



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

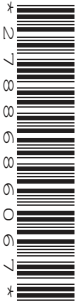
CANDIDATE
NAME

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COMBINED SCIENCE

5129/22

Paper 2

October/November 2011

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.

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

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



1 Study the following reaction scheme.

For
Examiner's
Use

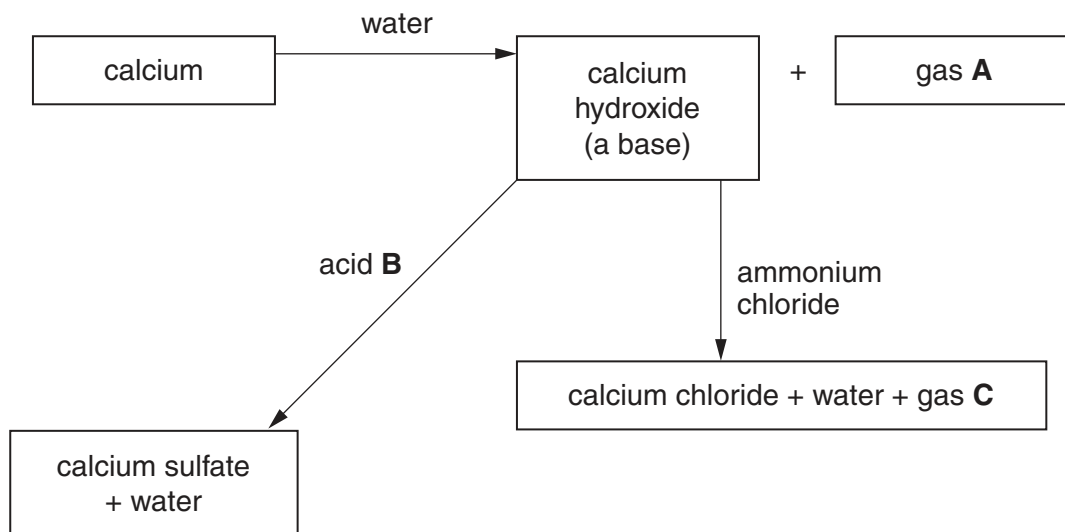


Fig. 1.1

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

gas **A**

acid **B**

gas **C**

[3]

(b) Calcium hydroxide solution is sometimes called limewater.

State the gas for which limewater is the test. What would be the result of the test?

gas

result

[2]

2 Changes in the volume of a person's lungs are measured over a period of two minutes.

The results are shown in Fig. 2.1.

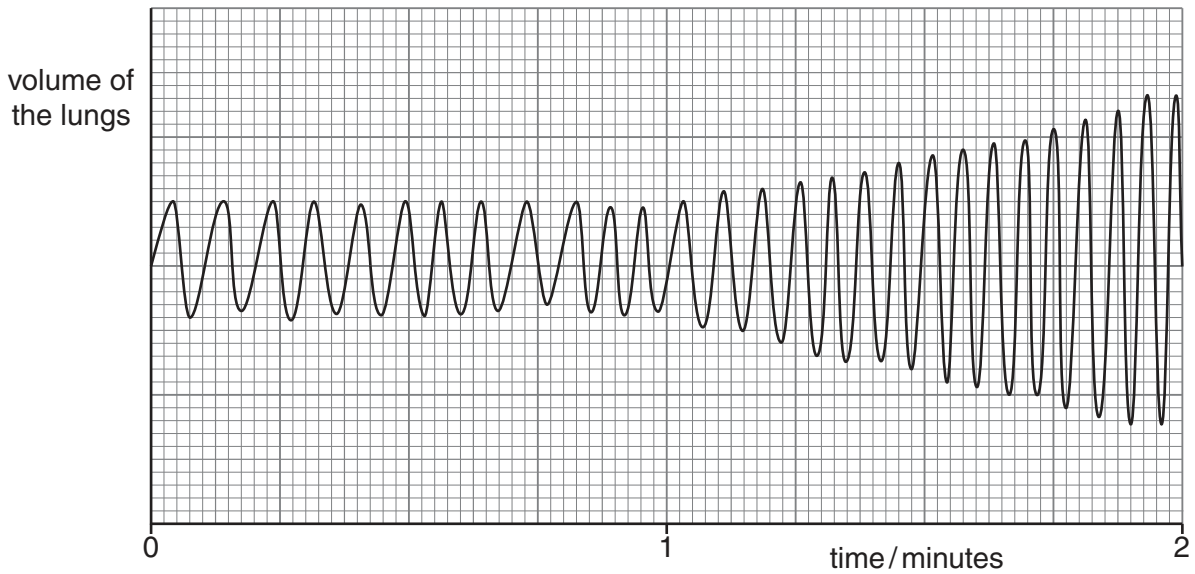


Fig. 2.1

(a) What is the breathing rate of this person during the first minute?

