



BOTSWANA EXAMINATIONS COUNCIL
Botswana General Certificate of Secondary Education

CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
NUMBER

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SCIENCE : DOUBLE AWARD

0569/03

Paper 3

October/November 2016

2 hours

Candidates answer on the Question Paper.
No Additional Materials are required.

* 0 2 2 0 5 5 9 3 0 *

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces provided at the top of this page.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do **not** use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.
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 16.

For Examiner's Use	
1	
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11	
12	
Total	

This document consists of **15** printed pages and **1** blank page.



- 5 (a) Complete Table 5.1 below to show the characteristics of some radioactive emissions.

Table 5.1

radioactive emission	nature	penetrating power
alpha		
gamma		

[2]

- (b) A radioactive source is added to water flowing in an underground pipe to locate a leakage. A Geiger-Muller tube is connected to a counter and carried along the surface of the ground above the pipe.

- (i) Which of the radioactive emissions in Table 5.1 is suitable for detecting the underground leakage. Explain your answer.

radioactive emission.....

explanation

[1]

- (ii) What would be observed when the detector is near the leakage?

.....

[1]

- 6 Choose from the list a substance or substances to fit each given description.

silver nitrate carbon monoxide argon aluminium barium nitrate
sulphur dioxide tin calcium carbonate sodium carbonate ammonia

- (a) It is used to make overhead electric cables.

..... [1]

- (b) They are gaseous compounds at room temperature.

..... and [2]

- (c) Its atoms have a completely filled outer shell.

..... [1]

- (d) It is used to soften hard water.

..... [1]

- (e) It is produced from incomplete combustion of fossil fuel.

..... [1]

- (f) It is a component of bronze.

..... [1]

- 7 Fig. 7.1 shows a set-up used in the electrolysis of concentrated aqueous sodium chloride using inert electrodes.

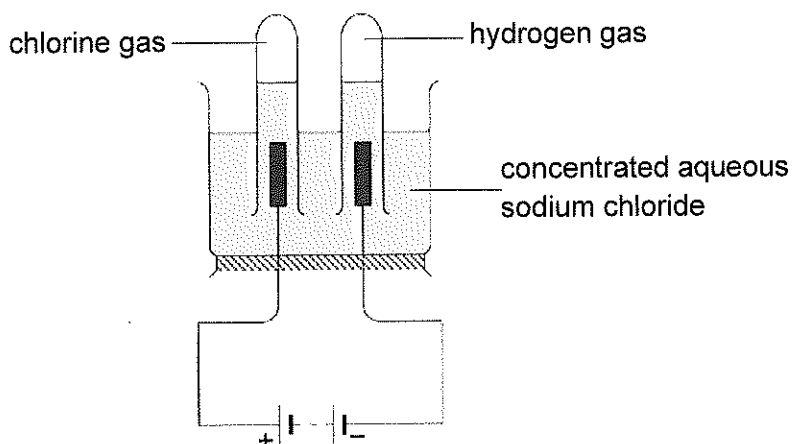
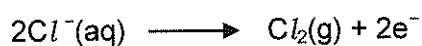


Fig. 7.1

- (a) Suggest the name of the material used for the inert electrode.

..... [1]

- (b) The equation for the production of chlorine gas at the anode is shown.



- (i) Explain why this is an **oxidation** reaction.

..... [1]

- (ii) State **two** observations made at the anode.

1

2

[2]

- (iii) Describe the test for chlorine gas.

.....

.....

..... [2]



- (c) Hydrogen reacts with chlorine to form hydrogen chloride, HCl .

Draw a 'dot and cross' diagram to show the bonding in hydrogen chloride, HCl .

[2]

- (d) Hydrogen chloride dissolves in water to form hydrochloric acid.

