CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

ADDITIONAL COMBINED SCIENCE   **5130/02**

Paper 2

October/November 2003

2 hours 15 minutes

Additional Materials: Answer paper

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.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer **one** part of each of the three questions.
Write your answers on the separate answer paper provided.

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

For Examiner's Use	
Section A	
11	
12	
13	
TOTAL	

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

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Local Examinations Syndicate

[Turn over

Section A

Answer **all** the questions.

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

1   Some of these statements are true and others are not true.

Put a tick against the statements that are true.

Brass is a chemical compound.

Ammonia is produced in the Haber process.

The rate of a reaction increases with increase in temperature.

Sodium chloride has covalent bonding.

Nitrogen is a noble gas.

A sodium atom has 11 electrons.

[3]

2   A potted plant was left in a sunny place for ten hours. The plant was **not** watered during this time.

The diagram, Fig. 2.1, shows how the shape of stomata on the leaves of this plant changed with time.

time / hours
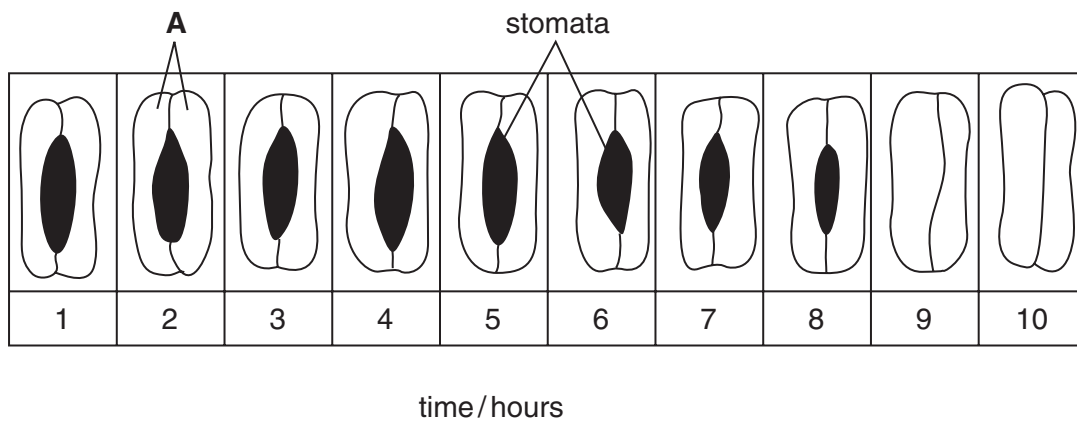
Fig. 2.1

(a) (i) Describe the function of stomata.

....

....

....[2]

(ii) After a few hours the stomata gradually decreased in size.

How did this help the plant?

....

....

....[2]

(b) Suggest how the appearance of the whole plant changed during this investigation.

....[1]

(c) The stomata decreased in size because the cells marked **A** lost water to the surrounding cells of the leaf by the process of osmosis.

(i) Name the cells marked **A**.

....[1]

(ii) What happens during osmosis?

....

....

....[2]

