



2002 SCHOOL CERTIFICATE TEST

11 November
Start 12.50 pm

SCIENCE
SECTION 1
50 marks

General Test Instructions

- Reading time: 10 minutes
- Working time: 1½ hours
- The supervisor will tell you when to begin the test
- This test has TWO sections
- Attempt ALL questions
- Write using black or blue pen
- Draw diagrams using pencil
- Calculators may be used
- Write your Centre Number and Student Number at the top of pages 29, 31 and 35

Directions for Section 1

- Attempt ALL questions
- Complete your answers to Section 1 on the separate Section 1 Answer Sheet
- Complete your answers in black or blue pen

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Instructions for answering questions in Section 1

- Complete your answers in either black or blue pen.

- **Multiple choice**

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

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

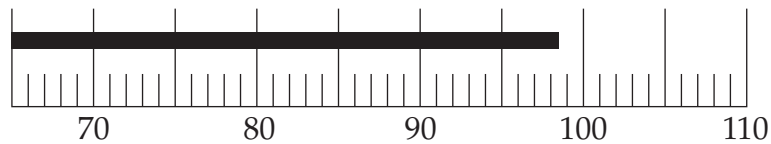
If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

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.

A B C D
An arrow points from the word "correct" to the B option.

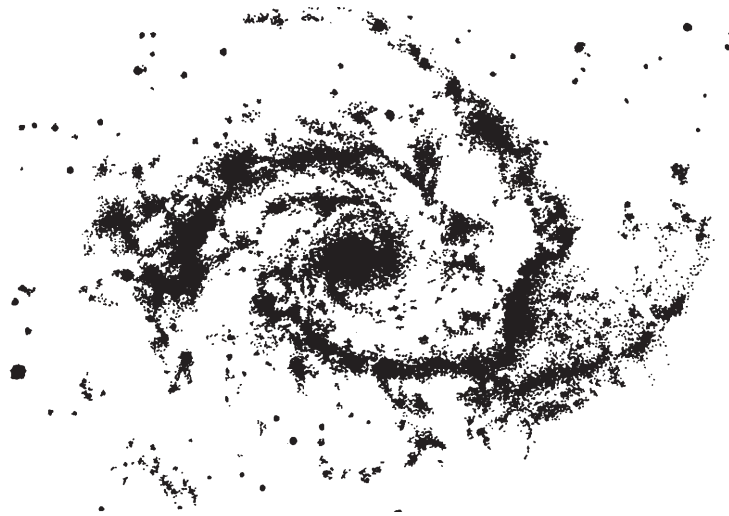
1



What is the reading on the scale?

- (A) 90.8
 - (B) 91.6
 - (C) 98.0
 - (D) 98.5
- 2 Why would scientists develop a new scientific model?
- (A) The old model has been in place for a long time.
 - (B) The scientists who first developed the old model have died.
 - (C) Results are obtained that cannot be explained by the old model.
 - (D) No experiments related to the old model have been done recently.
- 3 Which of the following is the most important characteristic of a useful hypothesis?
- (A) It is based on results of previous experiments.
 - (B) It can be tested by observation or experiment.
 - (C) It is consistent with current ideas and theories.
 - (D) It is as different as possible from other hypotheses.


- 4 The diagram represents a distant galaxy.



What instrument would be most useful to collect information about a distant galaxy?

- (A) Light microscope
(B) Light telescope
(C) Radio telescope
(D) Satellite
- 5 The scale diagram shows an estimate of how long Australia's reserves of oil, gas and coal will last.

