

TWENTY FIRST CENTURY
science

Module C5

CHEMICALS OF THE NATURAL ENVIRONMENT

Practice test

FOUNDATION

Name:

Form/teaching set:

Answer all of the questions.

Write your answers in the spaces provided on this paper.

You will need a copy of the Periodic Table for this test.

1 The table shows information about some substances.

name	formula	state at 20 °C	type of bonding
magnesium oxide	MgO	solid	ionic
oxygen	O ₂	gas	covalent
sodium chloride	NaCl	solid	ionic
carbon dioxide		gas	covalent

(a) Finish the table by writing in the formula of carbon dioxide. [1]

(b) Use only the information in the table to answer this question.

What is the link between the **type of bonding** of the substances and their **state at 20 °C**?

.....
.....

[1]

(c) Which one of the diagrams below represents a molecule of oxygen?

Put a ring around the correct answer.



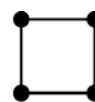
A



B



C



D

[1]

(d) There are small amounts of carbon dioxide and water vapour in the air.

Which two gases make up most of the air?

Put ticks (✓) in the boxes next to the **two** correct answers.

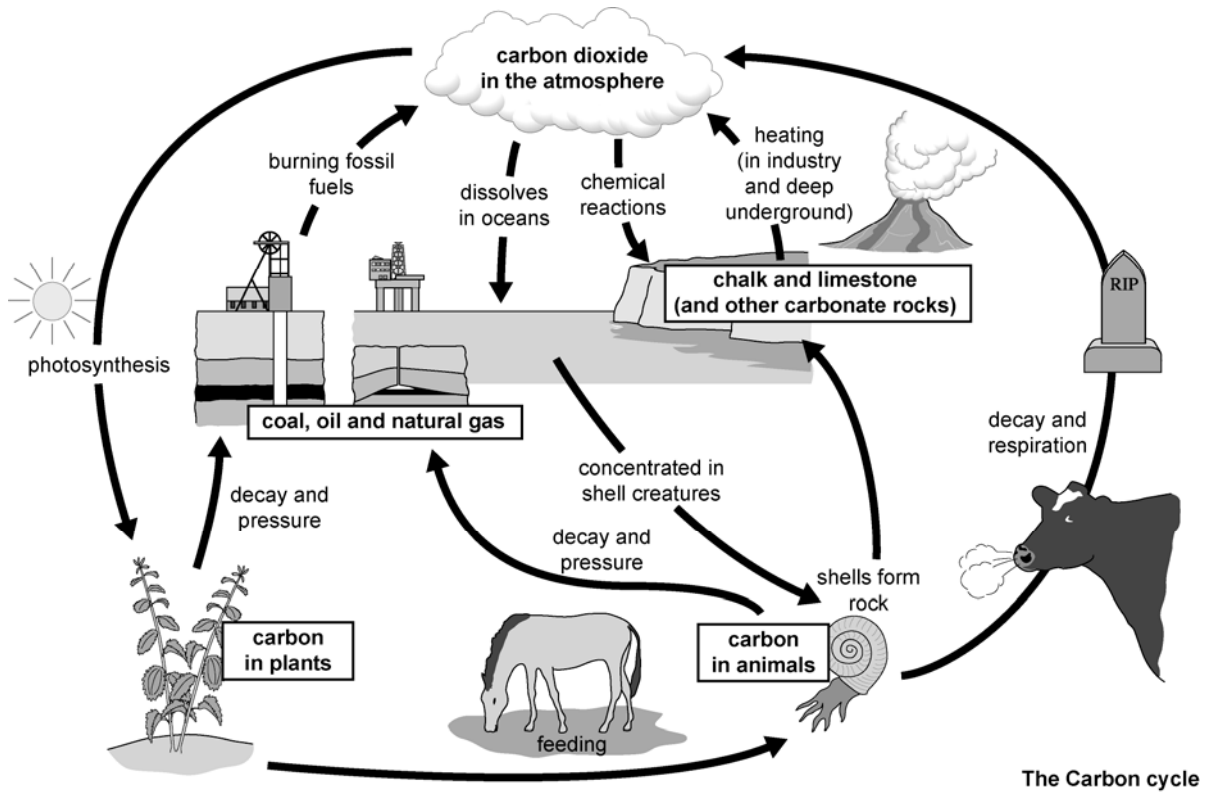
- | | |
|-----------------|--------------------------|
| ammonia | <input type="checkbox"/> |
| argon | <input type="checkbox"/> |
| nitrogen | <input type="checkbox"/> |
| oxygen | <input type="checkbox"/> |
| sodium chloride | <input type="checkbox"/> |
| zenon | <input type="checkbox"/> |

[2]

[Total marks: 5]

2 The diagram shows how the element carbon is moved from place to place around the Earth.

It is called the carbon cycle.



