA*
Primary production	energy units	174.0	337.7	89.3	66.3	239.3	1651.3
Solids (coal, etc)	%	71.4	11.7	4.3	0.0	11.7	32.4
Oil	%	14.9	32.1	0.9	6.6	53.9	23.9
Natural gas	%	12.9	36.7	2.2	90.3	24.3	26.6
Nuclear	%	0.0	8.3	78.5	1.5	9.5	10.7
Hydro and wind	%	0.9	8.4	6.5	0.0	0.2	1.4
Other	%	0.0	2.8	7.5	1.5	0.4	5.0
Net imports	energy units	–82.4	–105.7	403.0	17.2	–29.2	445.5

21. The primary energy production for one country is shown in the sector graph below. Which country?



22. What percentage of Australia's primary energy production was from renewable energy sources in 1994?

23. Diagram 1 shows the orbits of the two moons of Mars, Phobos and Deimos, around the planet and their positions at a particular time.

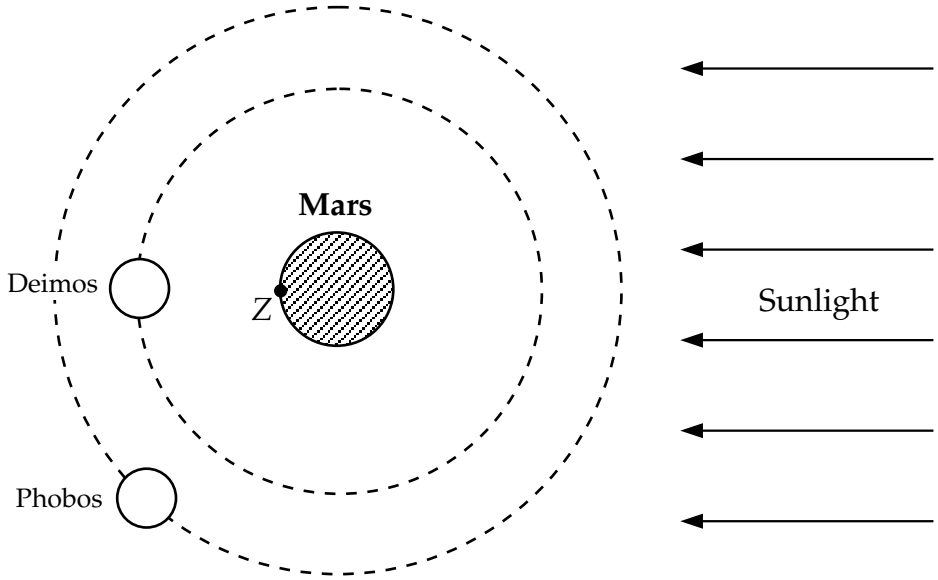


DIAGRAM 1

Diagram 2 shows the phases of a moon as seen by an observer on the planet's surface.

