

Centre Number	Candidate Number	Name
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MINISTRY OF EDUCATION, BOTSWANA
 in collaboration with
 UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
Botswana General Certificate of Secondary Education

SCIENCE : DOUBLE AWARD

0569/02

Paper 2

October/November 2004

2 hours

Candidates answer on the Question Paper
 No additional materials are required

Read the following carefully before you start.

Write your centre number, candidate number and name in the spaces provided at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Do not use staples, paper clips, highlighters, glue or correction fluid.

The number of marks is given in brackets [] at the end of each question or part question.

You may use a calculator.

A copy of the Periodic Table is printed on page 20.

For Examiner's Use	
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TOTAL	

This question paper consists of **17** printed pages and **3** blank pages.

- 1 Use some of the words in the list to complete the blanks in the paragraph.

greenhouse, nitrogen, solar, rise, fall, infrared, ultra-violet, carbon dioxide, increase, decrease.

Some gases such as from industries accumulate in the atmosphere leading to an in temperature. These gases trap long wave radiation emitted by the earth. This is known as the effect, and is believed to lead to global warming. Global warming causes a rise in the temperature of the oceans, which leads to a in sea level.

[5]

- 2 Fig. 2.1 shows a test-tube containing water and some ice.

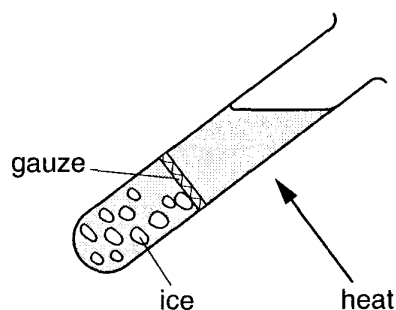


Fig. 2.1

- (a) If heat is supplied continuously the ice finally melts.
Suggest one method through which most heat energy reaches and eventually melts the ice.

.....

Give a reason for your answer.

.....

..... [2]

- (b) Name **two** other methods of heat transfer and explain why they transfer less heat energy than the method named in (a).

1 name

explanation

.....

2 name

explanation

..... [2]

3 (a) How would you tell if a paper-clip is made of a magnetic material or not?

.....

..... [1]

(b) Fig. 3.1 shows an electromagnet used as a relay switch.

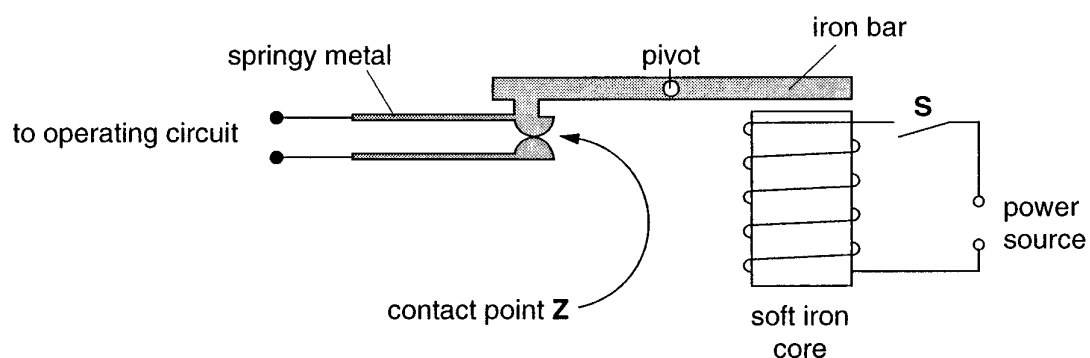


Fig. 3.1

(i) Explain what would happen when switch **S** is closed.

.....

.....

.....

.....

..... [4]

(ii) What magnetic property of iron makes it more suitable for this purpose?

..... [1]

- 4 Fig. 4.1 shows a sound wave passing through air and glass.

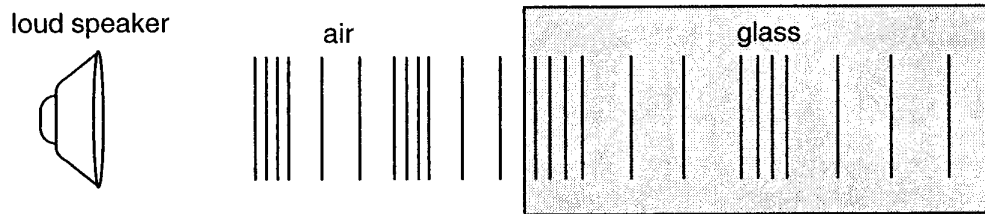


Fig. 4.1

- (a) On Fig. 4.1 label a compression with a letter **C** and a rarefaction, with a letter **R**. [2]
- (b) What happens to the speed, frequency and wavelength of the sound wave as it enters glass?

