



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

CANDIDATE  
NAME

CENTRE  
NUMBER

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CANDIDATE  
NUMBER

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**COMBINED SCIENCE**

**5129/22**

Paper 2

**October/November 2013**

**2 hours 15 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.

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.

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

Electronic calculators may be used.

You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.

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

This document consists of **19** printed pages and **1** blank page.



1 Use words from the list to complete the following sentences.

Each word may be used once, more than once or not at all.

**arteries      capillaries      fibrinogen      heart**  
**lungs      plasma      platelets      red blood cells      valves**  
**veins      water      white blood cells**

Blood consists of three types of cells and .....

The ..... contain a chemical called haemoglobin which combines with oxygen.

Blood gains oxygen when it passes through blood vessels in the .....

In the muscles, blood loses oxygen when it passes through blood vessels called .....

Blood flows in only one direction because ..... are present. [5]

2 The following is a list of gases.

**carbon dioxide      carbon monoxide      chlorine      hydrogen**  
**nitrogen      nitrogen oxide      oxygen      sulphur dioxide**

Use the list to complete the following sentences.

Each gas may be used once, more than once or not at all.

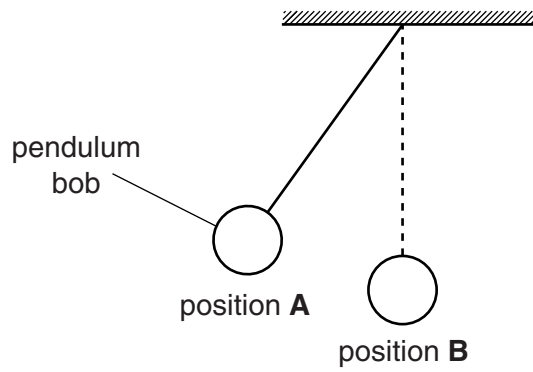
(a) The gas that displaces bromine from an aqueous solution of potassium bromide is ..... [1]

(b) ..... is a diatomic gas not present in polluted air. [1]

(c) The test for ..... is that it will relight a glowing splint. [1]

(d) The two gases which are reacted together to form ammonia are ..... and ..... [2]

3 Fig. 3.1 shows a swinging pendulum in two different positions **A** and **B**.



**Fig. 3.1**

At position **A**, the pendulum bob changes the direction in which it is moving.

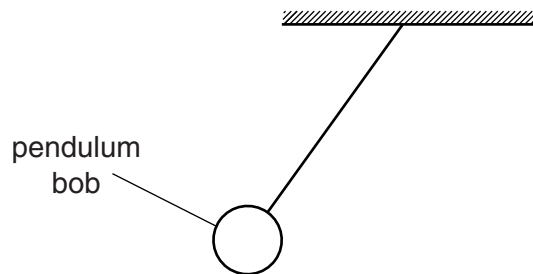
(a) A stopwatch is started when the pendulum is at position **A**.

The period of the pendulum is 1.0 s.

State the number of times that the pendulum passes through position **B** in the next 1.5 s.

number = ..... [1]

(b) Fig. 3.2 shows the pendulum in position **A**.



**Fig. 3.2**

On Fig. 3.2, draw an arrow to show the direction of the force of gravity on the pendulum bob. [1]

