UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

8492104199

COMBINED SCIENCE **0653/02**

Paper 2 (Core) **May/June 2008**

1 hour 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, tables 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.

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.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

This document consists of **20** printed pages.

UNIVERSITY of CAMBRIDGE International Examinations

For Examiner's Use

1 The Periodic Table shows all of the chemical elements arranged into groups and periods.

Fig. 1.1 shows part of the Periodic Table. The letters in this table are **not** the normal chemical symbols of the elements.

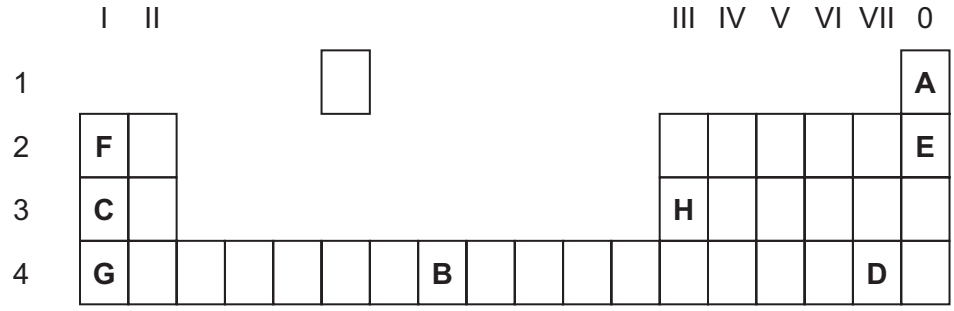


Fig. 1.1

(a) Complete the statements below using letters, chosen from **A** to **H**, which refer to elements in Fig. 1.1. Letters may be used once, more than once or not at all.

- The element shown as letter ..... is an alkali metal in period 3.
- The element shown as letter ..... is the noble gas with the lowest density.
- The three elements shown as letters ....., ... and ..... have very similar chemical properties to each other.
- The element shown as letter ..... is sometimes used as a catalyst. [4]

(b) The elements sodium and sulphur are both oxidised when they burn in air to produce sodium oxide and sulphur dioxide respectively.

(i) Explain the meaning of the term *oxidised*.

.....

..... [1]

For Examiner's Use

(ii) Sodium oxide reacts with water to form solution **P**.

Sulphur dioxide reacts with water to form solution **Q**.

Predict and explain the colour of Universal Indicator solution when added to **P** and **Q**.

colour in **P** .....

explanation .....

.....

colour in **Q** .....

explanation .....

..... [4]

(iii) Name the type of chemical reaction which occurs when solution **P** is added to solution **Q**.

..... [1]