rate = breaths per minute [1]

(b) (i) Describe **two** ways in which the person's breathing changes during the second minute.

- 1.
 - 2.
- [2]

(ii) Suggest what caused these changes.

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

3 A metre rule is pivoted at its centre of gravity.

A weight of 8.0 N is suspended from the rule at a distance of 0.20 m from the pivot, as shown in Fig. 3.1. The metre rule is held horizontally by means of a stretched spring that is 0.40 m from the pivot.

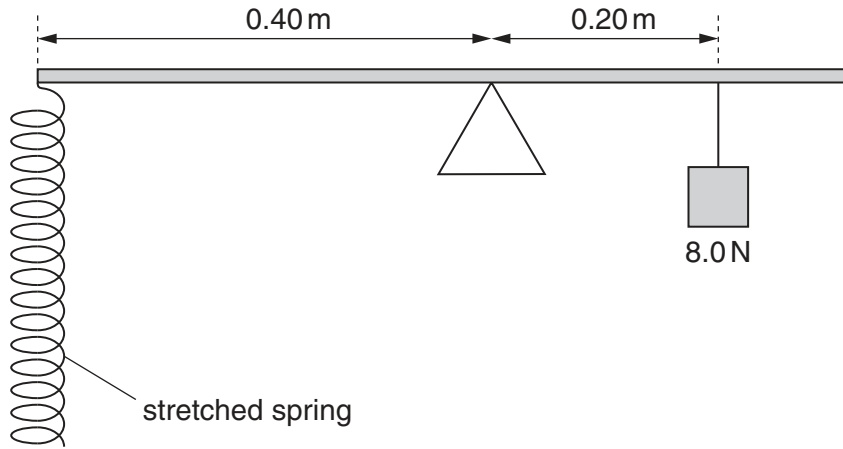


Fig. 3.1

(a) State the principle of moments.

.....
 [2]

(b) Calculate

(i) the moment of the 8.0 N weight about the pivot,

moment = unit [3]

(ii) the force exerted on the metre rule by the spring.

force = N [1]

- (c) The spring has an unstretched length of 10.0 cm. When a force of 2.0 N is used to stretch the spring, its length becomes 11.5 cm.

For
Examiner's
Use

Calculate the force needed to give the spring a length of 13.0 cm.

force = N [2]

- 4 Microwaves, radio-waves and visible light are components of the electromagnetic spectrum.

- (a) Name **two** other components of the electromagnetic spectrum.

..... and [2]

- (b) Radio-waves travel at a speed of 3.0×10^8 m/s in a vacuum.
A radio-wave has a wavelength of 1.5×10^3 m in a vacuum.

Calculate the frequency of this radio-wave.

frequency = unit [3]

5 Nitrogen is a gas that is the main constituent of air.

For
Examiner's
Use

(a) State the approximate percentage of nitrogen in air. [1]

(b) Oxides of nitrogen are produced when a fuel is burned in a car engine.

State one adverse effect on the environment of oxides of nitrogen.

..... [1]

(c) Nitrogen reacts with lithium to produce lithium nitride.

Balance the equation for this reaction.



(d) Lithium nitride is an ionic substance made up of lithium ions, Li^+ , and nitride ions.

(i) State the formula of a nitride ion. [1]

(ii) Suggest **two** properties of lithium nitride.

1.

2.

[2]

- 6 Fig. 6.1 shows the alimentary canal and associated structures in a rabbit. The arrangement is similar to the human alimentary canal.