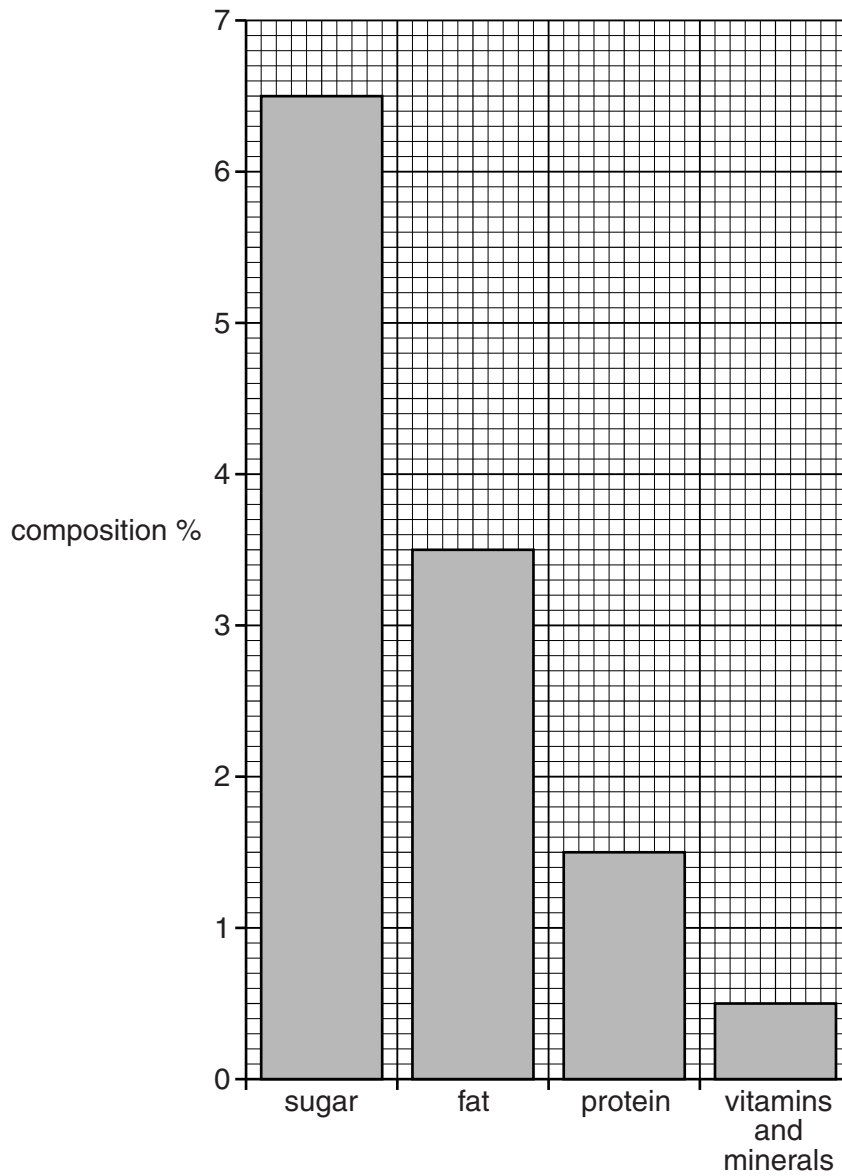
(c) The pendulum bob has a mass of 0.014 kg.

On Earth, the gravitational field strength  $g$  is 10 N/kg.

Calculate the weight of the pendulum bob.

weight = ..... N [1]

4 Fig. 4.1 shows the **percentage composition** of breast milk for four of five components.



**Fig. 4.1**

(a) The percentage for water is not shown on the graph.

Calculate the percentage water content of breast milk.

percentage water = .....% [2]

(b) State three ways in which breast feeding is better for a baby than bottle feeding with formula milk.

*For  
Examiner's  
Use*

1. ....

.....

2. ....

.....

3. ....

.....

[3]

- 5 Fig. 5.1 shows some properties of six atoms or ions, **A**, **B**, **C**, **D**, **E** and **F**.

The letters are not the symbols of the elements.

particle	protons	neutrons	electronic structure
<b>A</b>	6	8	2,4
<b>B</b>	8	8	2,6
<b>C</b>	11	12	2,8,1
<b>D</b>	12	12	2,8
<b>E</b>	17	18	2,8,8
<b>F</b>	18	22	2,8,8

**Fig. 5.1**

Use the letters **A–F** to answer the following.

Each letter may be used once, more than once, or not at all.

- (a) State the letter that represents

(i) a positive ion, .....

(ii) an alkali metal atom, .....

(iii) a noble gas atom. .... [3]

- (b) State the letters that represent atoms of elements in the third period of the Periodic Table.

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

- (c) State the letter that represents the element **X** that reacts with hydrogen to form a compound with the formula **XH<sub>2</sub>**.

..... [1]

6 In hydroelectric power stations, water falls from a higher to a lower level.

In one hydroelectric power station, a weight of 120 000 N of water falls through a vertical distance of 50 m.

(a) Calculate the change in gravitational potential energy of the water.

change = ..... J [2]

(b) The water is used to drive a turbine in the power station.

Assume that all the potential energy of the water drives the turbine for 2.0 minutes.

Use your answer from (a) to calculate the power input to the turbine.

power input = ..... unit ..... [3]

7 (a) Physical properties that change with temperature are used to measure temperature.

Name two suitable physical properties.

- 1. ....
  - 2. ....
- [2]

(b) A clinical thermometer usually has a greater sensitivity and a smaller range than a laboratory thermometer.

Explain what is meant by

*sensitivity*, .....  
.....  
..... [1]

*range*. .....  
.....  
..... [1]

8 Respiration in humans may be either aerobic or anaerobic.

Complete Table 8.1 by writing a ✓ or a ✗ in each box to compare the two types of respiration.

Use ✓ if the statement is true.

