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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6833645646

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.

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

For Examiner's Use

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**.

For Examiner's Use

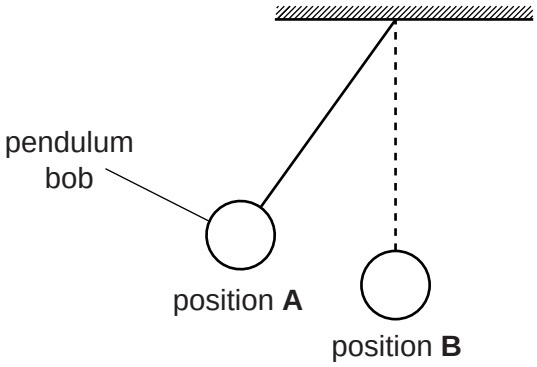

Fig. 3.1

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**.

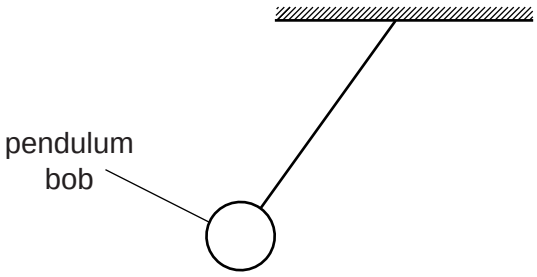

Fig. 3.2

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.