Suggest the pH of hydrochloric acid and explain your answer.

pH

explanation

[2]

- (e) In an experiment, 100 cm^3 of 0.1 mol/dm^3 of hydrochloric acid was reacted with excess zinc powder. The equation for the reaction is



- (i) Calculate the number of moles in 100 cm^3 of $0.1 \text{ mol/dm}^3 \text{ HCl}$.

moles = [2]

- (ii) Use the equation and your answer to (e)(i) to calculate the number of moles of zinc that reacted with the acid.

moles = [2]

- (iii) Calculate the mass of zinc that reacted with the acid.

mass = [1]

- (iv) Calculate the volume of hydrogen measured at room temperature and pressure.

volume = [2]

- 8 The structure of nylon, a synthetic macromolecule, is shown in Fig. 8.1.

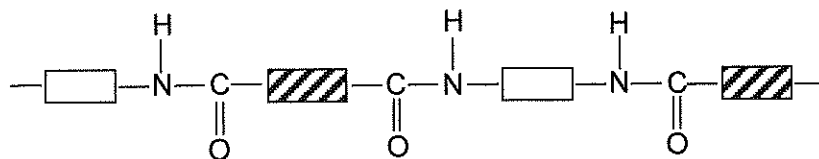


Fig. 8.1

- (a) What is a macromolecule?

..... [1]

- (b) What name is given to the linkage found in nylon?

..... [1]

- (c) One of the monomers in the nylon molecule is an alkanolic acid.

- (i) Using symbols from Fig. 8.1, draw the structure of the other monomer.

[1]

- (ii) What makes synthetic macromolecules harmful to the environment?

..... [1]

- (d) An alkanolic acid has the formula CH_3COOH .

- (i) Name the acid. [1]

- (ii) Draw the structural formula of CH_3COOH showing all bonds.

[2]

- (e) Complete the equation for the reaction between CH_3COOH and magnesium metal. Include state symbols.



9 Fig. 9.1 shows a cross-section of a seed.

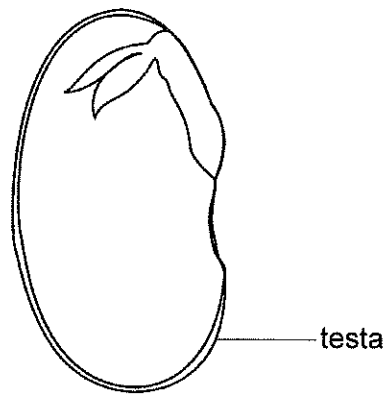


Fig. 9.1

(a) On Fig. 9.1, label the part that stores food as X. [1]

(b) Explain how low temperature may affect the germination of seeds.

.....

.....

.....

.....

.....

.....

..... [3]

(c) Fig. 9.2 shows a map of the positions of some plants and their seedlings in a large sampled area.

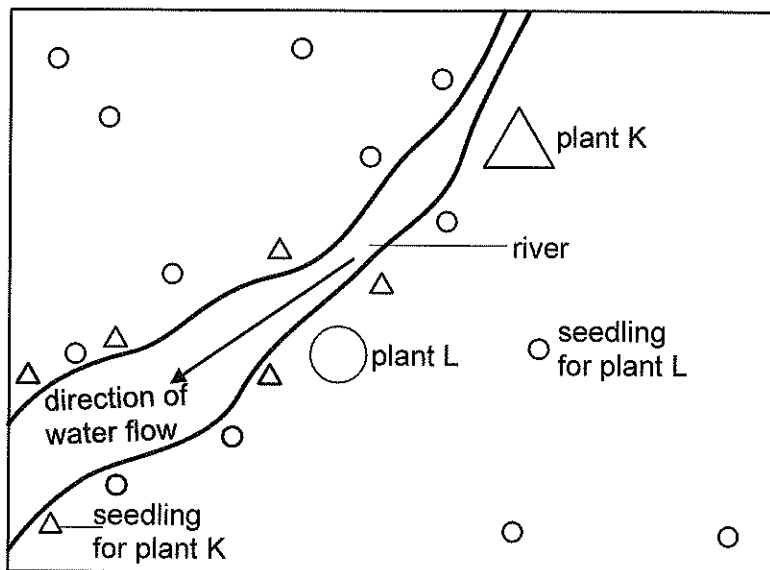


Fig. 9.2

(i) Suggest the mode of dispersal for the seeds of plant K and plant L.

plant K

plant L

[2]

(ii) Explain the answers in (c)(i).

explanation for plant K

.....

explanation for plant L

.....