Oil  = 50 years

Gas  = 75 years

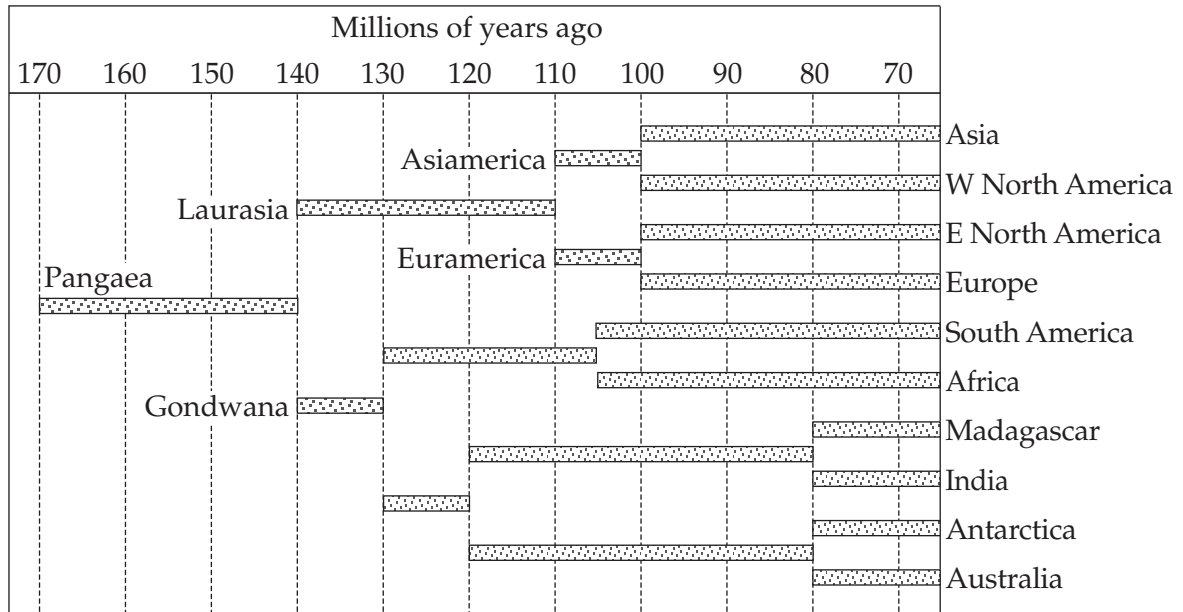
Coal  = X years

How long are the reserves of coal estimated to last?

- (A) 450 years
(B) 500 years
(C) 550 years
(D) 1100 years

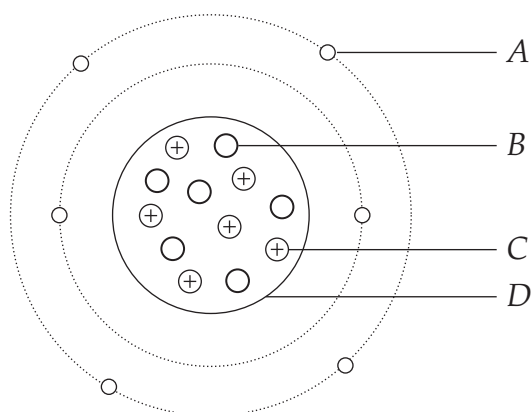
Use this diagram to answer Questions 6 and 7.

Separation of land masses



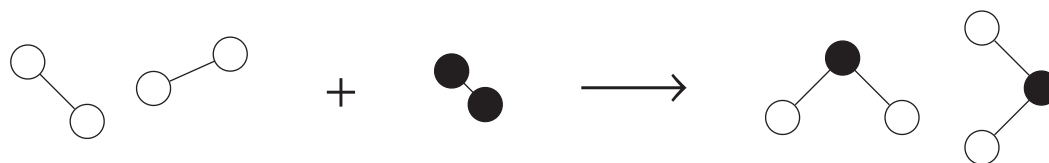
- 6 Which land masses resulted from Asiameica?
- (A) Euramerica and Laurasia
 (B) Laurasia and Gondwana
 (C) Asia and W North America
 (D) E North America and W North America
- 7 How long has Australia existed as a separate land mass?
- (A) 80 million years
 (B) 120 million years
 (C) 130 million years
 (D) 170 million years

- 8 Two different types of fossils are found in a rock. Which conclusion about the relative ages of the fossils is correct?
- (A) One fossil is older than the other.
 (B) The fossils are older than the rock.
 (C) The fossils are younger than the rock.
 (D) The fossils are the same age as the rock.
- 9 The diagram represents a carbon atom.



Which label identifies an electron?

- (A) A
 (B) B
 (C) C
 (D) D
- 10 The formation of water from hydrogen and oxygen can be represented as follows:



What scientific idea about the formation of new compounds is represented by this?

- (A) Matter is created.
 (B) Matter becomes heavier.
 (C) Atoms can be rearranged.
 (D) Atoms can change their shape.

- 11 Some properties of chemicals *X* and *Y* are listed in the table.

<i>X</i>	<i>Y</i>
reacts with acids	does not react with acids
does not react with <i>Y</i>	does not react with <i>X</i>
is soluble in water	is insoluble in water
melts at 60°C	melts at 90°C

A mixture of equal amounts of *X* and *Y* is placed in a beaker of acid at 70°C.

From this information, which statement is correct?

- (A) *X* will melt and *Y* will dissolve.
(B) *X* will react and *Y* will not melt.
(C) *X* will not melt and *Y* will dissolve.
(D) *X* will not react and *Y* will not melt.
- 12 Read the following description of substance *Z*.

Z is a colourless liquid that is often used in school science experiments. It reacts with calcium carbonate to release carbon dioxide gas. When *Z* reacts with a metal such as magnesium, bubbles of hydrogen gas form.