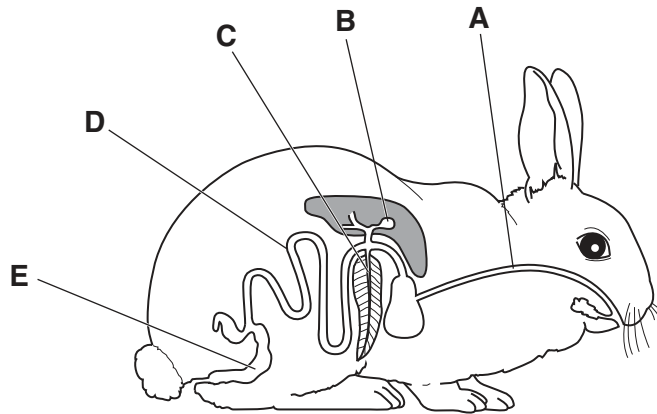


Fig. 6.1

- (a) Name the structures **A** to **E**.

A

B

C

D

E [5]

- (b) State where the following processes occur in the alimentary canal.

(i) ingestion [1]

(ii) egestion [1]

(iii) absorption of the soluble products of digestion
..... [1]

- (c) Name a gland in the alimentary canal where amylase is secreted.

..... [1]

7 A pupil lifts a book from the floor on to a table through a vertical distance of 1.2 m.
The book weighs 5.0 N.

(a) Calculate the useful work done by the pupil in lifting the book.

work done = J [2]

(b) It takes the pupil 0.50 s to lift the book.

Calculate the useful power developed by the pupil in lifting the book.

power = W [2]

(c) Lifting the same book through the same distance on the Moon would require the pupil to do less work than on the Earth.

Suggest why the work done would be less.

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

- 8 Fig. 8.1 shows the reduction of copper(II) oxide by methane.

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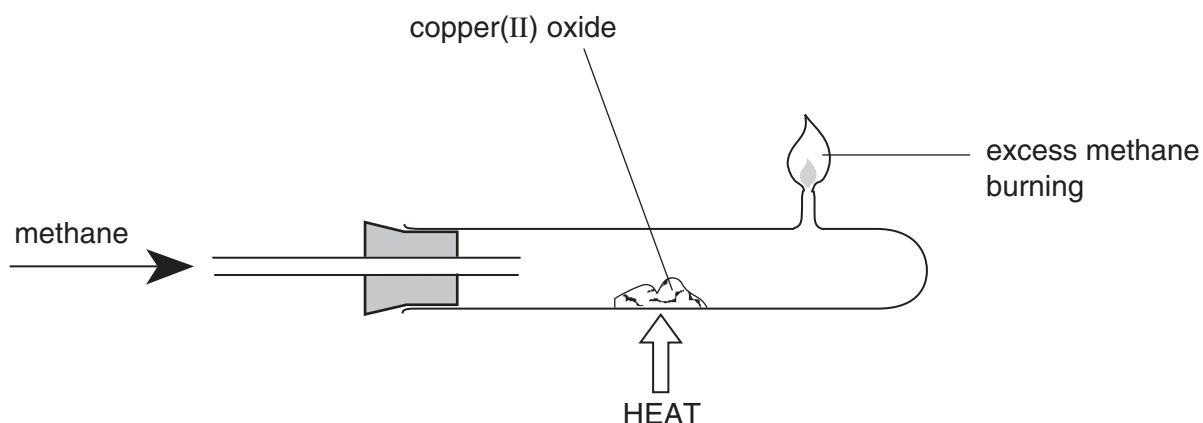


Fig. 8.1

- (a) Explain the meaning of the word *reduction*.

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

- (b) The equation for the reaction is



The relative molecular mass of copper(II) oxide is 80.

[A_r : C, 12; O, 16; H, 1]

Complete the following sentences.

320 g of copper(II) oxide produces g of water and g of carbon dioxide.

80 g of copper(II) oxide produces g of carbon dioxide.

4 g of copper(II) oxide produces g of carbon dioxide. [4]

- (c) Oxides are either acidic, amphoteric or basic.

What type of oxide is copper(II) oxide? Give a reason for your choice.

type of oxide

reason

[2]

- 9 An experiment is carried out to investigate conditions that affect the germination of cress seeds.

Two petri dishes are set up as shown in Fig. 9.1.