2 Fig. 2.1 shows the structure of the human thorax (seen from the front).

For Examiner's Use

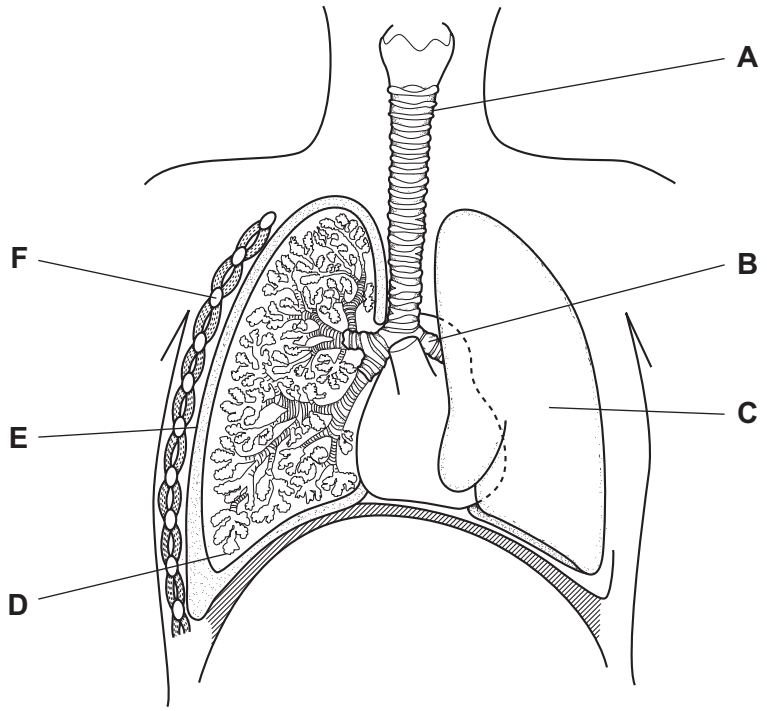


Fig. 2.1

(a) Give the **letter** of each of the following structures.

(i) the left bronchus .....

(ii) a pleural membrane .....

(iii) a place where there are goblet cells and cilia ..... [3]

(b) Gas exchange takes place in the alveoli. When a person smokes for a number of years, the walls of the alveoli start to break down. This is called emphysema.

(i) Name the process by which molecules of oxygen pass into the blood from the alveoli.

..... [1]

(ii) Explain why emphysema makes it more difficult for oxygen to get into the blood.

.....

.....

..... [2]

For Examiner's Use

(c) Oxygen is transported around the body in red blood cells. Fig. 2.2 is a diagram of a group of red blood cells.

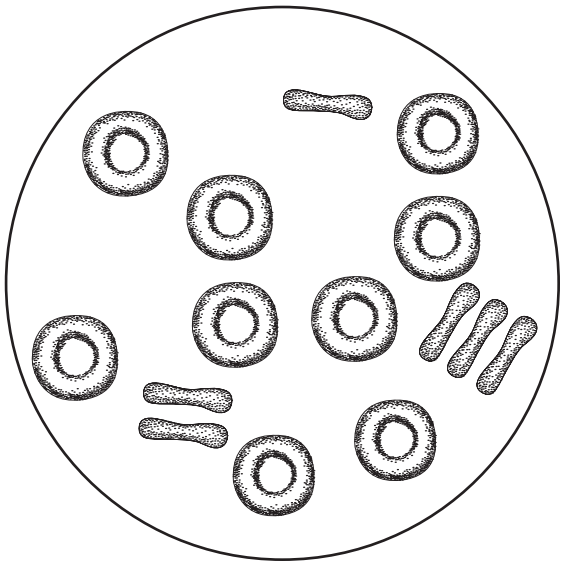


Fig. 2.2

(i) State **one** difference, apart from their colour, between the appearance of red blood cells and white blood cells.

..... [1]

(ii) What makes red blood cells look red?

..... [1]

(d) Explain why body cells need a constant supply of oxygen.

.....

.....

..... [2]

For Examiner's Use

3 A man drives a golf ball with his club and it flies through the air for nearly 200 metres.

(a) (i) State the form of energy given to the ball by the club when the ball is hit.

.....

[1]

(ii) State the type of energy gained by the ball as it rises into the air after being hit.

.....

[1]

(b) As the golfer moves around the course in a golf cart, his movement is measured. The measurements are plotted on the graph in Fig. 3.1.