[Turn over

3 The diagram, Fig. 3.1, shows a blast furnace used for the production of iron.

waste gases

raw materials
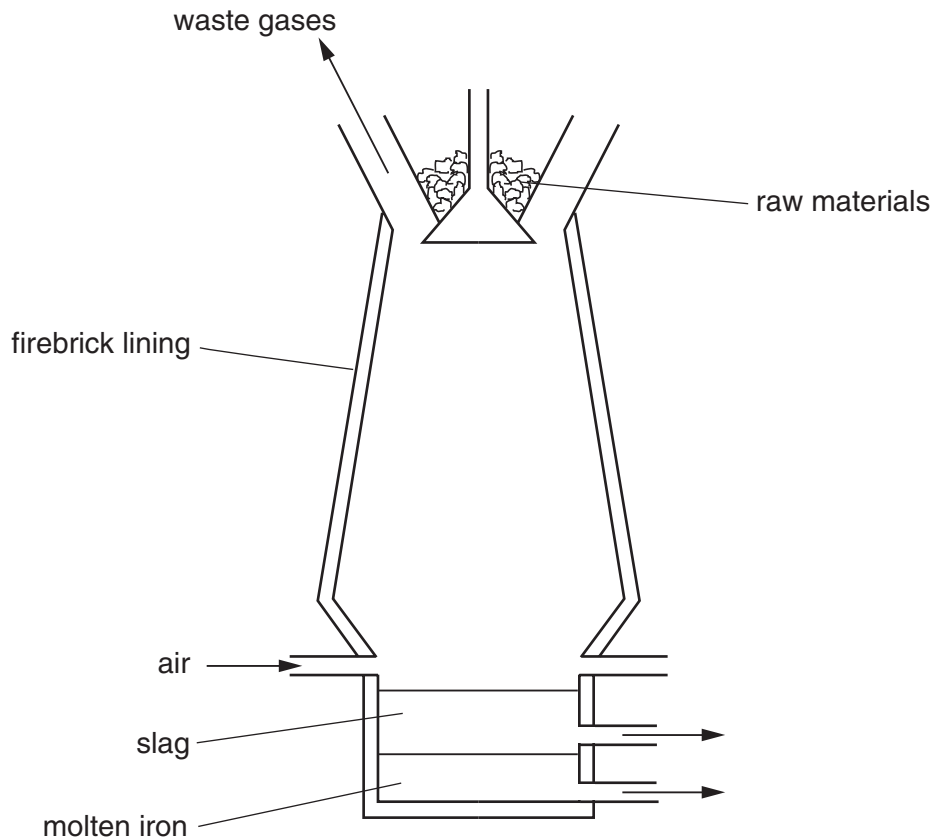
firebrick lining

air

slag

molten iron

Fig. 3.1

(a) Iron ore, haematite, enters at the top of the blast furnace.

Name the two other raw materials entering at the top of the blast furnace.

1 ....

2 ....[2]

(b) (i) In the blast furnace name the materials that react to form slag.

....[1]

(ii) Why is the formation of slag important in the extraction of iron from haematite?

....[1]

(c) This equation shows how iron is formed from haematite.

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$
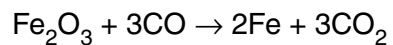
(i) Explain how the carbon monoxide in this reaction is formed.

....

....

....[2]

(ii) Calculate the mass of iron, in kg, extracted from each tonne of iron oxide.

(1 tonne = 1000 kg)

mass = ... kg   [3]

[Turn over

4   A man connects a fused 13A plug to an air conditioning unit.

The diagram, Fig. 4.1, shows the wiring in this plug.

Fig. 4.1

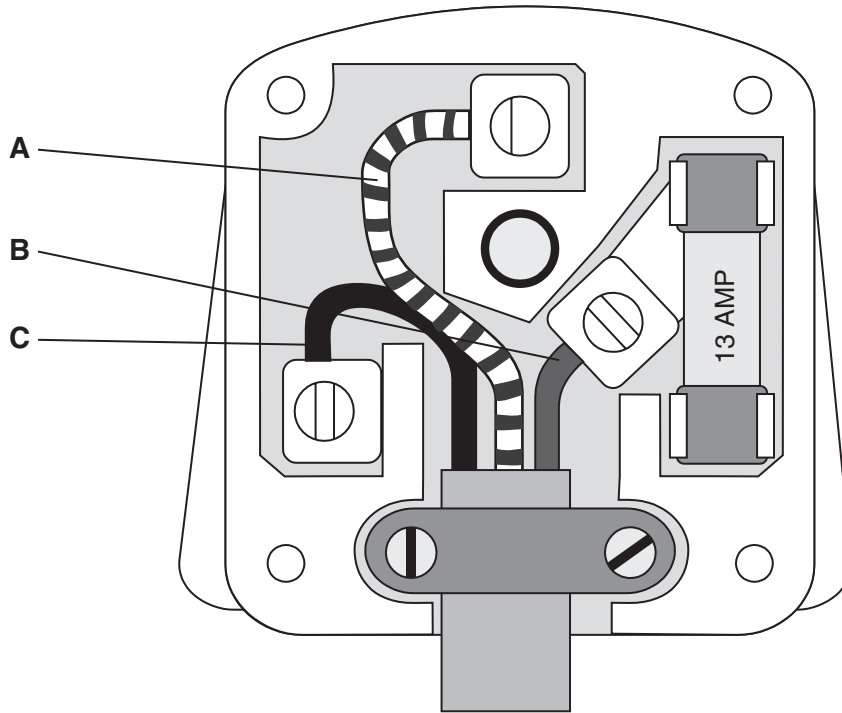(a) State the name and colour of each of the three wires labelled **A**, **B** and **C**.

wire	name	colour
A		
B		
C		

[3]

(b) Why is the fuse connected to wire **B**?