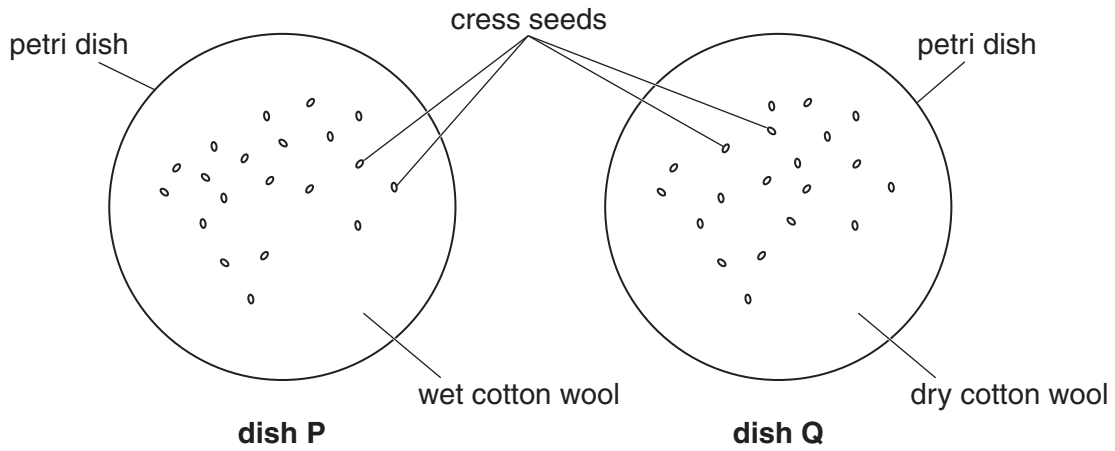


Fig. 9.1

The petri dishes are left for three days.

The number of seeds that have germinated in each of the two dishes is noted.

- (a) State the results you would expect after three days. Explain why you would expect these results.

results

.....

.....

explanation

.....

.....

[3]

- (b) Explain why 20 seeds were placed in each dish, rather than one seed.

.....

..... [1]

- (c) State **two** environmental conditions that should be kept the same in the two dishes.

1.

2.

[2]

10 An electric heater has a label attached to it, as shown in Fig. 10.1.

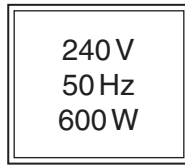


Fig. 10.1

- (a) Use information from Fig. 10.1 to calculate the current in the electric heater when it is working normally.

current = unit [3]

- (b) Another electric heater has a metal case. It has been wired incorrectly because the live wire is touching the metal case.

The live wire is fitted with a fuse and the heater has an earth connection.

Explain how a person is protected from an electric shock when the heater is switched on.

.....
.....
..... [3]

11 Fig. 11.1 shows the apparatus used to separate petroleum (crude oil) into useful products.

For
Examiner's
Use

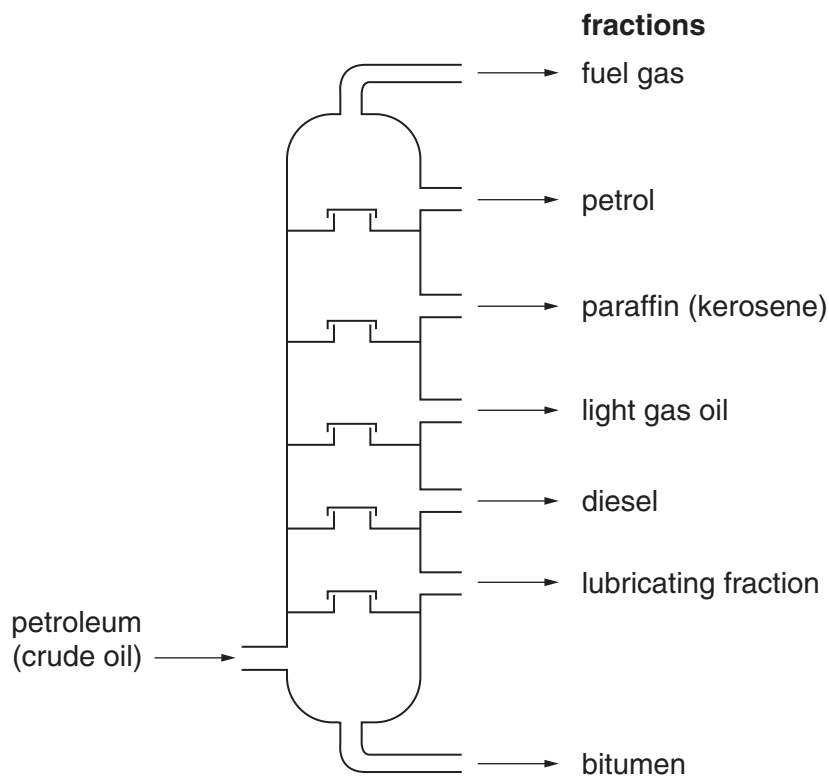


Fig. 11.1

(a) (i) Name the process used to separate petroleum (crude oil).