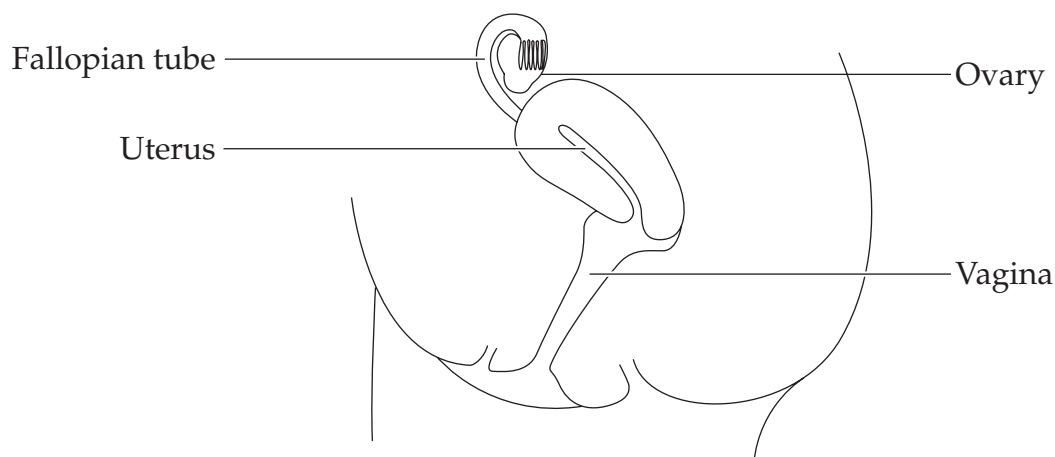
Which of the following could be the chemical formula of *Z*?

- (A) H₂O
(B) H₂SO₄
(C) NaOH
(D) NH₄OH
- 13 Why are indicators used in chemical experiments?
- (A) To identify chemical conditions
(B) To change the colour of chemicals
(C) To show when a reaction is occurring
(D) To make chemical reactions occur more quickly

14 What determines the features of an organism?

- (A) Genes only
- (B) Environmental factors only
- (C) Genes and environmental factors
- (D) Genes early in life, then environmental factors later in life

Use this diagram of the human female reproductive system to answer Questions 15 and 16.



15 Which choice correctly shows the path that an unfertilised egg takes through the female reproductive system?

- (A) Fallopian tube → uterus → ovary → vagina
- (B) Ovary → Fallopian tube → uterus → vagina
- (C) Ovary → uterus → Fallopian tube → vagina
- (D) Vagina → uterus → Fallopian tube → ovary

16 Which of the following occurs in the uterus?

- (A) An unborn baby grows.
- (B) Eggs are produced.
- (C) Fertilisation
- (D) Ovulation

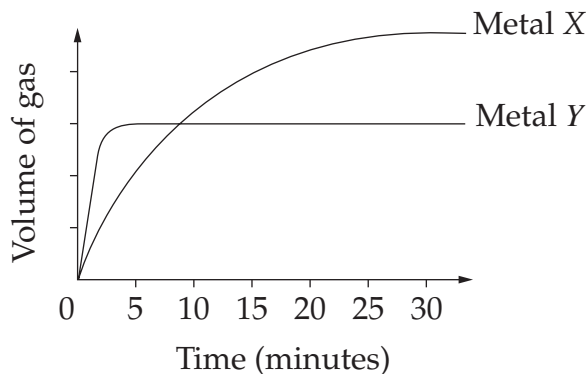
Use this information to answer Questions 17 and 18.

'Bt cotton' is a genetically modified strain of cotton plant. Each plant cell includes a gene from a soil bacterium, which causes the plant to make a chemical that kills caterpillars when they feed on the plant.

- 17 What has been transferred from a soil bacterium to Bt cotton plants?
- (A) DNA
 - (B) Cotton
 - (C) Caterpillars
 - (D) Chromosomes
- 18 How has the change in Bt cotton been produced?
- (A) By using insecticides
 - (B) By using radioactivity
 - (C) By using biotechnology
 - (D) By natural selection

Use this information to answer Questions 19–21.

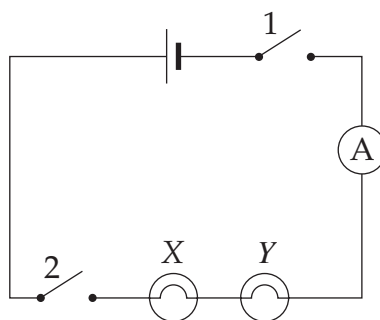
Two active metals *X* and *Y* were placed in separate containers of dilute acid. The volumes of gas produced as the metals reacted with acid were recorded at regular intervals. The results are shown in the graph.



- 19 Which statement about the chemical reactions in the first 5 minutes is correct?
- (A) *X* produces gas faster than *Y*.
 (B) *Y* produces gas faster than *X*.
 (C) *X* and *Y* produce gas equally quickly.
 (D) There is insufficient information to decide which metal produces gas faster.
- 20 What is the best explanation for the shape of the graph for metal *Y* after 5 minutes?
- (A) A large amount of *Y* was added to the acid.
 (B) *Y* stopped producing gas at 5 minutes.
 (C) More *Y* was used than *X*.
 (D) All *Y* was used up before 5 minutes had passed.
- 21 What names could be given to metals *X* and *Y*? (You may refer to the Periodic Table on page 38 to help you answer this question.)