[2]



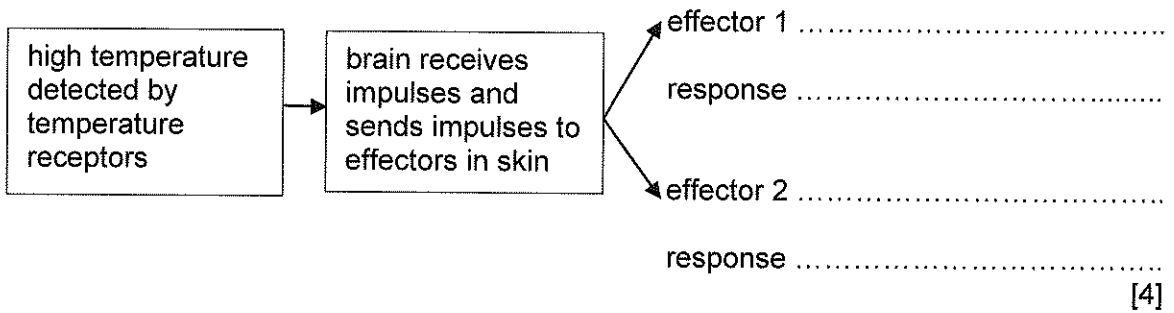
10 The human skin is involved in the process of maintaining a constant body temperature.

(a) (i) What is the name given to the processes that maintain a constant internal environment within the body?

..... [1]

(ii) The flow chart shows how impulses are transmitted from skin receptors to effectors when the temperature is above normal body temperature.

Complete the flow chart to show how two effectors in the skin respond to those impulses.



[4]

(b) Fig. 10.1 is a graph showing how a person's body temperature changes over a period of time.

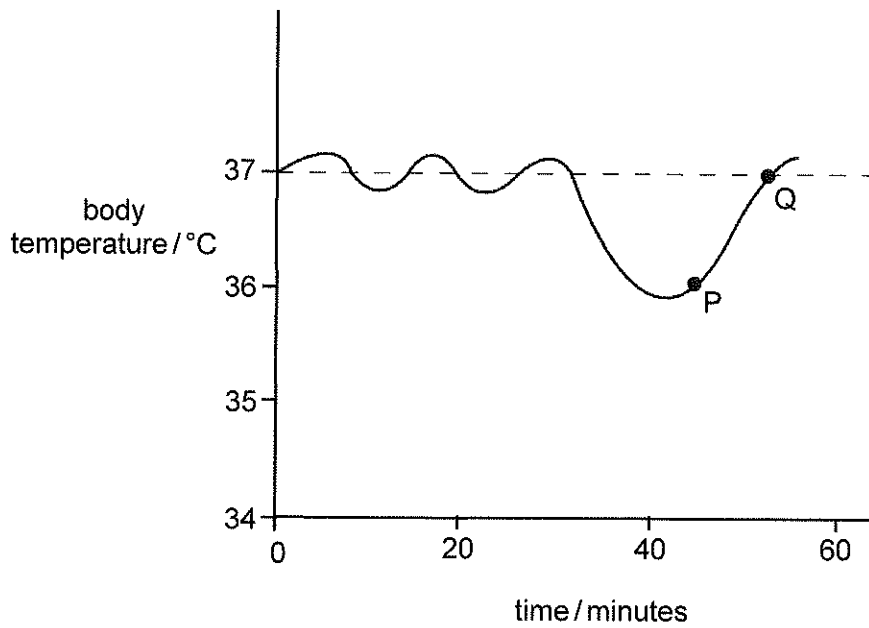


Fig. 10.1

Explain the changes that are taking place in the body between P and Q.