Use information from the diagram to answer the question.

Write about **two** ways in which carbon dioxide is **added** to the atmosphere and **two** ways in which it is **removed** from the atmosphere.

How it is added

.....

.....

.....

How it is removed

.....

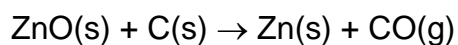
.....

.....

[3]

[Total marks: 3]

3 Zinc can be obtained from zinc oxide by heating the zinc oxide with carbon.
This is the chemical equation for the reaction.



(a) Which one of the reactants or products in this reaction is a **gas**?

Put a **ring** around the **one** correct answer.

ZnO C Zn CO [1]

(b) Which one of the reactants or products in this reaction is a **metal**?

Put a **ring** around the **one** correct answer.

ZnO C Zn CO [1]

(c) Which one of the reactants or products is **oxidised** in the reaction?

Put a **ring** around the **one** correct answer.

ZnO C Zn CO [1]

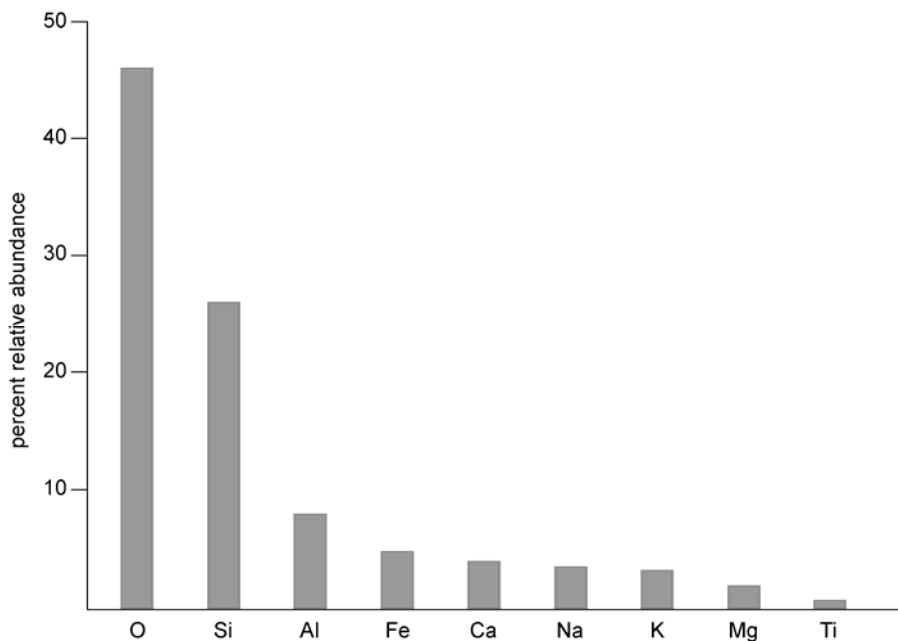
(d) Sodium metal cannot be obtained by heating sodium oxide with carbon.

State why.

..... [1]

[Total marks: 4]

4 The chart shows information about the abundance of elements in the lithosphere.



(a) What is the **lithosphere**?

Put a tick (✓) in the box next to the **one** correct answer.

the gases in the air

the oceans

the Earth's molten core

the outer rigid layer of the Earth

[1]

(b) Which two elements make up most of the lithosphere?

..... and

[1]

(c) Which one of the following shows the formula of the most common substance in the lithosphere?

Put a **ring** around the **one** correct answer.