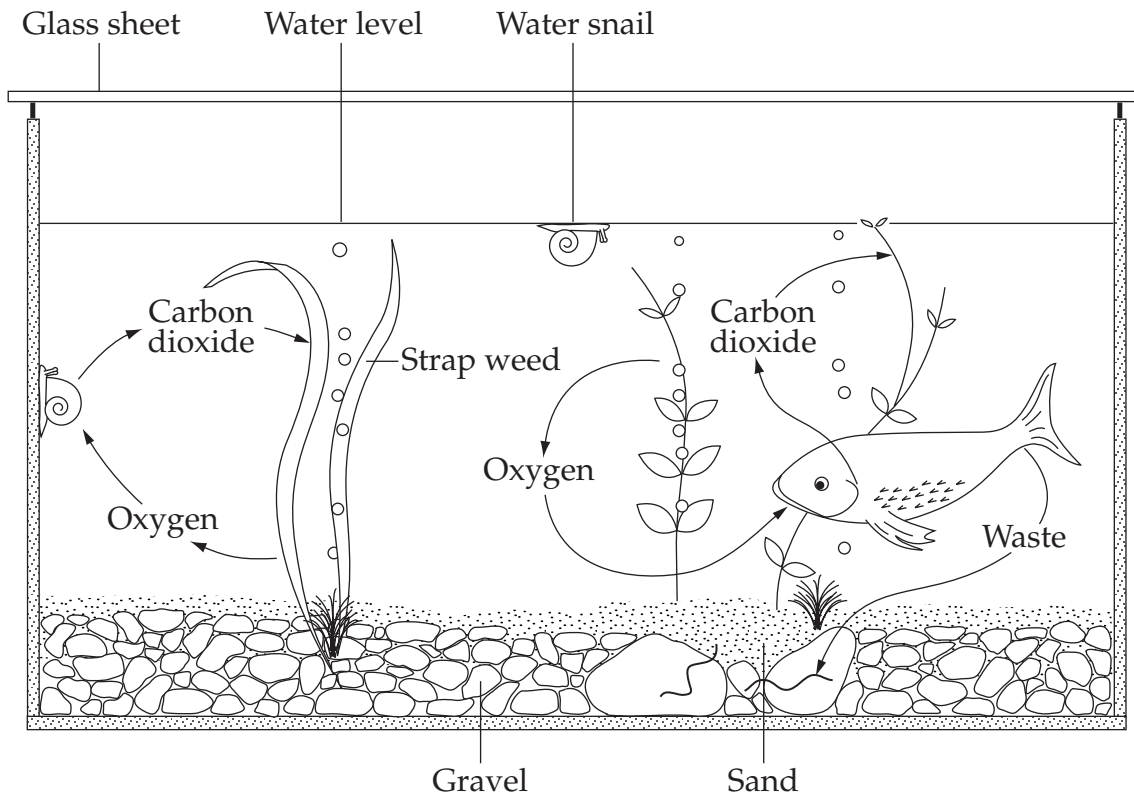
	<i>X</i>	<i>Y</i>
(A)	iron	magnesium
(B)	zinc	copper
(C)	sodium	aluminium
(D)	sodium	magnesium

- 22 This electrical circuit was set up.



- Switch 1 is now closed. Which globe(s) will light up?
- (A) X only
(B) Y only
(C) Both X and Y
(D) Neither X nor Y
- 23 Which of the following contributes to the greenhouse effect?
- (A) Extensive use of fossil fuels
(B) The increase in sea level
(C) Widespread planting of forests for timber
(D) The steady increase in average world temperatures
- 24 Which of the following is a scientific reason for continuing to investigate the greenhouse effect?
- (A) To genetically engineer crops that will feed more people
(B) To make more accurate predictions about climate change
(C) To better estimate costs of damage from increased storm activity
(D) To provide evidence for land disputes caused by rising sea levels

Use this diagram to answer Questions 25 and 26.



- 25 If this diagram was in a science textbook, what would be its most suitable title?
- (A) Picture of an aquarium
 (B) How to set up an aquarium
 (C) Cycling of materials in an aquarium
 (D) How humans affect organisms in an aquarium
- 26 Which of the following are biotic features of this aquarium?
- (A) Sand and waste
 (B) Glass sheet and gravel
 (C) Oxygen and carbon dioxide
 (D) Water snail and strap weed

Use this information to answer Questions 27–29.

The table shows how the speeds of four objects (*A*, *B*, *C* and *D*) vary over time.

<i>Time</i> (seconds)	<i>Speed of object (m/s)</i>			
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
0	12	10	0	4
1	9	20	5	4
2	6	30	20	4
3	3	40	40	4

27 Which object is slowing down?

- (A) *A*
- (B) *B*
- (C) *C*
- (D) *D*

28 Which object has no net force acting on it?

- (A) *A*
- (B) *B*
- (C) *C*
- (D) *D*

29 Which object is accelerating most rapidly over the 3 seconds?

- (A) *A*
- (B) *B*
- (C) *C*
- (D) *D*

Use this information to answer Questions 30 and 31.

Gum tree genes to be mapped

Scientists have launched a project to map the genetic structure of eucalypts, commonly known as gum trees.