For Examiner's Use

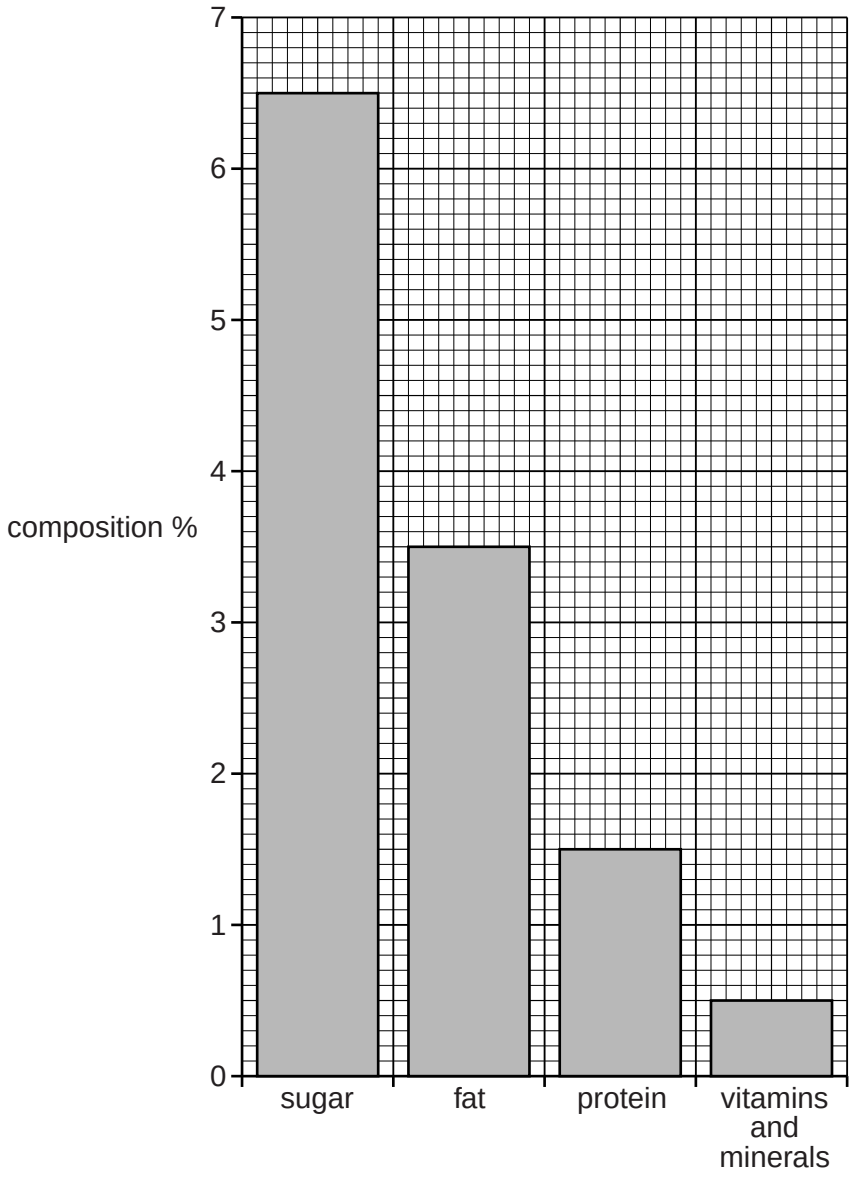

Fig. 4.1

(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**.

For Examiner's Use

The letters are not the symbols of the elements.

particle	protons	neutrons	electronic structure
A	6	8	2,4
B	8	8	2,6
C	11	12	2,8,1
D	12	12	2,8
E	17	18	2,8,8
F	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 $\mathbf{XH_2}$.

..... [1]

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

For Examiner's Use

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.

For Examiner's Use

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.

For Examiner's Use

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

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.

For Examiner's Use

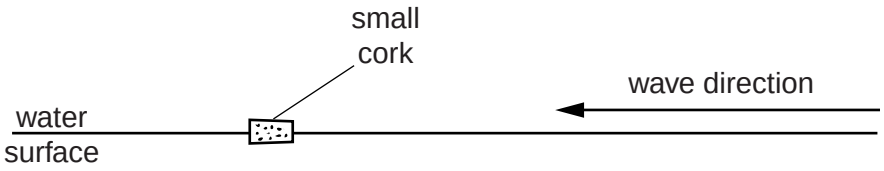

Fig. 10.1

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

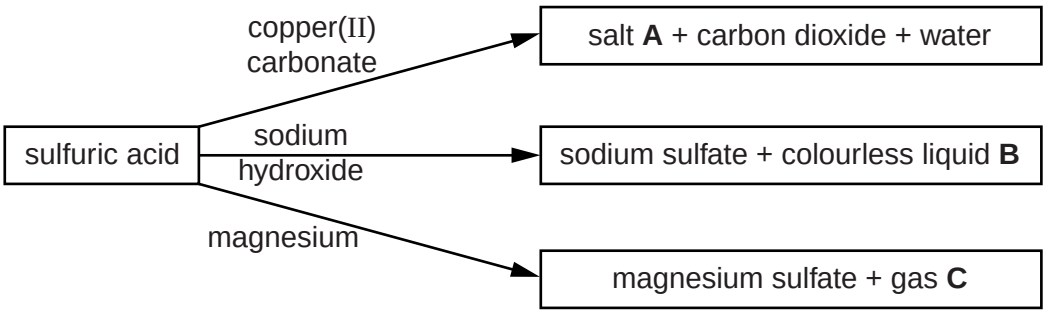

Fig. 11.1

(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 H_2SO_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.