..... [1]

(ii) State **one** use of paraffin (kerosene) and **one** use of bitumen.

paraffin

bitumen

[2]

(b) Octane is a component of petrol. It belongs to a homologous series of hydrocarbons.

(i) Name the homologous series. [1]

(ii) Octane contains eight carbon atoms.

Complete the formula of octane.

C_8H

[1]

(iii) What type of bonding is present in a molecule of octane?

..... [1]

12 Gonorrhoea is a sexually transmitted bacterial disease.

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Use

(a) State **two** symptoms of gonorrhoea.

1.

.....

2.

.....

[2]

(b) Name one other bacterial disease that is usually sexually transmitted.

..... [1]

(c) How are these bacterial diseases usually treated?

.....

..... [1]

(d) Name a sexually transmitted disease that is caused by a virus.

..... [1]

13 (a) Name a piece of apparatus used to measure the volume of a liquid.

..... [1]

(b) A stone has an irregular shape.

Describe how the method of displacement may be used to find the volume of the stone.

.....

.....

..... [3]

14 (a) Copper is an element.

Sodium chloride is a compound.

Brass is an alloy.

Using these substances as examples, define the terms *element*, *compound* and *alloy*.

element
..... [1]

compound
..... [2]

alloy
..... [2]

(b) State **one** test to show that copper is a metal.

..... [1]

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TURN OVER FOR QUESTION 15

15 Fig. 15.1 is a map of an island where famines frequently occur.

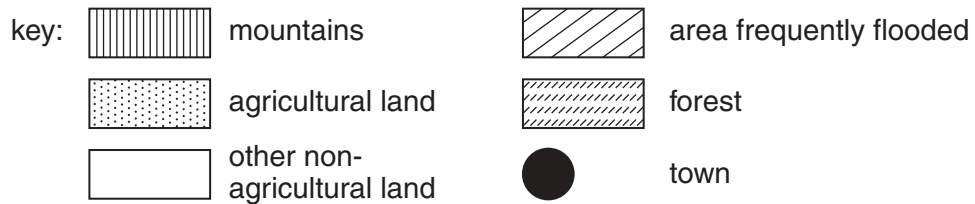
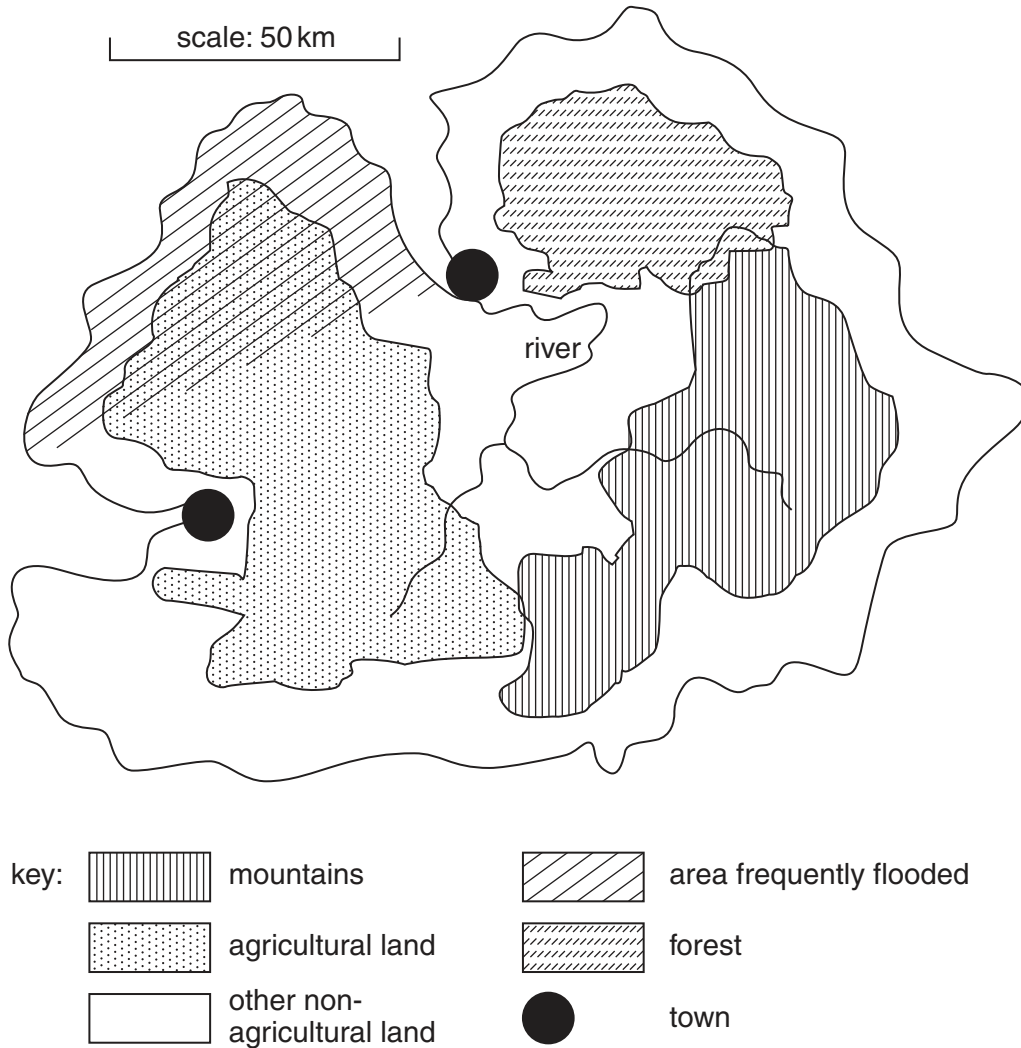