The project is expected to identify stronger and faster growing eucalypts. Eucalypts have become important for hardwood production worldwide.

'We're hoping we can identify genetic components of eucalypts that lead to better wood structure, faster growth rates and more disease resistance . . . to inform us about how to breed better quality eucalypts for forestry.'

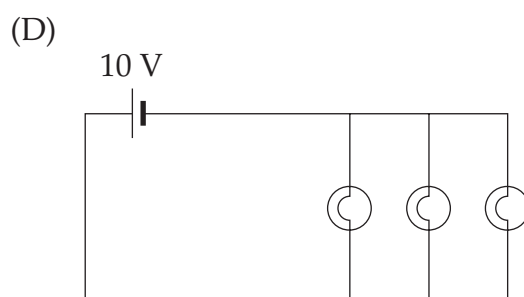
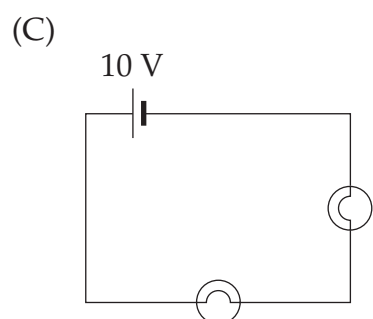
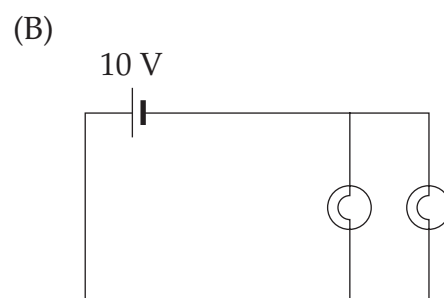
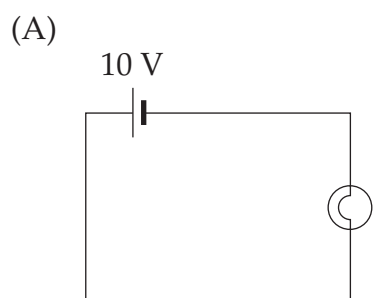
Professor Mattick said researchers believed a gum tree's genetic structure could contain up to 30 000 different genes.

Only one other plant, the *Arabidopsis*, has been completely genetically mapped.

- 30 What is one thing the scientists hope to improve?
- (A) The wood structure
 - (B) The number of natural forests
 - (C) The trees' genetic components
 - (D) The number of genes in eucalypts
- 31 Why are scientists carrying out this research?
- (A) To replace hardwood production worldwide
 - (B) To breed better quality eucalypts for forestry
 - (C) To use our natural forests for timber production
 - (D) To make a complete genetic map of the plant *Arabidopsis*

- 32 Four circuits containing identical power sources and light globes were constructed as shown.

In which circuit would the current be the smallest?



- 33 Which of the following is a natural way that large amounts of carbon dioxide are added to the Earth's atmosphere?

- (A) Volcanic eruptions
- (B) Formation of fossil fuels
- (C) Photosynthesis by plants
- (D) Movement of crustal plates

Use this information to answer Questions 34 and 35.

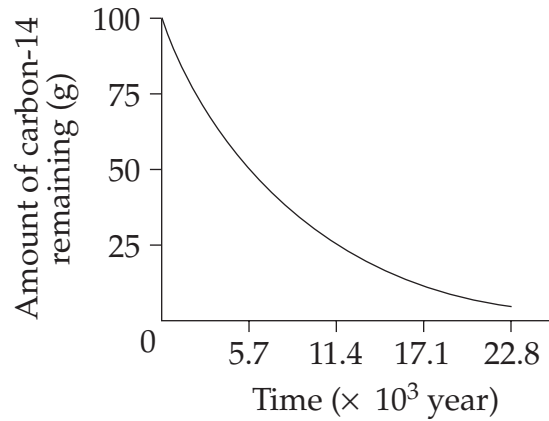
A recent study has shown that some children who are given antibiotics early in life have an increased risk of developing asthma, hay fever and eczema.

The researchers collected data from 1881 children. They compared the incidence of asthma, hay fever and eczema in children who had been given antibiotics early in their lives with those who had not.

- 34 What conclusion could be drawn from this study?
- (A) Antibiotics should not be given to very young children.
 - (B) Asthma, hay fever and eczema are caused by antibiotics.
 - (C) Children who are given antibiotics early in their lives will develop asthma.
 - (D) Some children who are given antibiotics early in their lives develop asthma, hay fever and eczema.
- 35 Why is this study an example of a fair test?
- (A) The researchers tested several variables.
 - (B) The researchers used a control group.
 - (C) The researchers used a small sample size.
 - (D) The researchers recorded information that was easy to collect.

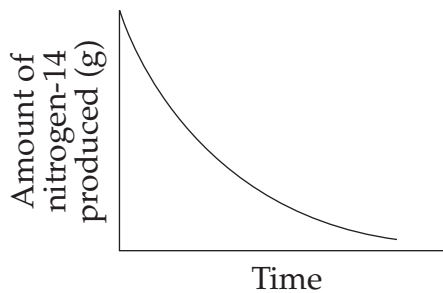
Use this information to answer Questions 36 and 37.