CaO

MgO

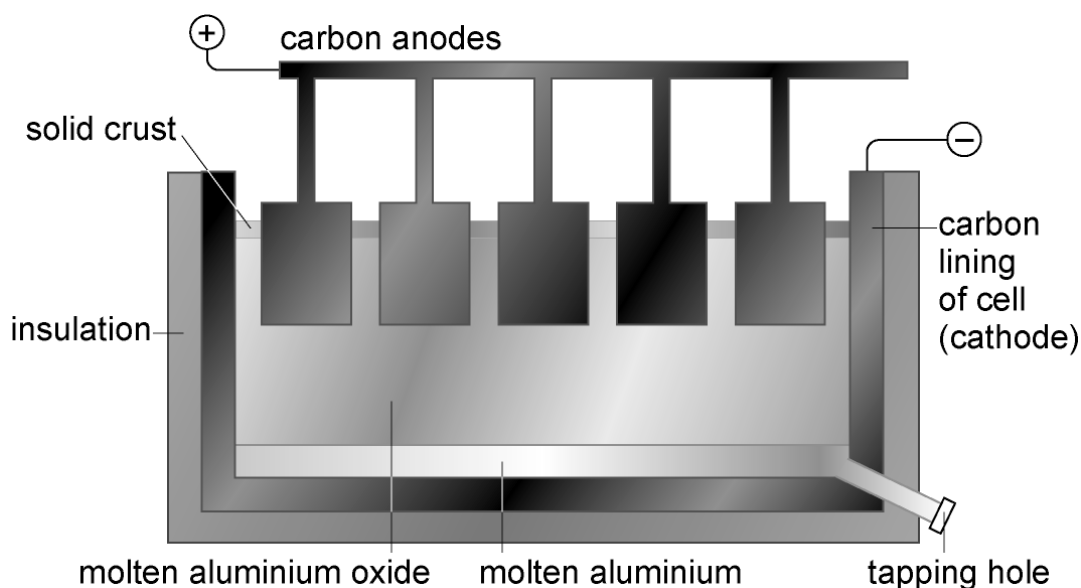
SiO₂

TiO₂

[1]

[Total marks: 3]

5 The diagram shows the equipment used to extract aluminium from aluminium oxide.



(a) What name is given to the process used to extract metals using electricity in this way?

.....

[1]

(b) In this process, the aluminium oxide must be molten.

Which of the following statements explain why the aluminium oxide must be molten?

Put a tick (✓) in the box next to the **best** answer.

- It must be molten for the oxygen to escape.
- Electric current is needed to melt it.
- Ions cannot move in a solid.
- Molten aluminium is produced.

[1]

[Total marks: 2]

6 This question is about some simple molecular substances.

Look at the information in the table.

name	formula	boiling point in °C
water	H ₂ O	100 °C
oxygen	O ₂	-183 °C
nitrogen	N ₂	-196 °C

Water is a liquid at 20 °C but oxygen and nitrogen are gases at this temperature.

Explain how the data in the table show this, and state what it tells you about the forces of attraction between the molecules.

.....

.....

.....

.....

.....

..... [3]

[Total marks: 3]

[Total marks for the test: 20]

TWENTY FIRST CENTURY
science

Module C5

CHEMICALS OF THE NATURAL ENVIRONMENT

Practice test

HIGHER

Name:

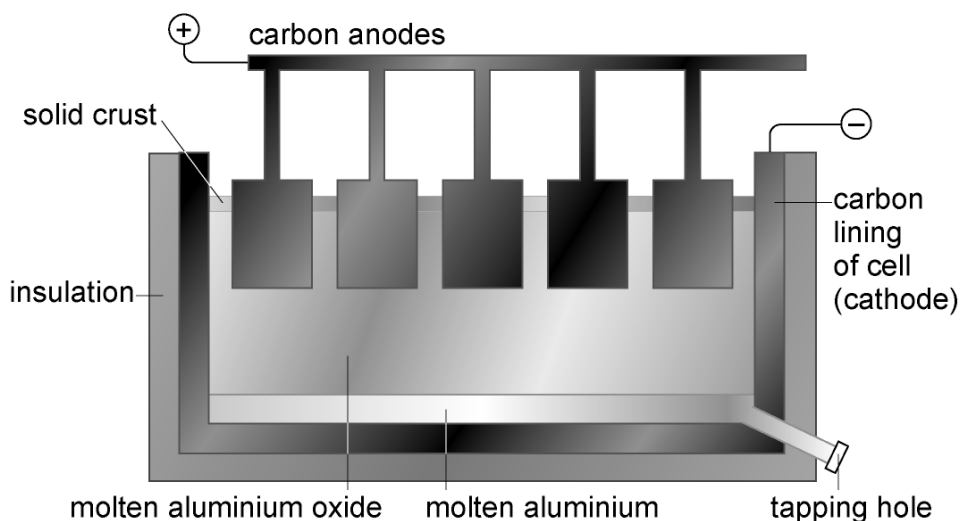
Form/teaching set:

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- 1 The diagram shows the equipment used to extract aluminium from aluminium oxide.