(Tick **one** box only in each row).

	<i>speed</i>	<i>frequency</i>	<i>wavelength</i>	
Increases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Decreases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Stays the same	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[3]

- 5 Fig. 5.1 shows some water being boiled by a 1.2 kW electric kettle connected to 240 V mains supply.

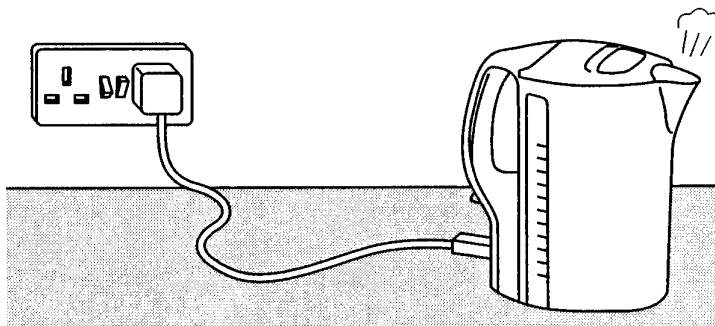


Fig. 5.1

- (a) What is the current through the
- (i) live wire,

current = A [2]

(ii) earth wire,

current = A [1]

(iii) neutral wire?

current = A [1]

- (b) The kettle is switched on for 20 minutes every day.
Calculate the cost of using the kettle for 12 days if 1 unit costs 30 t.

cost = [3]

6 Fig. 6.1 shows some major stages in the generation of electricity at a thermal power station.



Fig. 6.1

- (a) (i) What are the major energy changes at each stage in the power station?

boiler: →

turbines: →

generator: → [3]

- (ii) What type of voltage does the generator produce?
(Tick **one** box).

alternating ☐ direct ☐ [1]

- (b) The 240 V output from a generator is connected to a transformer with a primary coil of 10 000 turns. The secondary coil of the transformer has 20 000 turns.

- (i) Calculate the output voltage,

output voltage = V [2]

- (ii) The power input to the transformer from the generator is 1200 W.

Calculate the input current to the transformer.

input current = A [2]

- 7 (a) Choose from the list of metals:

calcium, copper, sodium, zinc.

The metal which:

- (i) forms a carbonate that does not decompose on heating,

..... [1]

- (ii) does not react with dilute hydrochloric acid,

..... [1]

- (iii) reacts with steam but not with cold water.

..... [1]

- (b) The table shows the colours of some aqueous solutions.

solution	colour
copper(II) sulphate	blue
iron(II) sulphate	green

- (i) State the colour change in the solution when iron is added to aqueous copper(II) sulphate solution.

blue to

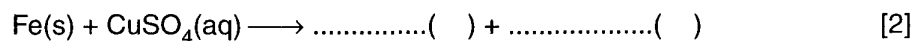
- (ii) Name the type of reaction that takes place in (b)(i).

.....

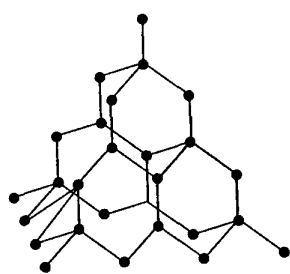
- (iii) Explain why the reaction took place.

..... [3]

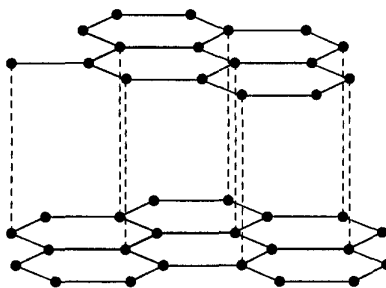
- (c) Complete the equation for the reaction.



- 8 Fig. 8.1 shows the structures of two forms of carbon.



diamond



X

Fig. 8.1

- (a) (i) Name the form X.

..... [1]

- (ii) What is the term used to describe two different forms of an element in the same physical state?