When carbon-14 undergoes radioactive decay, it forms nitrogen-14. The graph shows the amount of carbon-14 remaining over time. At time = 0, there was no nitrogen-14 present.

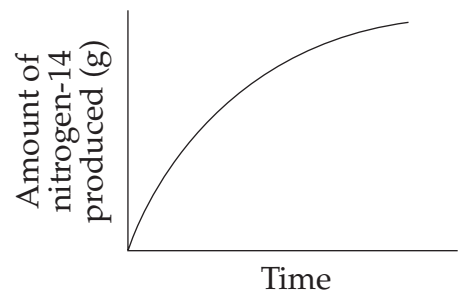


36 Which graph shows the amount of nitrogen-14 produced over the same period?

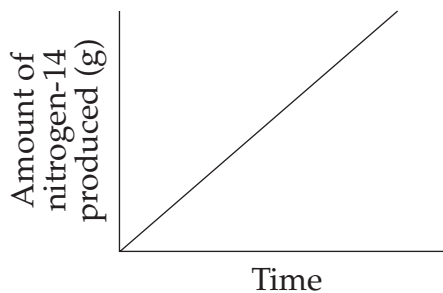
(A)



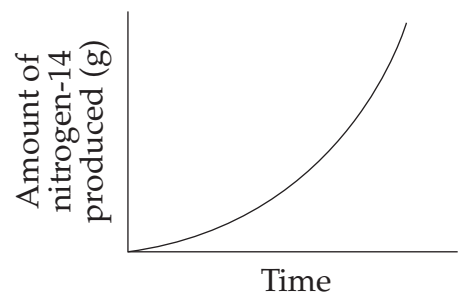
(B)



(C)



(D)

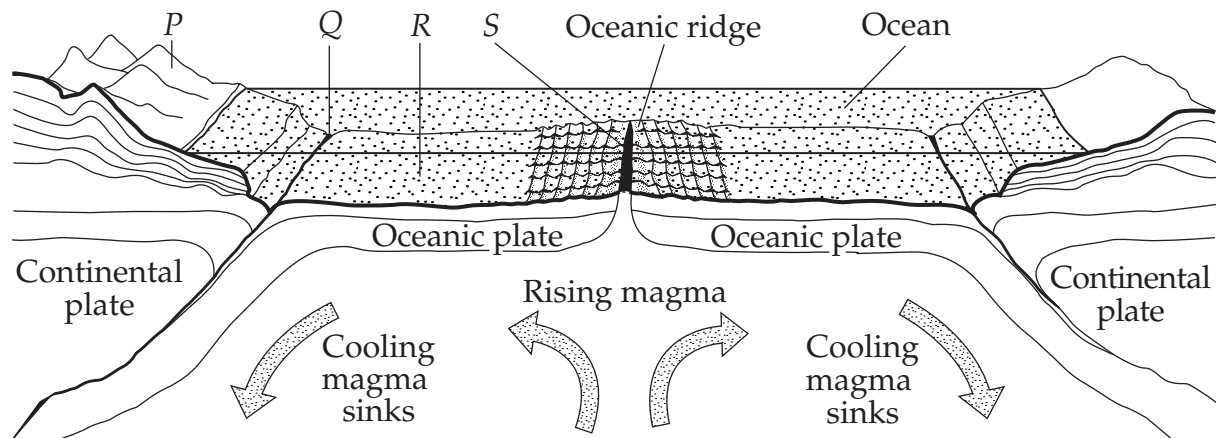


37 What is the approximate amount of nitrogen-14 produced after 8×10^3 years?

- (A) 23 g
- (B) 37 g
- (C) 63 g
- (D) 77 g

Use this information to answer Questions 38–41.

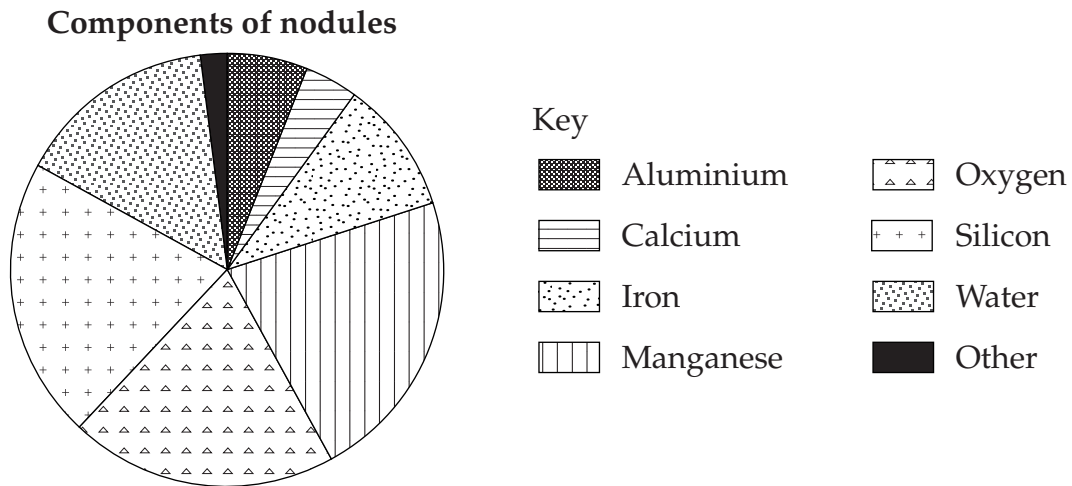
The diagram represents geological activity at plate boundaries.