Use ✗ if the statement is false.

**Table 8.1**

statement	aerobic respiration	anaerobic respiration
produces lactic acid		
releases carbon dioxide		
releases energy		
uses glucose		
uses oxygen		

[5]



- 9 Table 9.1 shows the boiling points of some alkanes.

The general formula of alkanes is  $C_nH_{2n+2}$ .

For  
Examiner's  
Use

**Table 9.1**

alkane	molecular formula	boiling point/°C
butane	$C_4H_{10}$	0
pentane	$C_5H_{12}$	36
hexane		68
heptane	$C_7H_{16}$	
octane	$C_8H_{18}$	125

- (a) Complete Table 9.1 by

- (i) writing the molecular formula of hexane,  
(ii) estimating the boiling point of heptane.

[2]

- (b) The alkanes are a homologous series of compounds.

Describe the characteristics of a homologous series.

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

- (c) Ethane is the second member of the alkane homologous series and has a molecular formula  $C_2H_6$ .

- (i) Draw the structure of ethane.

[1]

- (ii) State the names of the products when ethane undergoes **complete** combustion.

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

10 Fig. 10.1 shows a small cork floating on the surface of a pond.

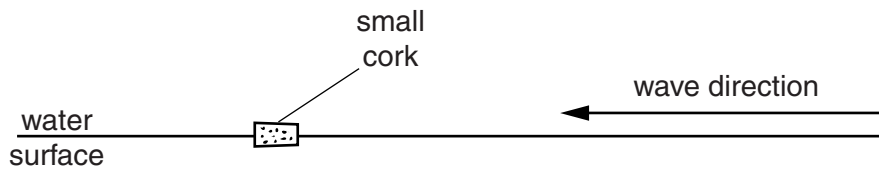


Fig. 10.1

A wave travels along the surface and makes the cork move.

(a) Which of the following describes the motion of the cork?

- left and right      left only      up and down      up only**

..... [1]

(b) Explain what is meant by the *amplitude* of a wave.

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

(c) The speed of the wave is 9.6 cm/s.

The wavelength is 7.2 cm.

Calculate the frequency of the wave.

frequency = ..... unit ..... [3]

11 Fig. 11.1 shows three reactions of dilute sulfuric acid.

For  
Examiner's  
Use

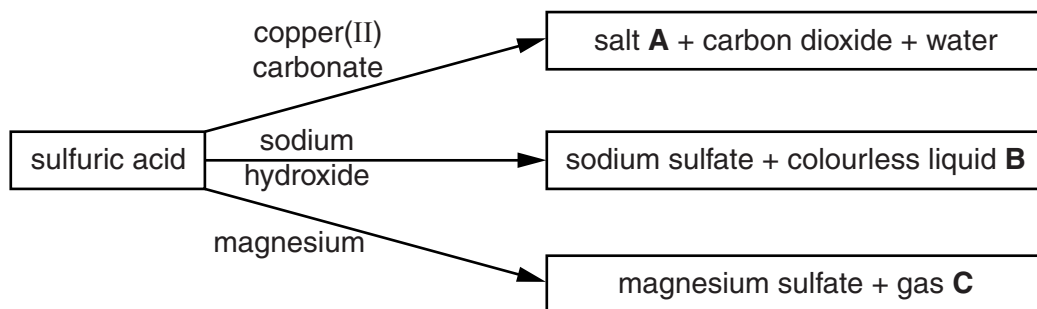


Fig. 11.1

(a) Identify **A**, **B** and **C**.

salt **A** .....

colourless liquid **B** .....

gas **C** .....

[3]

(b) State which of the three reactions can be performed using a pipette and burette.

..... [1]

(c) When Universal Indicator is added to dilute sulfuric acid the solution turns red.

(i) Suggest the pH of the solution. .... [1]

(ii) The formula for sulfuric acid is  $\text{H}_2\text{SO}_4$ .

State the formulae of the two different ions present in dilute sulfuric acid.