..... [1]

(b) Fig. 8.2 shows some objects made from diamond and X.

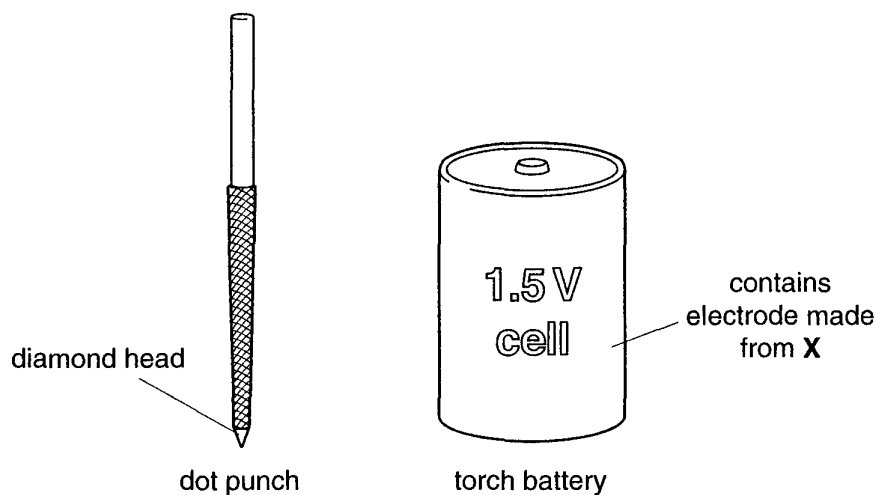


Fig. 8.2

(i) State the property that makes each form suitable for the use shown.

diamond

X [2]

(ii) Give one **other** use of diamond.

.....

(c) Two isotopes of carbon are $^{12}_6\text{C}$ and $^{13}_6\text{C}$.

(i) What is the difference between the two isotopes?

..... [1]

(ii) State one reason why the isotopes react similarly.

..... [1]

(iii) Draw an atomic structure showing the arrangement of electrons in an atom of $^{13}_6\text{C}$ and the number and position of neutrons and protons.

[2]

- 9 Fig. 9.1 shows a set-up used for the electrolysis of aqueous copper(II) sulphate solution using carbon electrodes.

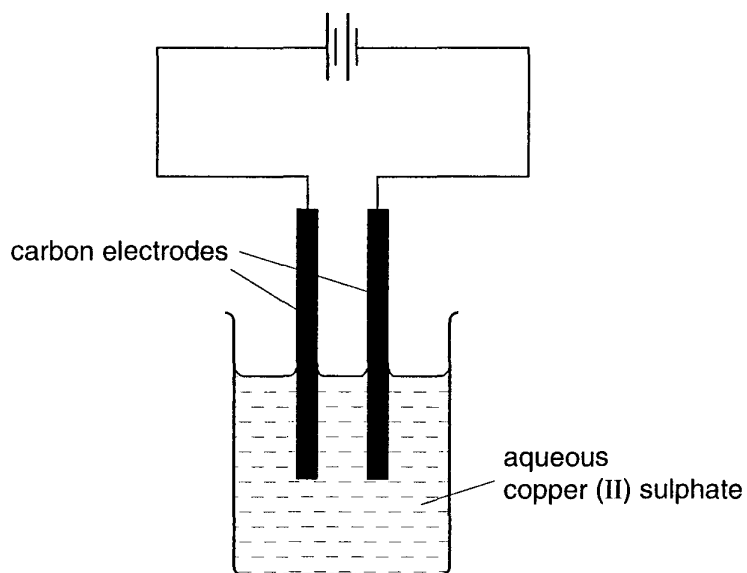


Fig. 9.1

- (a) (i) Label the anode on the diagram. [1]
- (ii) Write the formulae of all the ions present in aqueous copper(II) sulphate. [2]
-
-
- (iii) Name the electrode where copper is deposited. [1]
-
- (iv) Name the product of electrolysis other than copper. [1]
-

(b) Fig. 9.2 is a pie chart for the composition by mass of clean air.