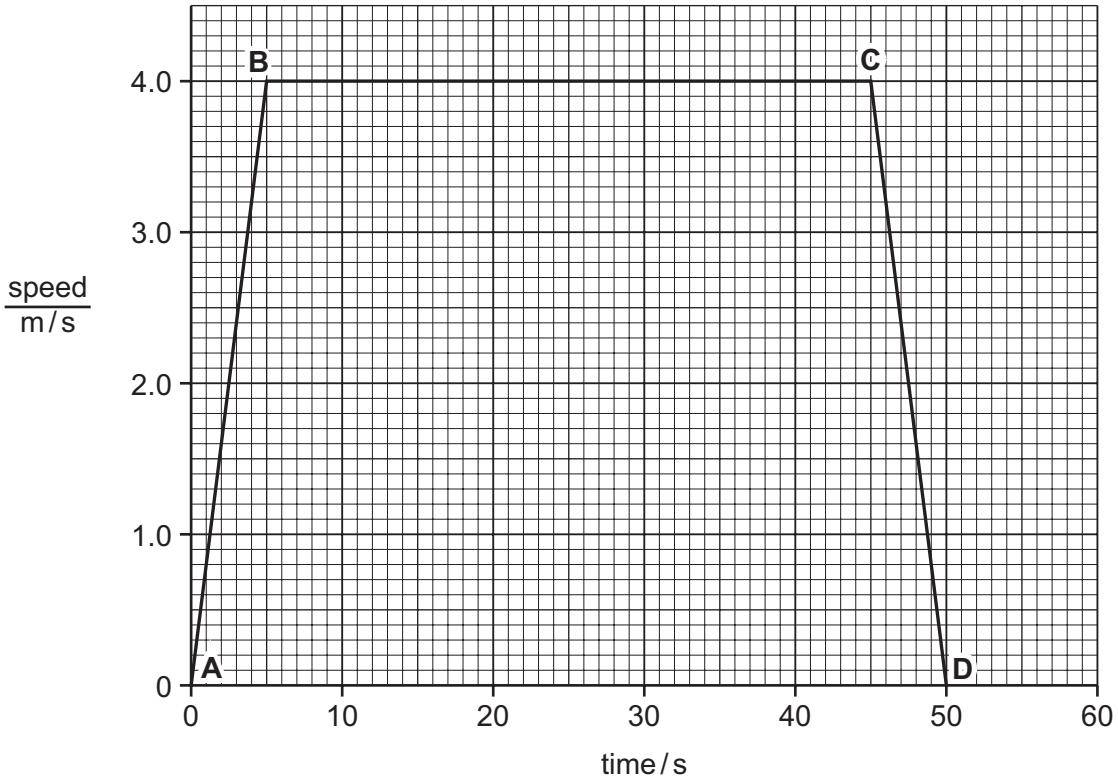


Fig. 3.1

(i) Describe what is happening between

A – **B**

.....

B – **C**

.....

C – **D**

.....

[3]

(ii) What is the speed of the cart after 3 seconds?

..... m/s [1]

For Examiner's Use

(c) The golfer hits the ball along the ground. It travels 6 m in 3 s.

Calculate the average speed of the ball.

State the formula that you use and show your working.

formula

working

..... m/s [2]

(d) The golfer's bag of clubs has a mass of 6 kg.

(i) Calculate the weight of the bag of clubs.

Assume that the gravitational field strength on Earth is 10 N/kg.

..... N [1]

(ii) Calculate the work done by the golfer when the bag is lifted 0.5 m.

State the formula that you use and show your working.

formula

working

..... J [2]

For Examiner's Use

4 Kerosene is a mixture of hydrocarbons used as a fuel for aircraft and for lighting and cooking.

(a) Kerosene is obtained from petroleum (crude oil) and is a liquid which boils in the range 150 °C – 200 °C.

(i) Name the process used to separate kerosene from petroleum.

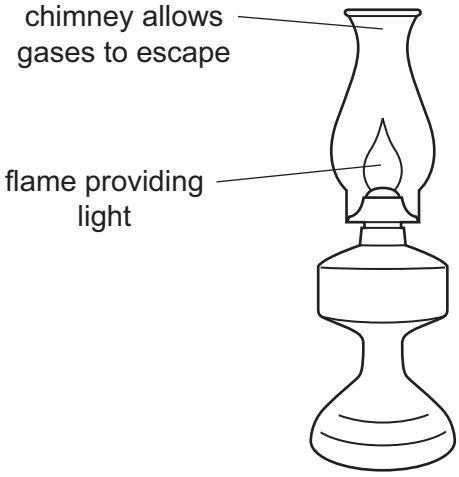
..... [1]

(ii) State the important difference between the various compounds in petroleum which enables them to be separated by the process you have named in **(i)**.