For Examiner's Use

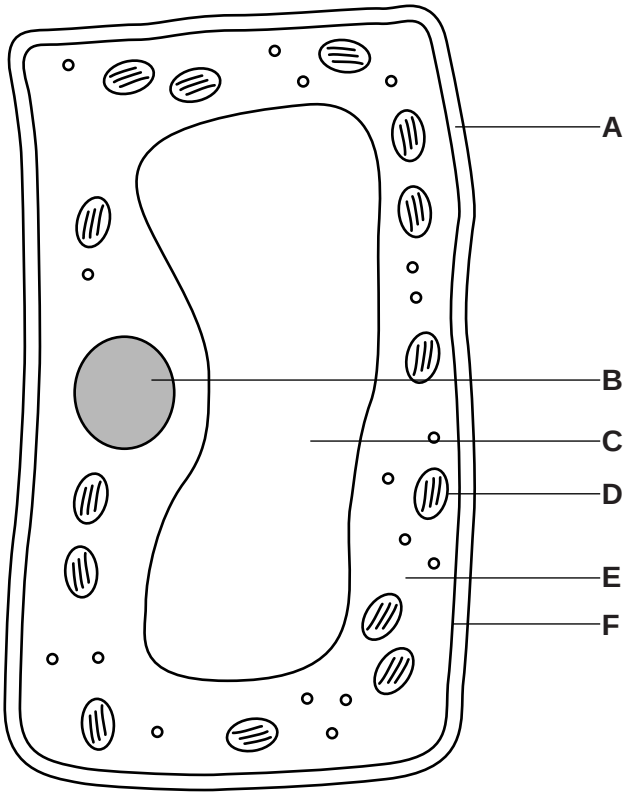

Fig. 12.1

(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.

For Examiner's Use

(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.

For Examiner's Use

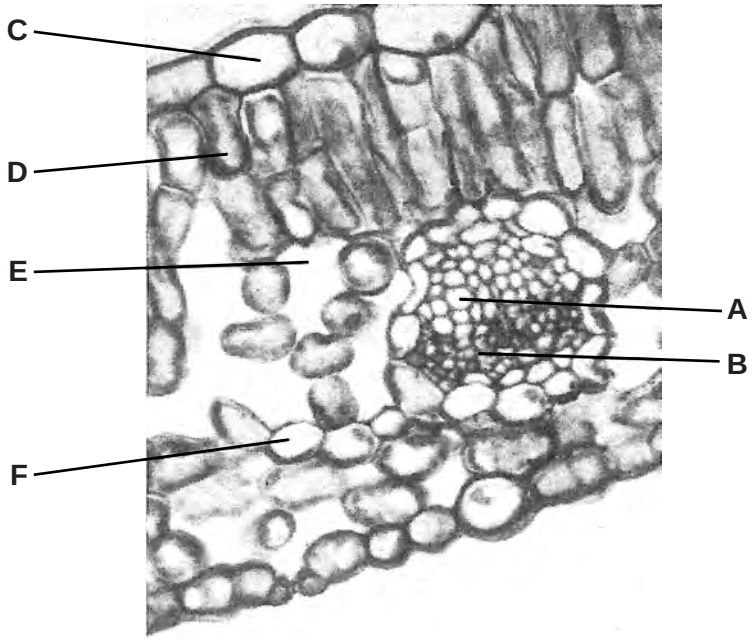

Fig. 14.1

(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 SiH_4.

For Examiner's Use

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.

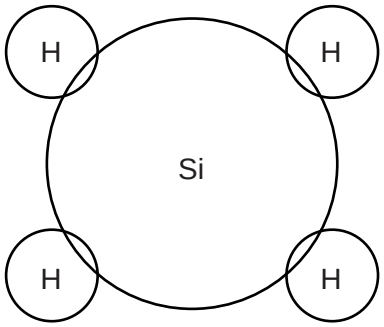

Fig. 15.1

[2]

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

The equation for the reaction is

$$SiH_4 + 4H_2O \longrightarrow Si(OH)_4 + 4H_2$$

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 ($^{238}_{92}U$).

For Examiner's Use

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

(b) A nucleus of $^{238}_{92}U$ 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 $^{238}_{92}U$ 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
							1 H Hydrogen 1									4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4										11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12										27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	209 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 †															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	147 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	231 Pa Protactinium 91	238 U Uranium 92	237 Np Neptunium 93	244 Pu Plutonium 94	243 Am Americium 95	247 Cm Curium 96	247 Bk Berkelium 97	251 Cf Californium 98	252 Es Einsteinium 99	257 Fm Fermium 100	258 Md Mendelevium 101	259 No Nobelium 102	260 Lr Lawrencium 103

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

Key

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

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