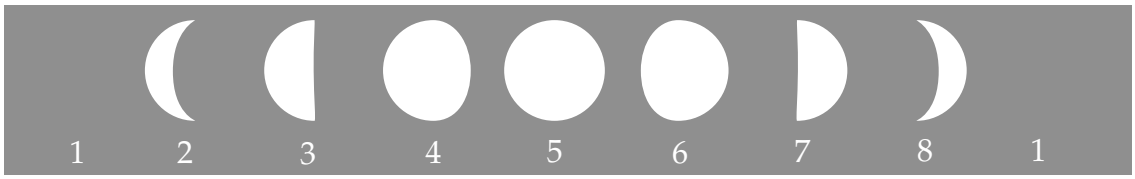
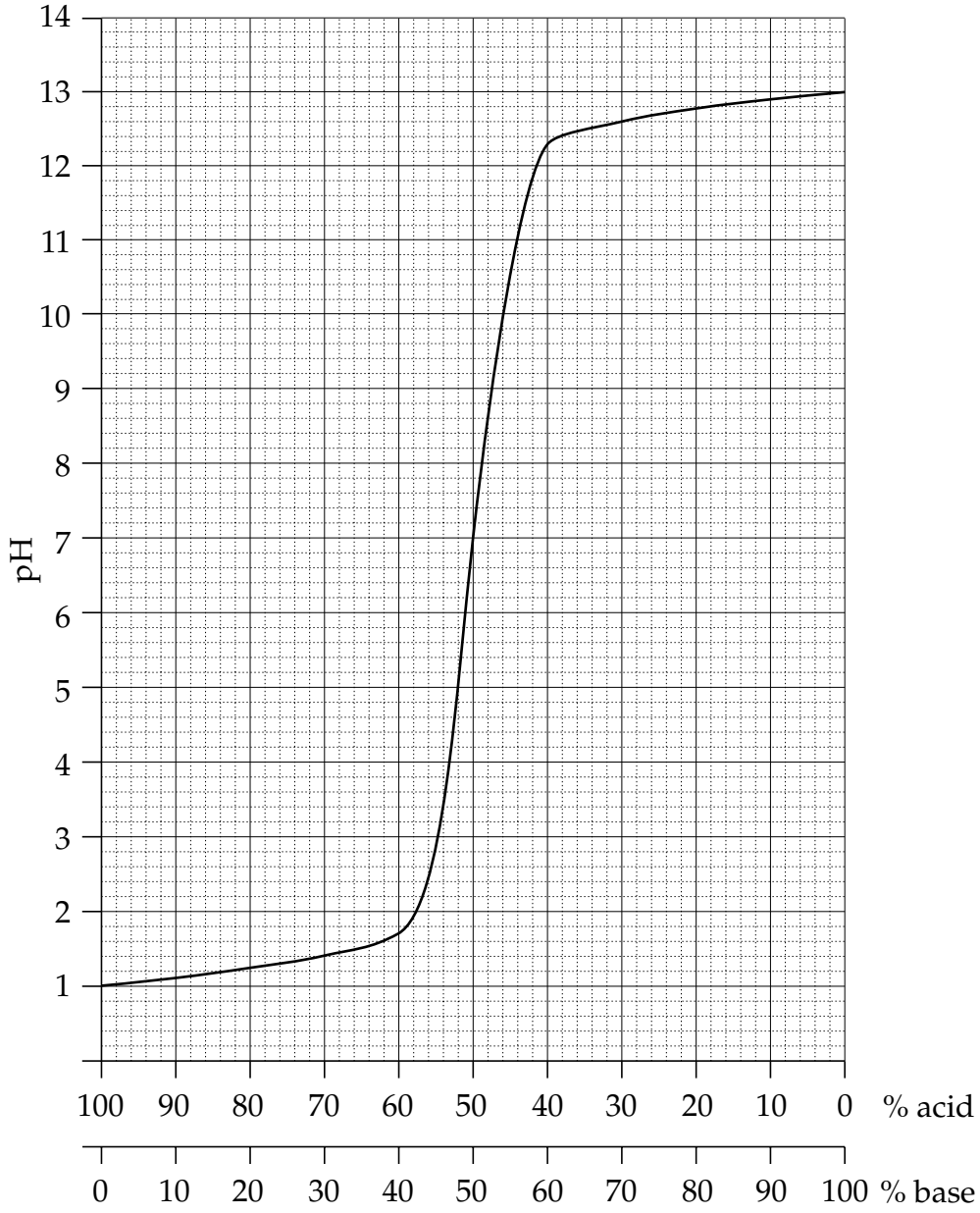


DIAGRAM 2

Mars is NOT eclipsing Deimos. What number(s) represent the appearance of the moons as seen by an observer standing at *Z*?

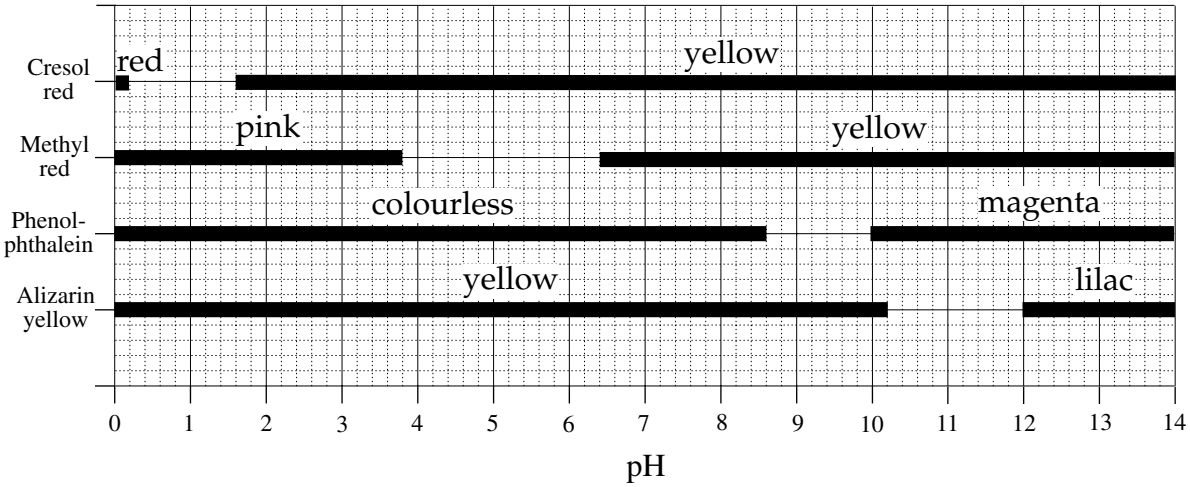
Use the following information to answer Questions 24 and 25.

Students investigating pH mixed varying amounts of acid with base. The results are shown below.



24. What is the pH of a mixture made up of 90% acid and 10% base?

25. Indicators are chemicals that change colour at different pH. The diagram below shows the colour of each indicator at different pH.



The students prepared another acid–base mixture and tested four samples of it with different indicators. They recorded the following results.

Sample No.	*Indicator*	*Final colour*
1	cresol red	yellow
2	methyl red	yellow
3	phenolphthalein	magenta
4	alizarin yellow	yellow

What is the percentage (%) of acid in this acid–base mixture?

End of Section 1

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