..... [1]

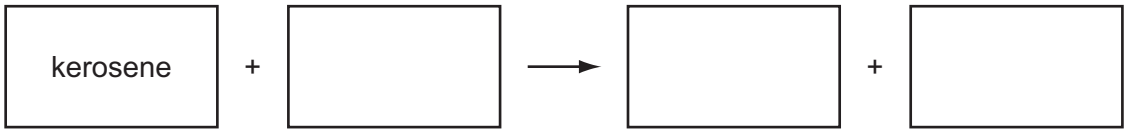
(b) The light from a kerosene lamp is provided by the flame produced when kerosene burns in air.

The lamp must be carefully designed and operated to ensure that most of the kerosene undergoes complete combustion.



kerosene lamp

(i) Complete the **word** chemical equation for the complete combustion of kerosene.



[2]

For Examiner's Use

(ii) Describe **one** observation which shows that the reaction occurring in the kerosene lamp is exothermic.

.....

.....

..... [1]

(c) The full chemical symbol for carbon is shown below.

$$^{12}_{6}C$$

Draw a diagram of a carbon atom. Label the nucleus and show the full electron configuration.

[2]

For Examiner's Use

5 Fig. 5.1 shows the quantity of carbon dioxide that was emitted to the atmosphere by a large industrial company, between 2000 and 2005.

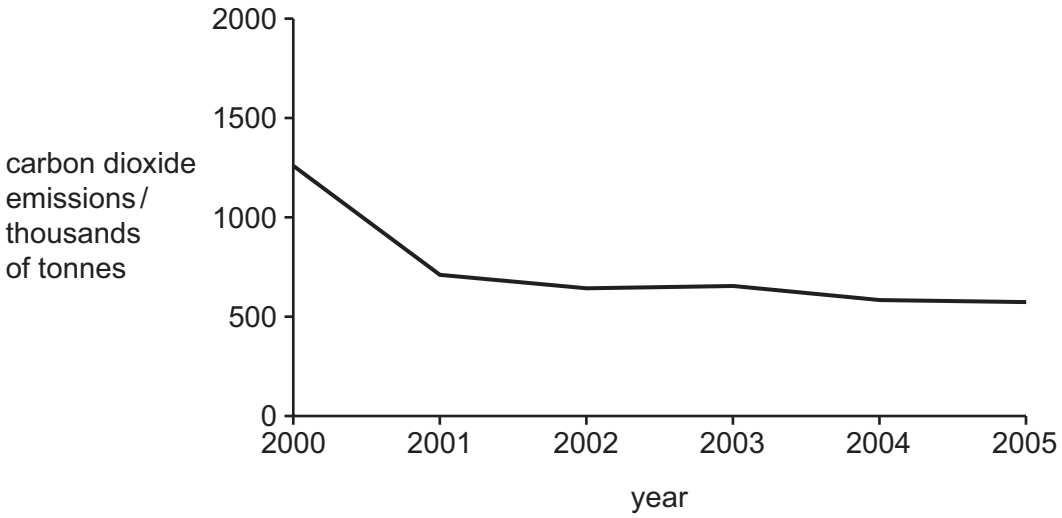


Fig. 5.1

(a) Describe how the company's carbon dioxide emissions changed between 2000 and 2005.

.....

.....

..... [2]

(b) The company stated that these carbon dioxide emissions included those relating to the electricity that it used.

Explain how using electricity can be responsible for emissions of carbon dioxide.

.....

.....

..... [2]

(c) Apart from using less electricity, suggest **one** other way that the company could reduce its carbon dioxide emissions.

.....

..... [1]

(d) In 1997, at a meeting in the city of Kyoto in Japan, many countries in the world signed an agreement to reduce their emissions of carbon dioxide. The agreement came into force in 2005.

Explain why we need to reduce emissions of carbon dioxide.

.....

.....