- 38 What can be correctly inferred from this diagram?
- (A) New crust is forming at the oceanic ridge.
 (B) The cooling magma pushes the oceanic plates together.
 (C) The continental plates are moving under the oceanic plates.
 (D) The two continental plates move towards each other and buckle the crust upwards.
- 39 Which location is least likely to have volcanic eruptions?
- (A) P (B) Q (C) R (D) S
- 40 How does the age of rocks farther from the oceanic ridge compare with that of rocks closer to the oceanic ridge?
- (A) It is older.
 (B) It is younger.
 (C) It is identical.
 (D) It varies with the size of the ocean.
- 41 The convection currents causing crustal movement are found in which layer of the Earth?
- (A) Asthenosphere
 (B) Crust
 (C) Mantle
 (D) Outer core

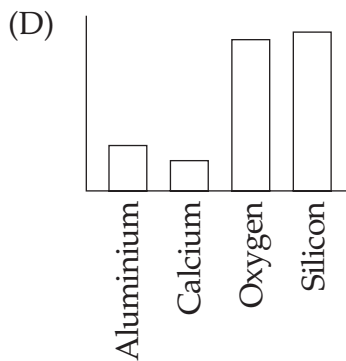
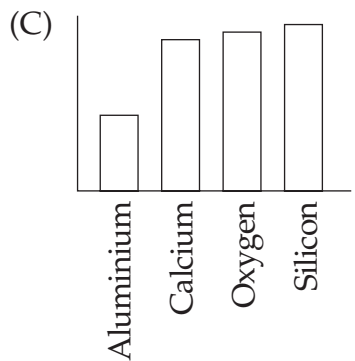
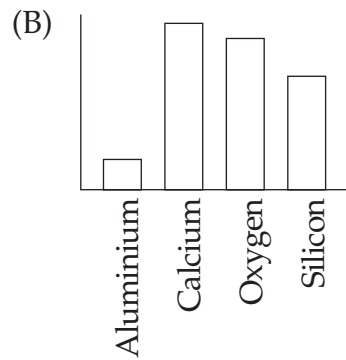
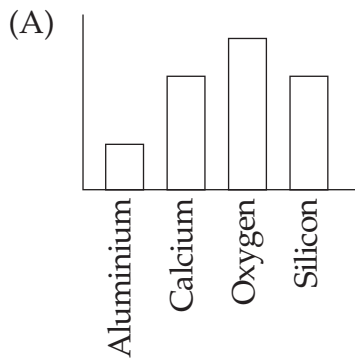
Use this information to answer Questions 42–46.

The sector graph shows the average composition of nodules of minerals found on the ocean floor.

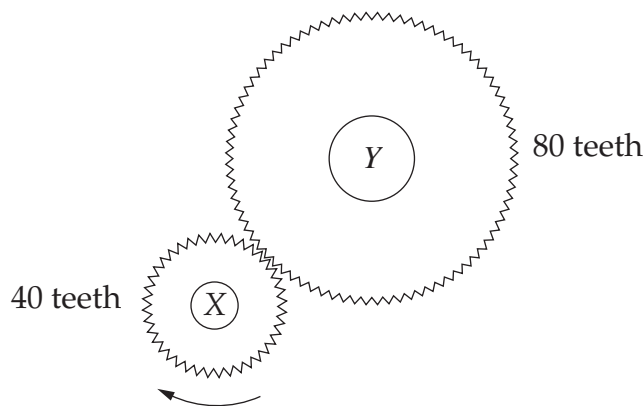


- 42 Which component is most abundant?
- (A) Aluminium
(B) Iron
(C) Manganese
(D) Water
- 43 Which component is a compound?
- (A) Manganese
(B) Oxygen
(C) Silicon
(D) Water
- 44 What is meant by 'Other' in the key?
- (A) Sodium chloride
(B) Sand and calcium carbonate
(C) Small percentages of substances not named
(D) Fragments of shells, bones, coral and marine remains
- 45 What is the percentage of iron in the nodules?
- (A) 5 (B) 10 (C) 20 (D) 35

46 Which column graph matches the information in the sector graph?



47 The diagram shows two gear wheels. The number of teeth on each wheel is shown. Wheel X makes one complete rotation in a clockwise direction as shown.