Fig. 15.1

(a) What is meant by *famine*?

..... [1]

(b) Use information from the map to suggest why famines often occur on this island.

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

(c) What effect would each of the following have on the probability of famine occurring on this island? In each case, explain your answer.

For
Examiner's
Use

(i) a rapid increase in population

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

(ii) a decrease in annual rainfall

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

16 Fig. 16.1 shows a bar magnet being pushed into a coil of wire.

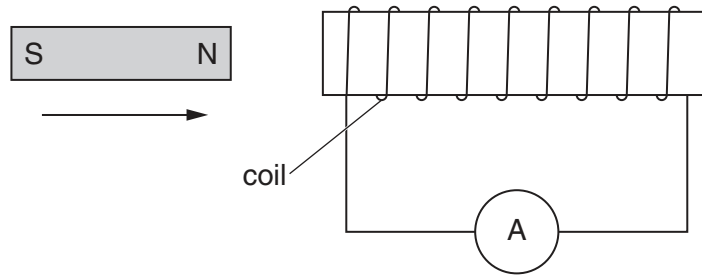


Fig. 16.1

The ammeter shows that there is a small current in the coil.

(a) Name this electrical effect.

..... [1]

(b) State **two** factors affecting the size of the current when a magnet is pushed into a coil.

1.

2. [2]

(c) The current in the coil produces a magnetic field.

What effect does this magnetic field have on the bar magnet?

..... [1]

17 The following is a list of gases.

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ammonia	carbon dioxide	ethane	ethene
helium	hydrogen	oxygen	sulphur dioxide

Use the list to complete the following sentences.

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

- (a) The gas that is used in the manufacture of steel is [1]
- (b) The gas used for filling balloons is [1]
- (c) The gas that undergoes polymerisation is [1]
- (d) The gas that relights a glowing splint is [1]

18 Alcohol is a drug.

- (a) Explain what is meant by the term *drug*.

.....

 [2]

- (b) Describe **three** harmful physical effects on a person who drinks excessive amounts of alcohol.

1.

2.

3.