....

....

....[3]

(c) The air conditioning unit has a power rating of 500 W.

The cost of electricity is 8 cents per kilowatt hour.

Calculate the cost of running this air conditioning unit for 24 hours.

cost = ... cents   [3]

[Turn over

5 In an investigation, the size of the pupil in a person's eye is measured in different conditions of light intensity.
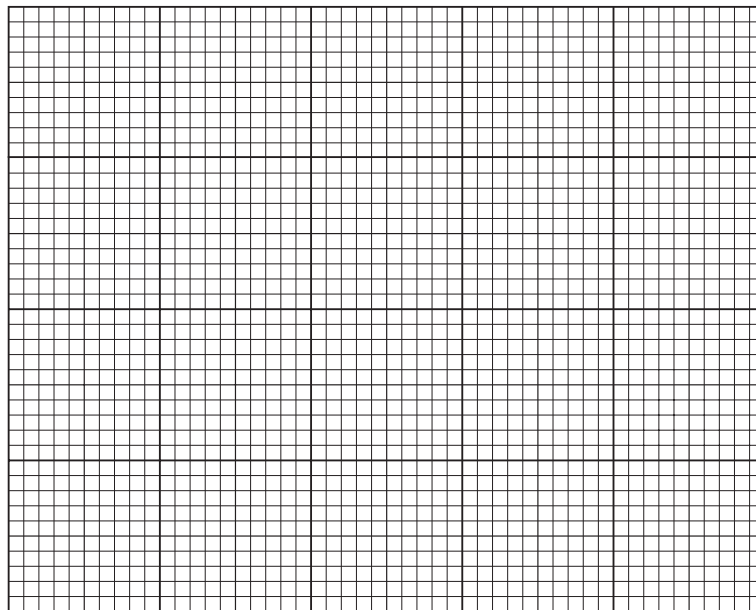
The results of this investigation are shown in the table in Fig. 5.1.

light intensity (arbitrary units)	size of pupil in mm
10	4.0
20	2.8
30	2.1
40	1.6
50	1.3

Fig. 5.1

(a) Plot a graph of light intensity (horizontal axis) against pupil size.

Draw a curve through the points.

[4]

(b) (i) Use your graph to find the size of the person's pupil when the light intensity is 25 units.

....[1]

(ii) From the graph describe how the size of the pupil is related to light intensity.

....

....

....[2]

  (iii) Explain how a relay neurone is involved in this response of the eye.

  ....

  ....

  ....[2]

(c) Name the parts of the eye that perform the following functions.

  (i) detecting light

  ....[1]

  (ii) focusing light

  ....[1]