.....
.....
.....
.....

[3]

- 11 (a) A boy eats a sandwich made from bread and fish for breakfast.
Fig. 11.1 shows the sandwich bolus as it moves along the oesophagus to the stomach.

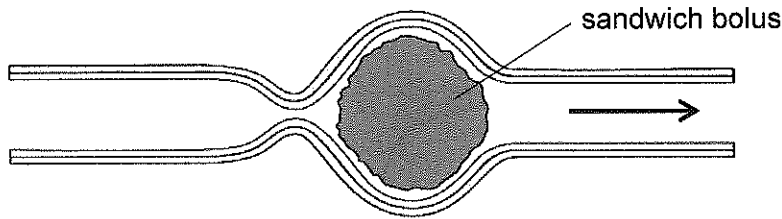


Fig. 11.1

- (i) Name the process that causes the movement shown in Fig. 11.1.

..... [1]

- (ii) Explain how the process shown in Fig. 11.1 is brought about.

.....

 [2]

- (b) Name **one** chemical element which is present in carbohydrates.

..... [1]

- (c) Explain how the chemical composition of fish and bread in the sandwich compares to that of the sandwich bolus.

fish

explanation

bread

explanation [4]

- (d) Which region of the alimentary canal contains fibre in the highest proportion?
Explain your answer.

region

explanation [2]



- 12 A pond contains water plants, tadpoles and fish.
The graph shows the amount of oxygen and carbon dioxide in the pond during a day.

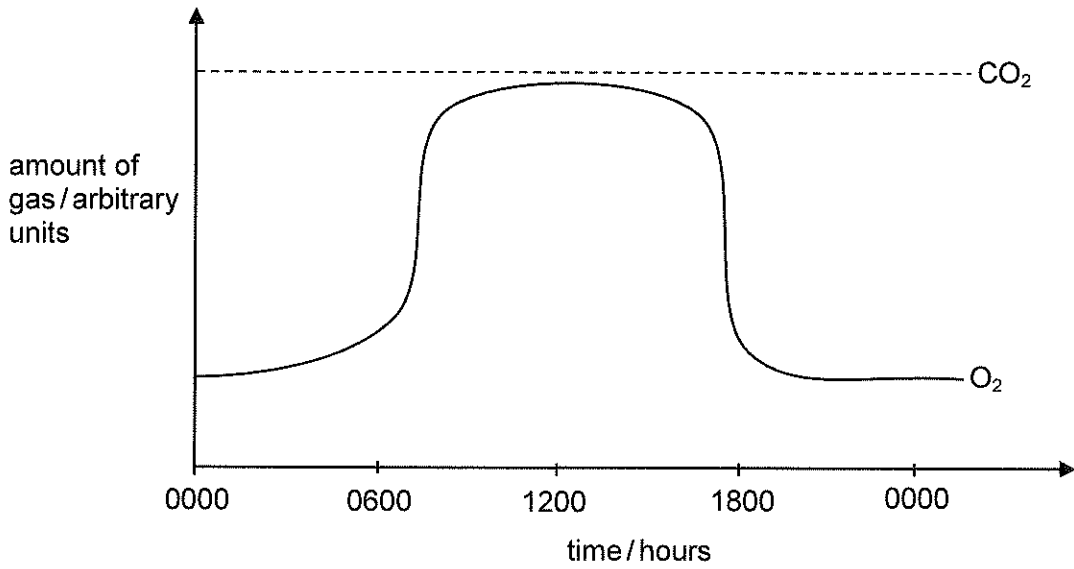


Fig. 12.1

- (a) Name the main process occurring in the plants at:

1200

0000

[2]

- (b) Explain the shape of the oxygen graph between 0600 hrs and 1200 hrs.

.....

[3]

- (c) Water plants are removed from the pond.

Explain how this will affect life in the pond.

.....

[2]

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