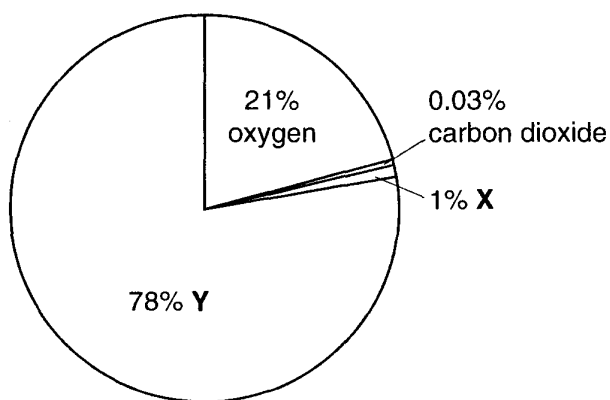


Fig. 9.2

(i) Name the components labelled X and Y.

X

Y

[2]

(c) (i) State one use of each of the following gases:

Oxygen

Carbon dioxide [2]

(ii) Name one natural process responsible for maintaining the composition by mass of clean air.

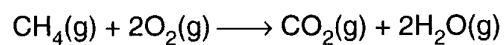
..... [1]

10 (a) Complete the table on organic compounds. The first one has been done for you.

molecular formulae	molecular structure	homologous series
CH ₄	<pre> H H — C — H H </pre>	alkane
C ₃ H ₆		alkene
	<pre> H H H — C — C — O — H H H </pre>	

[3]

(b) 1.6 g of methane, CH₄, undergoes complete combustion according to the equation:



(i) Calculate the number of moles of methane burnt.

[1]

(ii) Calculate the number of moles of water that would be formed.

[1]

(iii) Use your answer from (b)(ii) above to calculate the mass of water produced.

[1]

11 The diagram shows a food chain.

grass → grasshopper → blue tits → cat → hyena

(a) (i) Name the principal source of energy for this food chain.

..... [1]

(ii) State the form in which energy is transferred from the grasshopper to the blue tit.

..... [1]

(b) If all grasshoppers suddenly die explain what will happen to the amount of grass and number of blue tits.

amount of grass

.....

..... [2]

number of blue tits

.....

..... [2]

(c) At each stage in a food chain, the mass of living material and energy is less than in the previous stage. Explain why this is so.

.....

.....

.....

.....

..... [3]

12 Fig. 12.1 shows some parts of a flower.

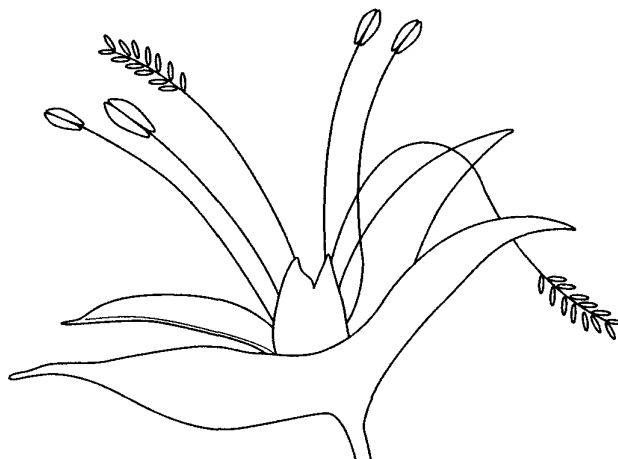


Fig. 12.1

(a) (i) Name the agent of pollination for this flower.

..... [1]

(ii) Give **two** reasons for your answer in **a(i)**.

1

2 [2]

(b) (i) Mark on the diagram with the letter **X** where ovules are produced.

[1]

(ii) What does the ovule develop into after fertilisation?

..... [1]

- 13 Match the following words: *testis*, *oviduct*, *uterus*, *penis*, *semen*, *scrotum* and *ureter* with the phrases below.

- (a) where a fetus develops
- (b) the liquid that contain sperms
- (c) produces sperms
- (d) where fertilisation takes place
- (e) passes sperms into female during sexual intercourse [5]

- 14 Fig. 14.1 shows a simple reflex arc.