[Turn over

6 The diagram, Fig. 6.1, shows the separation of crude oil.
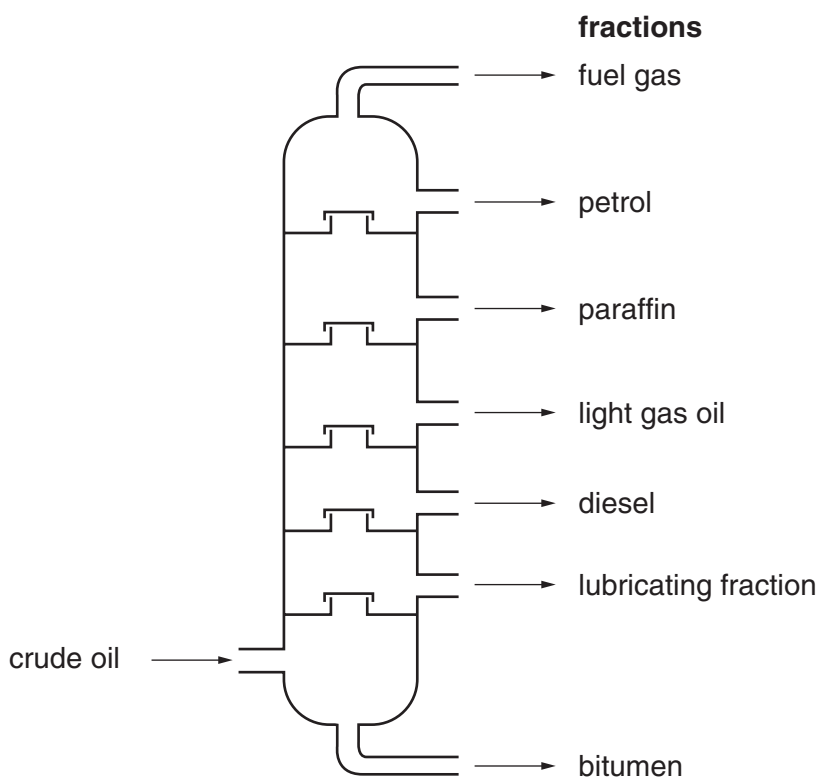
fractions

Fig. 6.1

(a) What is the name of this process?

....[2]

(b) Choose **three** of the fractions shown in Fig. 6.1.

Describe a different use for each.

fraction ....

use ....

fraction ....

use ....

fraction ....

use ....[3]

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[Turn over

7 The diagram, Fig. 7.1, shows an electrical circuit.
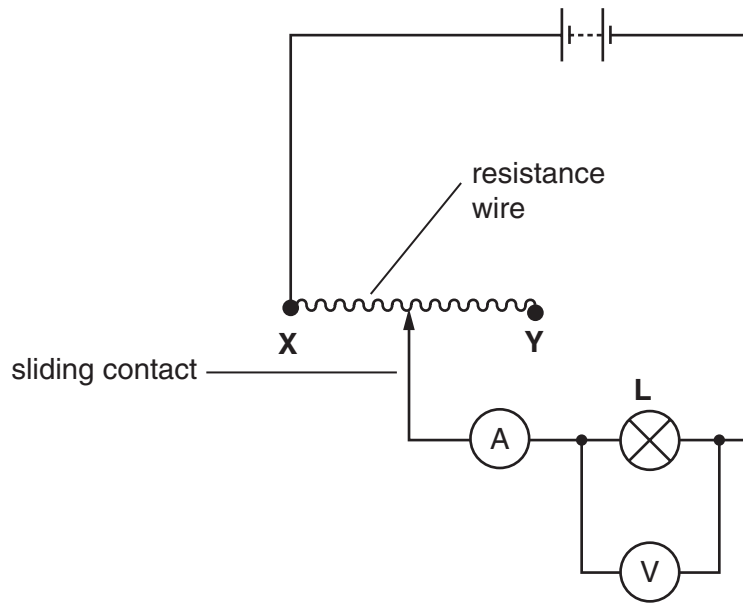

Fig. 7.1

(a) The ammeter reading is 1.8 A and the voltmeter reading is 3.0 V.

Calculate the resistance of the lamp **L**.

[3]

(b) The sliding contact is moved towards **Y** along the resistance wire.

What change would this cause to the

(i) ammeter reading,

....[1]

(ii) voltmeter reading,

....[1]

(iii) resistance of the lamp?

....[1]

(c) Explain your answers to **(b)(i)** and **(b)(ii)**.

....

....

....

....[3]