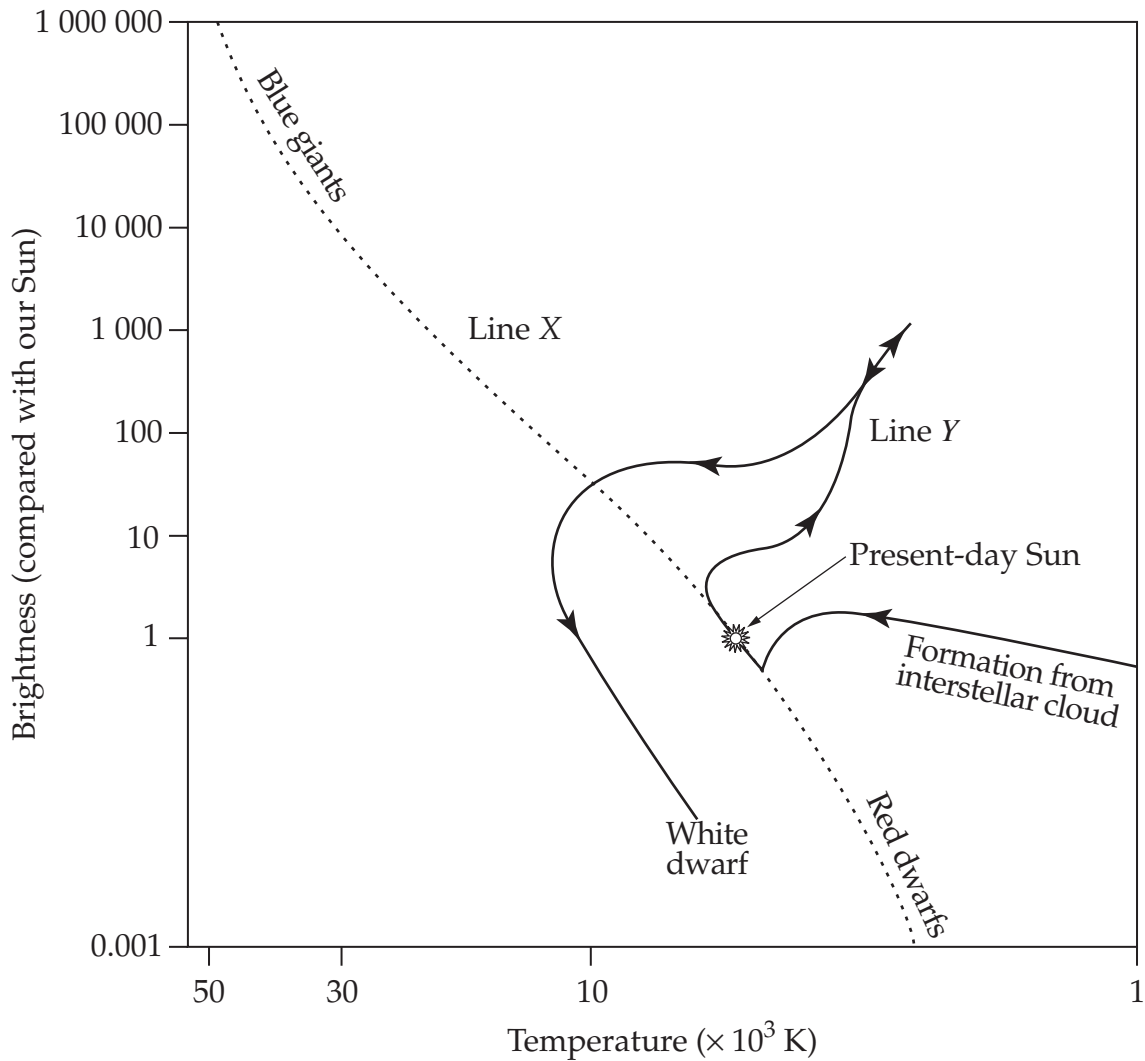
How many rotations will wheel Y make, and in which direction will it turn?

	<i>Number of rotations</i>	<i>Direction of rotation</i>
(A)	2	Anticlockwise
(B)	2	Clockwise
(C)	$\frac{1}{2}$	Anticlockwise
(D)	$\frac{1}{2}$	Clockwise

Use this information to answer Questions 48–50.

The graph shows:

- the present-day temperature and brightness of most stars in the Universe (dotted line X);
- the predicted evolutionary path of our Sun (solid line Y) including its present-day conditions.



- 48 According to this information, what will be the final evolutionary stage of our Sun?
- (A) Blue giant
 - (B) Interstellar cloud
 - (C) Red dwarf
 - (D) White dwarf
- 49 How did our Sun change during its initial formation from interstellar cloud?
- (A) It became larger.
 - (B) It became smaller.
 - (C) It became hotter.
 - (D) It became colder.
- 50 How much brighter than our Sun is a blue giant of temperature 30 000 K?
- (A) 5 times
 - (B) 10 times
 - (C) 1 000 times
 - (D) 10 000 times

End of Section 1

Go on to Section 2

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