..... [2]

(e) Tropical rainforests can help to combat rising levels of carbon dioxide, because they take it from the air and use it in photosynthesis.

Describe **one** other reason why we should try to conserve tropical rainforests.

.....

.....

..... [2]

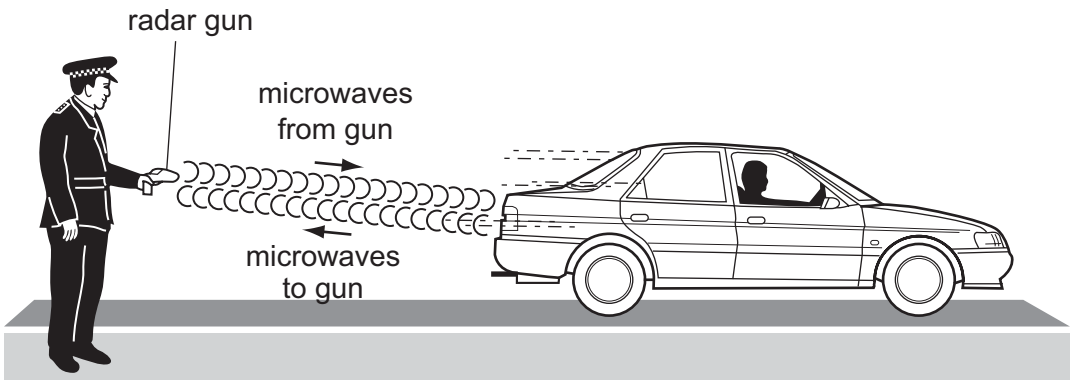
[Turn over

For Examiner's Use

6 **(a)** A policeman is using a radar gun to measure the speed of a car.

The radar gun emits microwaves which hit the moving car and bounce back to a receiver in the radar gun.

A computer in the radar gun calculates the speed of the car.



(i) What type of waves are microwaves?

..... [1]

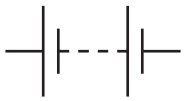
(ii) The waves bounce off the car back towards the radar gun. What is this process called?

..... [1]

(b) A car has two headlamps and two rear lamps. All four lamps are connected in parallel with each other across a 12 V battery.

(i) Complete the circuit diagram below to show how the four lamps are connected to the battery. Include one switch in your circuit which will control all four lamps.

12 V



[2]

(ii) If the filament in one lamp breaks, the other three stay lit. Explain why this happens.

.....

..... [1]

(c) Fig. 6.1 shows a spring. The spring is 10 cm long. A metal nut is hung on the spring and the length is now 13 cm.

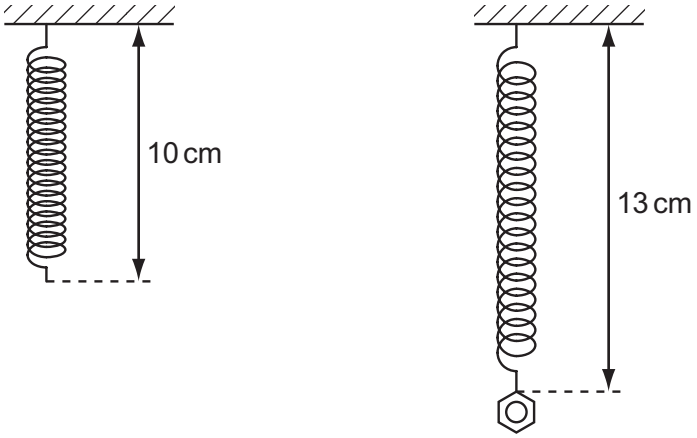


Fig. 6.1

Calculate the length of the spring if 3 **more** identical nuts are hung on the spring.

Show your working.

..... cm [2]

For Examiner's Use

7 **(a)** Draw lines to link each term to its definition.

term	definition
cell membrane	a green pigment found in some plant cells, which absorbs energy from sunlight
chlorophyll	a partially permeable layer surrounding a cell
cell wall	a fully permeable layer surrounding a plant cell
chloroplast	an organelle found in some plant cells, where photosynthesis takes place

[3]

(b) Plant leaves often contain starch, which is produced during photosynthesis.