[Turn over

8 The diagram, Fig. 8.1, shows part of the human respiratory system.

A

B

C
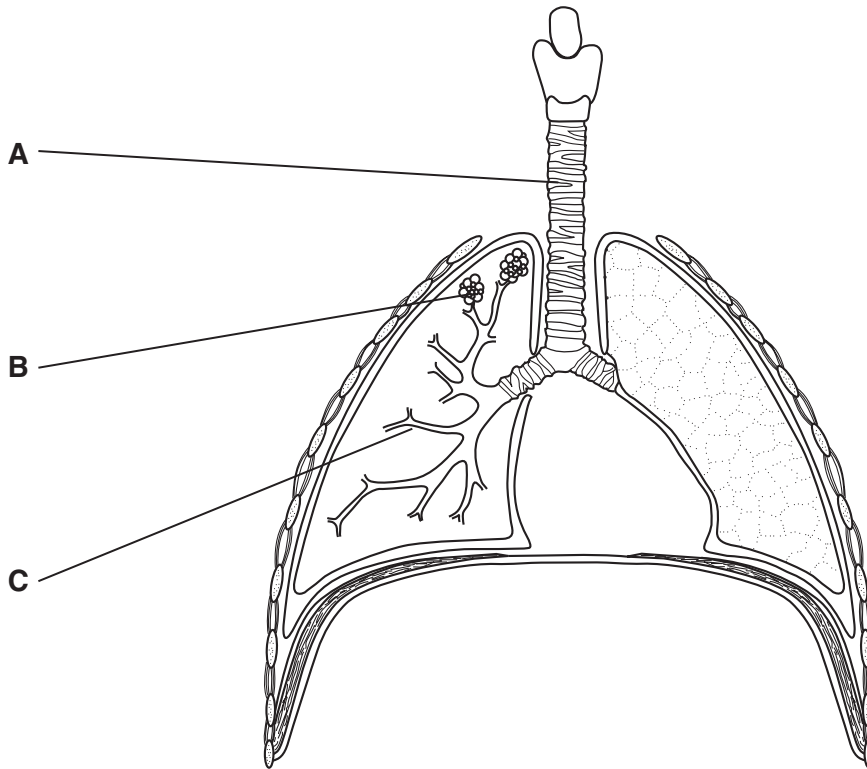
Fig. 8.1

(a) Name the parts labelled **A**, **B** and **C** on the diagram.

A ....

B ....

C ....[3]

(b) Describe the function of part **B**.

....

....

....[2]

9 The diagram, Fig. 9.1, shows the structure of diamond.
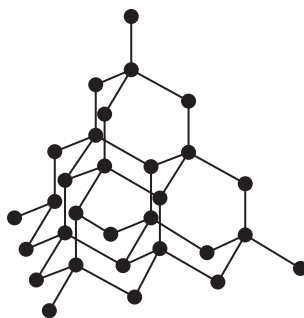
Fig. 9.1

(a) (i) Name the type of bonding present in diamond.

....[1]

(ii) Diamond is a solid with a very high melting point.

Use ideas about the bonding in diamond and its structure to explain this fact.

....

....

....[2]

(b) Silicon(IV) oxide and carbon dioxide both have the same type of bonding as diamond. Silicon(IV) oxide is a solid with similar properties to diamond, including a high melting point. Carbon dioxide is a gas at room temperature. Explain this difference.

....

....

....

....[3]

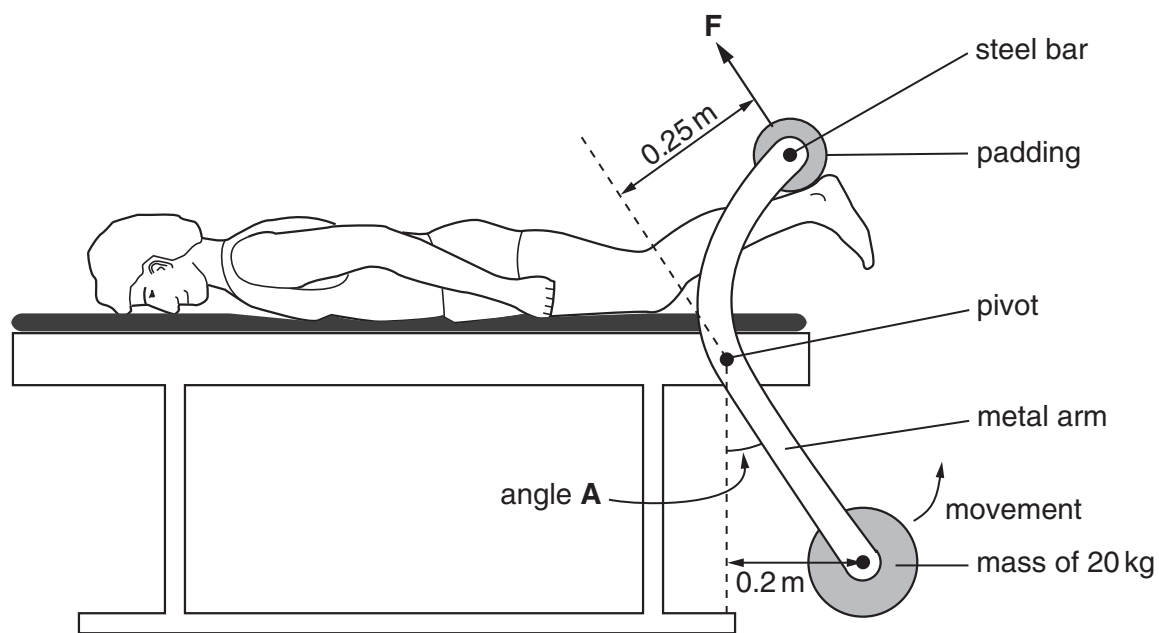**[Turn over**

10 Fig. 10.1 shows a man exercising.

Fig. 10.1

When he applies a force **F** to the steel bar with his heels the metal arm rotates at the pivot and angle **A** increases, lifting the mass of 20 kg.