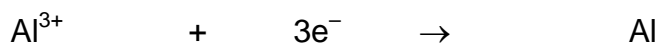


- (a) What name is given to the process used to extract metals using electricity in this way?

.....

[1]

- (b) The reaction at the electrode where the aluminium metal forms is shown in the equation below.



aluminium ions

electrons

aluminium metal

Where do the electrons come from?

Put a tick (✓) in the box next to the **one** correct answer.

from the aluminium

from the insulation

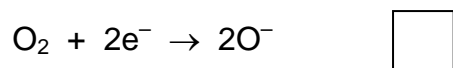
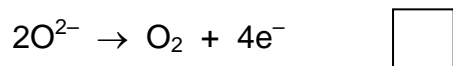
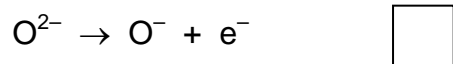
from the negative electrode

from the positive electrode

[1]

(c) Which one of the following shows what happens to the oxide ions during the process?

Put a tick (✓) in the box next to the **one** correct answer.



[1]

[Total marks: 3]

2 This question is about some simple molecular substances.

Look at the information in the table.

name	formula	boiling point in °C
water	H ₂ O	100 °C
oxygen	O ₂	-183 °C
nitrogen	N ₂	-196 °C

(a) Water is a liquid at 20 °C but oxygen and nitrogen are gases at this temperature.

Water is a liquid at 20 °C but oxygen and nitrogen are gases at this temperature.

Explain how the data in the table show this, and state what it tells you about the forces of attraction between the molecules.

.....

.....

.....

.....

.....

.....

.....

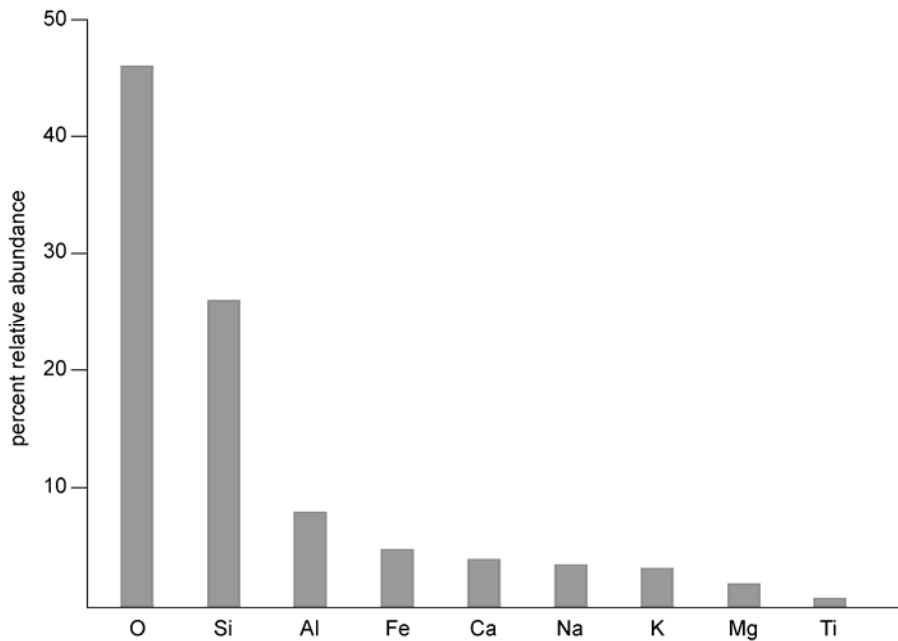
[3]

(b) Which **one** of the substances in the table makes up most of the **hydrosphere**?

..... [1]

[Total marks: 4]

3 The chart shows information about the abundance of elements in the lithosphere.



(a) What is the **lithosphere**?

.....
.....

[1]

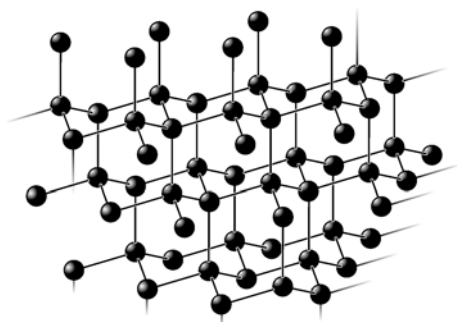
(b) Which one of the following shows the formula of the most common substance in the lithosphere?