Describe how the starch is produced.

.....

.....

.....

..... [2]

(c) Fig. 7.1 shows one of the ways in which a plant called *Bryophyllum* reproduces. It grows new plantlets from its leaves.

For Examiner's Use

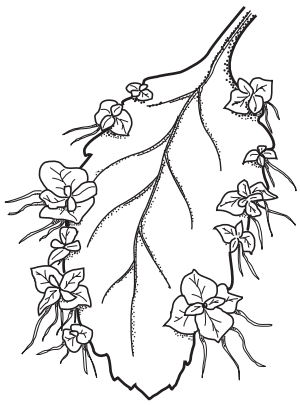


Fig. 7.1

(i) Name the type of reproduction that is taking place.

..... [1]

(ii) The new plants that are produced are clones of the parent plant.

Explain what is meant by the term *clone*.

.....

.....

..... [2]

For Examiner's Use

8 **(a)** A student wrote down some properties of alpha, beta and gamma radiations.

Draw a line from each property to the correct radiation.

stopped by paper	alpha
contains negatively charged particles	
passes through several centimetres of lead	beta
passes through paper but stopped by a few millimetres of aluminium	
has no mass	gamma

[3]

(b) **(i)** Gamma radiation can be used to sterilise surgical instruments. What property of gamma radiation makes it suitable for this purpose?

.....

[1]

(ii) State **one** other use for radiation from a radioactive source.

.....

.....

[1]

(c) In an experiment a radiation detector was set up and used to measure background radiation. The background radiation in the laboratory was found to be 40 counts per minute.

(i) What is *background radiation*?

.....

.....

[1]

(ii) State **one** source of background radiation.

.....

[1]

(iii) A radioactive source was placed near the detector and a reading of 1200 counts per minute was recorded. What was the count rate of the radioactive source?

..... counts per minute [1]

For Examiner's Use

9 Fig. 9.1 shows apparatus which can be used to reduce copper oxide to copper.

Copper oxide is a black powder and during the reaction metallic copper forms inside the reaction tube.

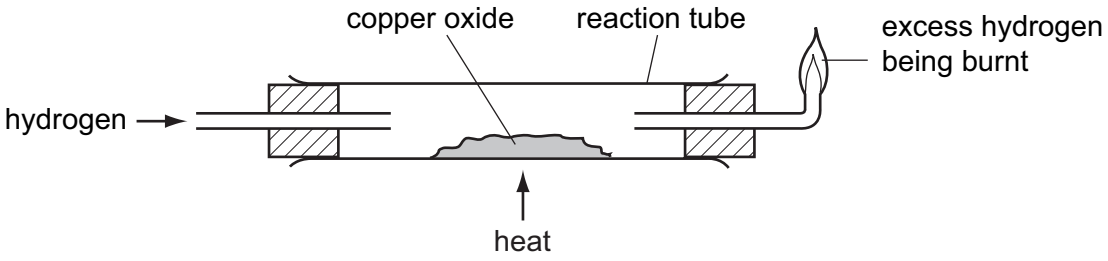
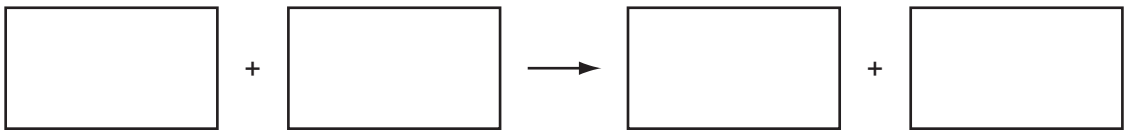


Fig. 9.1

(a) (i) Select from the list of substances below to complete the word equation for the reaction in Fig. 9.1.

air	**copper**	**copper oxide**
hydrogen	**oxygen**	**water**



[1]

(ii) Describe **one** piece of evidence which would show that copper had been formed in this reaction.