He moves the metal arm until the 20 kg mass is in the position shown.

(a) As angle **A** increases more force is needed to hold the 20 kg mass in position.

Explain why this is so.

....

....

....[2]

(b) Calculate the force **F** applied by the man's heels to hold the mass in the position shown.

Use ideas about moments and the distances shown in the diagram in your calculation.

Ignore the mass of the metal arm.

(The force exerted by gravity on a 1 kg mass can be taken as 10 N.)

force = ... N   [3]

[Turn over

Section B

Answer **one** part, **(a)** or **(b)**, of each of the three questions.

Write your answers on the separate answer paper provided.

11 Either

(a) (i) Define the processes of sexual and asexual reproduction.
Describe pollination and fertilisation in a dicotyledonous flower. [8]

(ii) Plant growers sometimes propagate plants by producing seeds (sexual reproduction) and sometimes by taking cuttings (asexual reproduction).
Suggest **one** advantage for each method. [2]

Or

(b) (i) Describe the dual circulation of blood in humans in terms of the pressure and the functions of the two circulations. [4]

(ii) Describe how you would investigate the effect of exercise on pulse rate.
State and explain the results that you would expect. [6]

12 Either

(a) You are given four white powders and told that they are ammonium chloride, calcium carbonate, calcium chloride and zinc carbonate. You are not told which powder is which compound.
Describe the tests that you would carry out to identify each powder. [10]

Or

(b) (i) Define the terms *acid* and *alkali*.
Describe how you would demonstrate in the laboratory **two** characteristic chemical properties of an acid and **two** characteristic chemical properties of an alkali. [6]

(ii) Describe the use of the pH scale in the measurement of acidity and alkalinity. [4]

13 Either

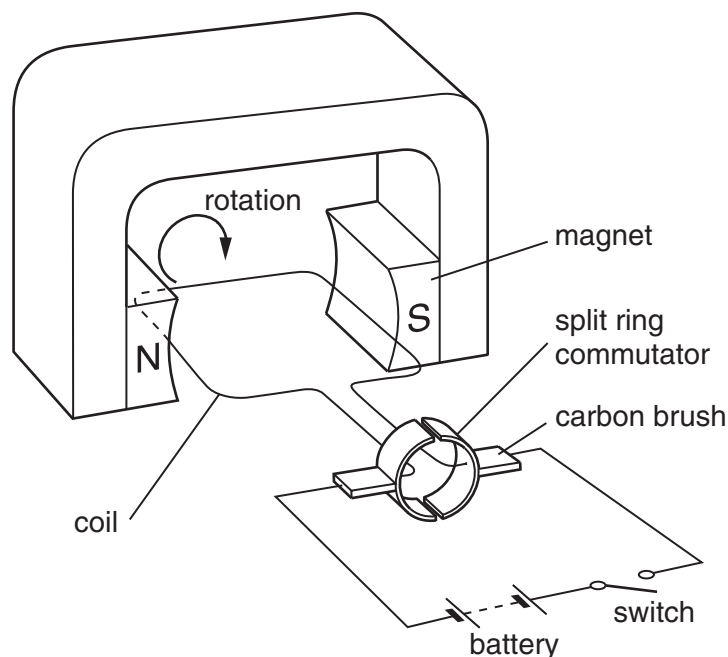**(a)** The diagram, Fig. 13.1, shows the main parts of a simple electric motor.

Fig. 13.1

  (i) Explain why the coil moves.
  Explain the function of the split-ring commutator. [6]

  (ii) Explain why the speed of the motor is increased by winding the coil onto a soft iron core.
  State and explain two other ways of increasing the speed of this electric motor. [4]

Or

(b) (i) Describe how you would determine the relative penetrating powers of radiation from alpha, beta and gamma sources in the laboratory.
Describe **two** other ways in which these radiations differ. [7]

  (ii) What safety measures should be used in the storage and use of these sources? [3]

[Turn over

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
†90-103 Actinoid 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
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 dm³ at room temperature and pressure (r.t.p.).