CaO **MgO** **SiO₂** **TiO₂**

[1]

(c) Diamond is a gemstone.

The diagram shows part of the giant structure of carbon atoms that makes up diamond.



Use the diagram to help explain why diamond is a very hard substance.

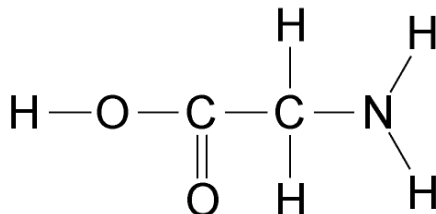
.....

.....

..... [1]

[Total marks: 3]

4 The formula below shows the atoms and bonds in a molecule of an **amino acid**.



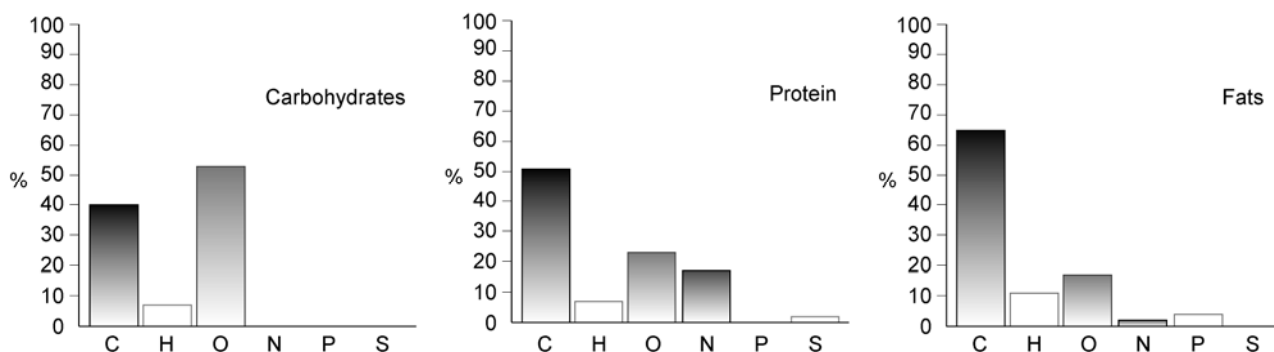
(a) List the elements in the amino acid.

.....
 [1]

(b) Write the formula for the amino acid without showing the bonds.

..... [1]

(c) Look at this information about the composition of three chemicals that form part of our diet.



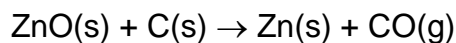
A diet consisting of only carbohydrates does not allow the body to make the amino acid shown above.

State why.

.....
 [1]

[Total marks: 3]

- 5 Zinc can be obtained from zinc oxide by heating the zinc oxide with carbon.
This is the chemical equation for the reaction.



- (a) The zinc oxide has been **reduced**.

State why.

..... [1]

- (b) What is the maximum mass of zinc that could be obtained from 8.1 tonnes of zinc oxide?

(Relative atomic masses: O = 16, Zn = 65)

..... [1]

- (c) Write down the name of **one** other metal that can be obtained from its oxide by reduction with carbon.

..... [1]

- (d) Which one of the following describes the particles in a metal crystal?

Put a tick (✓) in the box next to the **one** correct answer.

negative ions in a sea of freely moving positive ions

negative ions freely moving in a lattice of fixed electrons

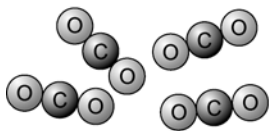
positive ions in a sea of freely moving electrons

positive ions freely moving in a lattice of fixed electrons

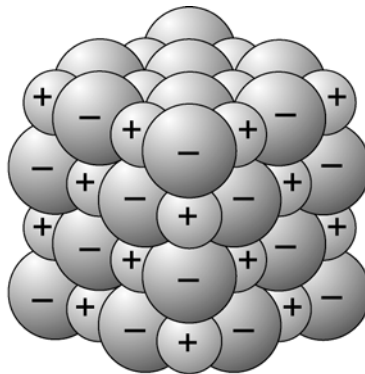
[1]

[Total marks: 4]

6 The diagrams show representations of carbon dioxide and sodium chloride.



carbon dioxide molecules
have covalent bonds



sodium chloride crystals
have ionic bonds

Explain the difference between covalent bonds and ionic bonds.

.....

.....

.....

.....

..... [3]

[Total marks: 3]

[Total marks for the test: 20]