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

12 Fig. 12.1 shows a section through a leaf cell.

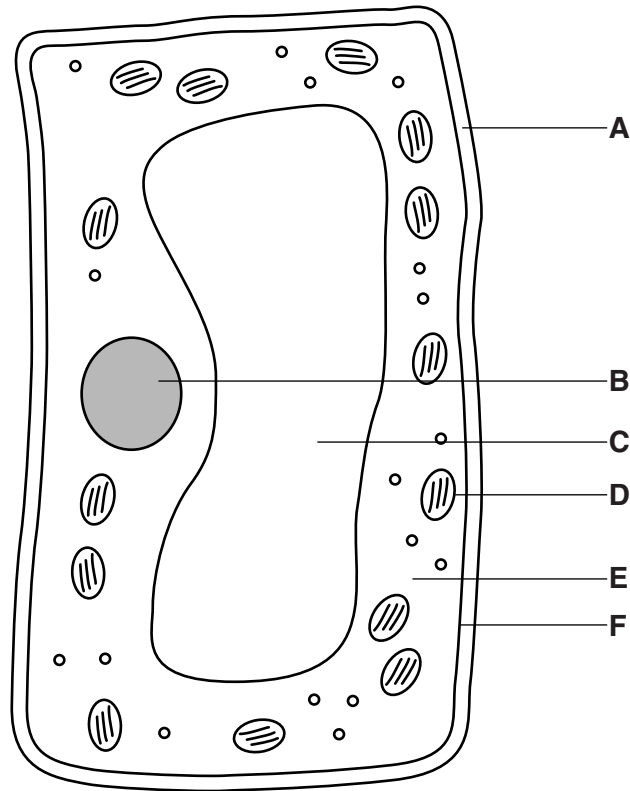


Fig. 12.1

(a) Three of the structures labelled in Fig. 12.1 are also present in animal cells.

State the three letters representing these structures and name the structures.

Write your answers in Table 12.1.

Table 12.1

letter	name

[3]

(b) State **two** ways in which the structure of a root hair cell is different from the structure of the leaf cell shown in Fig. 12.1.

*For  
Examiner's  
Use*

Explain the reason for each difference.

difference **one** .....

.....

explanation .....

.....

.....

.....

[3]

difference **two** .....

.....

explanation .....

.....

.....

.....

[3]

13 Some hairdryers do not have an earth wire. They are double insulated.

(a) Explain the meaning of *double insulation*.

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

(b) Explain the importance of

(i) the hairdryer having a plastic case and not a metal case,

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

(ii) not handling the hairdryer with wet hands.

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

(c) Complete the sentence below about energy changes in a hairdryer.

Electrical energy is changed into ..... energy and ..... energy. [2]

14 Fig. 14.1 shows a section through a leaf.

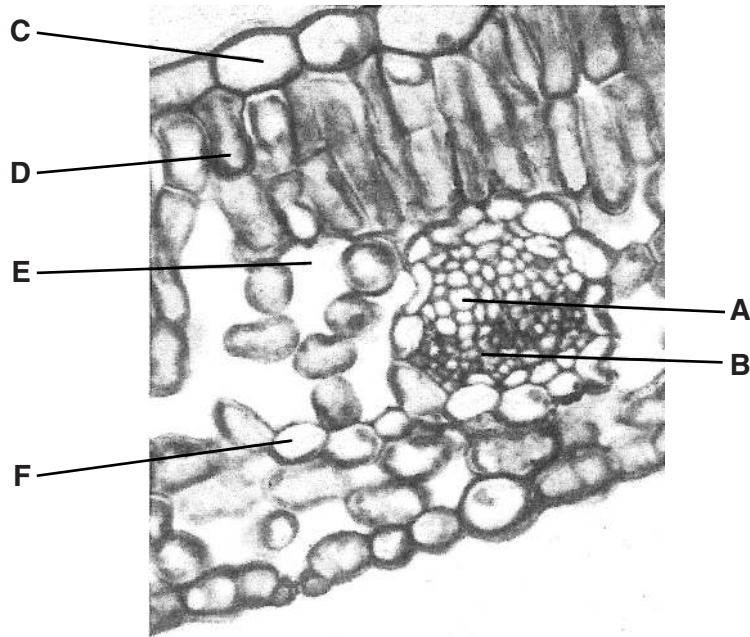


Fig. 14.1

(a) Use letters on Fig. 14.1 to identify

- (i) an air space, .....
- (ii) a palisade mesophyll cell, .....
- (iii) a xylem cell. ....

[3]

(b) A chemical present in chloroplasts enables the plant to carry out photosynthesis.

The process involves light energy.

(i) Name this chemical.

.....

[1]

(ii) State the form of the energy at the end of this process.

.....

[1]

(c) Name a process by which water vapour is lost from the leaf.

.....

[1]

15 Silane contains silicon and hydrogen and has the formula  $\text{SiH}_4$ .

Silicon is in Group IV of the Periodic Table.

(a) Complete Fig. 15.1 to show the arrangement of the outer shell electrons in a molecule of silane.