.....

..... [1]

(b) When a student carried out the reaction in Fig. 9.1 she realised the material left inside the reaction tube was a mixture of metallic copper and unreacted copper oxide.

In order to separate the metallic copper, she stirred the material from the reaction tube with warm dilute sulphuric acid for several minutes. She then filtered the mixture as shown in Fig. 9.2.

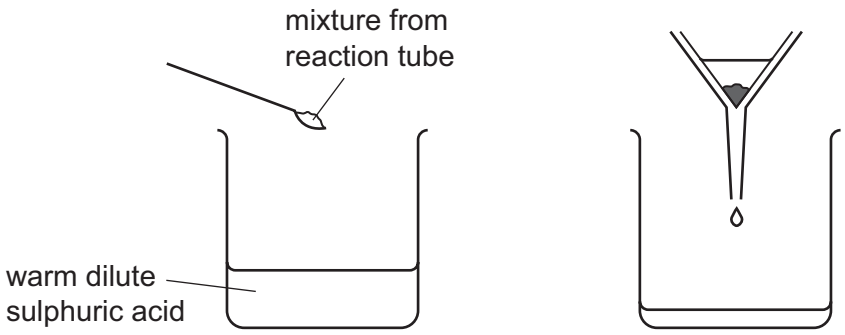


Fig. 9.2

(i) Name the copper compound formed when sulphuric acid reacts with copper oxide.

..... [1]

(ii) The copper compound you have named in **(i)** is soluble.

Explain why the method shown in Fig. 9.2 is successful in separating metallic copper from the original mixture of copper and copper oxide.

.....

.....

.....

..... [2]

(c) Copper oxide is a compound of a metal and a non-metal.

(i) Name the type of chemical bonding in copper oxide.

..... [1]

(ii) Explain why there is a strong force of attraction between the copper and oxide particles in copper oxide.

.....

.....

..... [2]

(d) Metallic copper can also be obtained by electrolysis.

For Examiner's Use

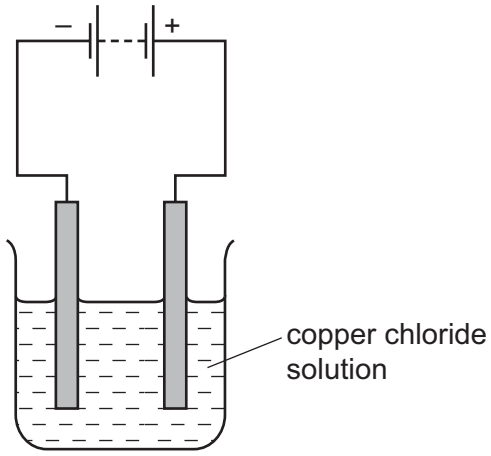


Fig. 9.3

Describe what would be seen at each of the electrodes when the electrolysis shown in Fig. 9.3 is carried out.

at the positive electrode

.....

at the negative electrode

..... [2]

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** Sulphur 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	**Po** Polonium 84	**At** Astatine 85	**Rn** Radon 86
Fr Francium 87	226 **Ra** Radium 88	227 **Ac** Actinium 89 †															

*58-71 Lanthanoid series	140 **Ce** Cerium 58	141 **Pr** Praseodymium 59	144 **Nd** Neodymium 60	**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
†90-103 Actinoid series	232 **Th** Thorium 90	**Pa** Protactinium 91	238 **U** Uranium 92	**Np** Neptunium 93	**Pu** Plutonium 94	**Am** Americium 95	**Cm** Curium 96	**Bk** Berkelium 97	**Cf** Californium 98	**Es** Einsteinium 99	**Fm** Fermium 100	**Md** Mendelevium 101	**No** Nobelium 102	**Lr** Lawrencium 103

Key: a **X** b

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

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