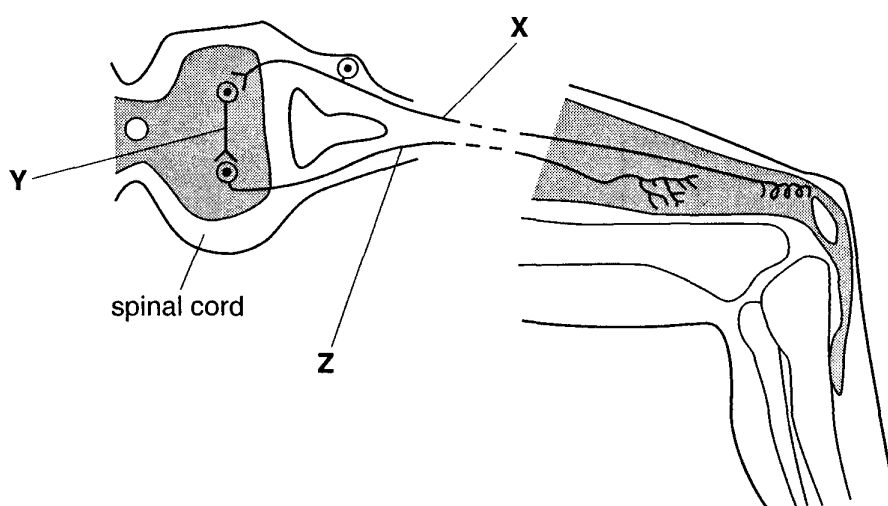


Fig. 14.1

- (a) Name the neurones labelled X, Y and Z.

X

Y

Z [3]

(b) On neurones **X**, **Y** and **Z**, show by arrows, the direction of movement of nervous impulses. [1]

(c) Define *reflex action*.

.....
..... [1]

15 Fig. 15.1 shows the exchange of materials between cells and blood.

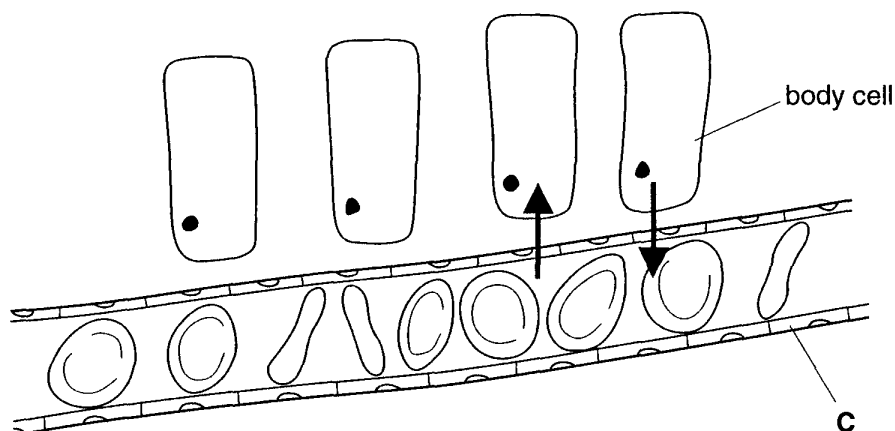


Fig. 15.1

(a) Name the component of blood that transports dissolved substances around the body.

..... [1]

(b) (i) Name the fluid through which waste materials pass from the body cells into the blood.

..... [1]

(ii) Explain how waste products move through this fluid from the cell into the blood.

.....
.....
..... [2]

(c) How does the structure of blood vessel **C** help in the removal of waste materials?

.....
..... [1]

16 Fig. 16.1 shows the effect of untreated sewage on the amount of oxygen dissolved in a river.

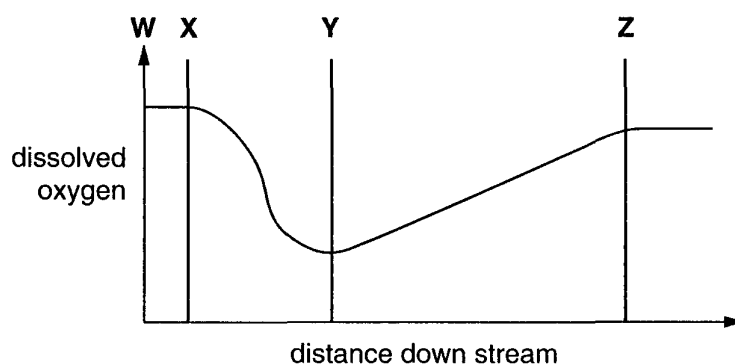


Fig. 16.1

(a) (i) State the part of the graph at which sewage was discharged into the river.

..... [1]

(ii) Explain your answer in (i) above.

.....
.....
.....
..... [3]

DATA SHEET

The Periodic Table of the Elements

[illegible]

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

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