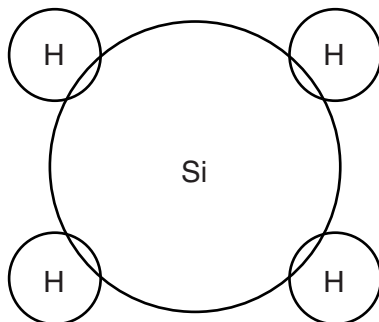
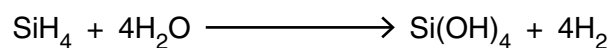


Fig. 15.1

[2]

(b) Silane reacts with water to form silicic acid and hydrogen.

The equation for the reaction is



The relative molecular mass,  $M_r$ , of silicic acid is 96.

[ $A_r$ : Si, 28; O, 16; H, 1]

Complete the following sentences.

..... g of silane produces 96 g of silicic acid and ..... g of hydrogen.

..... g of silane produces 9.6 g of silicic acid and ..... g of hydrogen.

..... g of silane produces 1.2 g of silicic acid.

[4]



16 An isotope of uranium is uranium-238 ( $^{238}_{92}\text{U}$ ).

(a) State the number of neutrons in a  $^{238}_{92}\text{U}$  nucleus. .... [1]

(b) A nucleus of  $^{238}_{92}\text{U}$  decays by emitting an alpha-particle to form a nucleus of thorium.

Determine the number of protons and the number of neutrons in this thorium nucleus.

protons .....

neutrons ..... [2]

(c) A sample of  $^{238}_{92}\text{U}$  has a half-life of 4.5 billion years and emits 10 000 alpha-particles per second.

Calculate the number of alpha-particles that this sample will emit per second after 13.5 billion years.

number = ..... [2]

(d) Alpha-particles, beta-particles and gamma-rays have different ionising powers.

Name the type of radioactive emission that is the least ionising.

..... [1]

17 (a) State one sign or symptom of gonorrhoea

(i) that occurs in **males** only,

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

(ii) that occurs in **females** only.

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

(b) State the treatment for gonorrhoea.

..... [1]

**18** Iron is a metal used to manufacture car bodies and machinery.

Iron can be prevented from rusting by galvanising.

(a) Explain what is meant by *galvanising*.

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

(b) State one other method used to prevent iron from rusting.

..... [1]

(c) State the two substances present in air that cause iron to rust.

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

**19** Electrons are charged particles.

State

(a) the sign of the charge on an electron, ..... [1]

(b) the unit of charge, ..... [1]

(c) the name given to rate of flow of charge. .... [1]

**20** Ultraviolet radiation is a component of the electromagnetic spectrum.

(a) State the name given to another component of the electromagnetic spectrum with frequencies higher than ultraviolet radiation.

..... [1]

(b) All electromagnetic waves are transverse.

State an example of a longitudinal wave.

..... [1]

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## DATA SHEET The Periodic Table of the Elements

		Group																																			
		I	II	III	IV	V	VI	VII	0																												
		<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="text-align: center;">1 <b>H</b> Hydrogen 1</td> </tr> </table>										1 <b>H</b> Hydrogen 1																									
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7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4																																				
23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12	11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	14 <b>N</b> Nitrogen 7	16 <b>O</b> Oxygen 8	19 <b>F</b> Fluorine 9	20 <b>Ne</b> Neon 10																														
39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	27 <b>Al</b> Aluminium 13	28 <b>Si</b> Silicon 14	31 <b>P</b> Phosphorus 15	32 <b>S</b> Sulfur 16	35.5 <b>Cl</b> Chlorine 17	40 <b>Ar</b> Argon 18																														
85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	65 <b>Zn</b> Zinc 30	64 <b>Cu</b> Copper 29	59 <b>Ni</b> Nickel 28	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	84 <b>Kr</b> Krypton 36																													
133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	112 <b>Cd</b> Cadmium 48	108 <b>Ag</b> Silver 47	106 <b>Pd</b> Palladium 46	119 <b>Sn</b> Tin 50	122 <b>Sb</b> Antimony 51	128 <b>Te</b> Tellurium 52	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54																												
223 <b>Fr</b> Francium 87	226 <b>Ra</b> Radium 88	201 <b>Hg</b> Mercury 80	197 <b>Au</b> Gold 79	195 <b>Pt</b> Platinum 78	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	209 <b>Po</b> Polonium 84	210 <b>At</b> Astatine 85	222 <b>Rn</b> Radon 86																												
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a	<b>X</b>
b	†

a = relative atomic mass  
 X = atomic symbol  
 b = atomic (proton) number

\* 58–71 Lanthanoid series  
† 90–103 Actinoid series

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