[3]

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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					19 F Fluorine 9	20 Ne Neon 10				
23 Na Sodium 11	24 Mg Magnesium 12		12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8						
39 K Potassium 19	40 Ca Calcium 20	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				
85 Rb Rubidium 37	88 Sr Strontium 38	65 Zn Zinc 30	70 Ga Gallium 31	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36				
133 Cs Caesium 55	137 Ba Barium 56	108 Ag Silver 47	115 In Indium 49	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54				
223 Fr Francium 87	226 Ra Radium 88	201 Hg Mercury 80	204 Tl Thallium 81	209 Pb Lead 82	209 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86				
		59 Ni Nickel 28	59 Co Cobalt 27	106 Pd Palladium 46	108 Ag Silver 47	197 Au Gold 79					
		55 Mn Manganese 25	56 Fe Iron 26	101 Ru Ruthenium 44	101 Rh Rhodium 45	192 Ir Iridium 77					
		51 V Vanadium 23	55 Mn Manganese 25	101 Ru Ruthenium 44	103 Rh Rhodium 45	186 Re Rhenium 75					
		48 Ti Titanium 22	52 Cr Chromium 24	101 Ru Ruthenium 44	103 Rh Rhodium 45	184 W Tungsten 74					
		45 Sc Scandium 21	51 V Vanadium 23	93 Nb Niobium 41	96 Mo Molybdenum 42	181 Ta Tantalum 73					
		89 Y Yttrium 39	48 Ti Titanium 22	91 Zr Zirconium 40	93 Nb Niobium 41	178 Hf Hafnium 72					
		227 Ac Actinium 89	45 Sc Scandium 21	89 Y Yttrium 39	91 Zr Zirconium 40	139 La Lanthanum 57					
		140 Ce Cerium 58	51 V Vanadium 23	93 Nb Niobium 41	96 Mo Molybdenum 42	181 Ta Tantalum 73					
		141 Pr Praseodymium 59	52 Cr Chromium 24	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		142 Nd Neodymium 60	55 Mn Manganese 25	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		143 Pm Promethium 61	56 Fe Iron 26	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		144 Nd Neodymium 60	59 Pr Praseodymium 59	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		145 Sm Samarium 62	60 Nd Neodymium 60	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		146 Eu Europium 63	61 Pm Promethium 61	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		147 Pm Promethium 61	62 Sm Samarium 62	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		148 Gd Gadolinium 64	63 Eu Europium 63	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		149 Tb Terbium 65	64 Gd Gadolinium 64	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		150 Sm Samarium 62	65 Tb Terbium 65	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		151 Dy Dysprosium 66	66 Dy Dysprosium 66	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		152 Eu Europium 63	67 Ho Holmium 67	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		153 Er Erbium 68	68 Er Erbium 68	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		154 Tm Thulium 69	69 Tm Thulium 69	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		155 Yb Ytterbium 70	70 Yb Ytterbium 70	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		156 Lu Lutetium 71	71 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		157 Gd Gadolinium 64	72 Yb Ytterbium 70	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		158 Tm Thulium 69	73 Yb Ytterbium 70	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		159 Tb Terbium 65	74 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		160 Er Erbium 68	75 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		161 Ho Holmium 67	76 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		162 Dy Dysprosium 66	77 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		163 Er Erbium 68	78 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		164 Tm Thulium 69	79 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		165 Ho Holmium 67	80 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		166 Er Erbium 68	81 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		167 Er Erbium 68	82 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		168 Tm Thulium 69	83 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		169 Tm Thulium 69	84 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		170 Yb Ytterbium 70	85 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		171 Yb Ytterbium 70	86 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		172 Lu Lutetium 71	87 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		173 Yb Ytterbium 70	88 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		174 Lu Lutetium 71	89 Lu Lutetium 71	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		175 Lu Lutetium 71	90 Th Thorium 90	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		176 Lu Lutetium 71	91 Pa Protactinium 91	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		177 Lu Lutetium 71	92 Th Thorium 90	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		178 Lu Lutetium 71	93 Np Neptunium 93	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		179 Lu Lutetium 71	94 Pu Plutonium 94	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		180 Lu Lutetium 71	95 Am Americium 95	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		181 Lu Lutetium 71	96 Cm Curium 96	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		182 Lu Lutetium 71	97 Bk Berkelium 97	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		183 Lu Lutetium 71	98 Cf Californium 98	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		184 Lu Lutetium 71	99 Es Einsteinium 99	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		185 Lu Lutetium 71	100 Fm Fermium 100	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		186 Lu Lutetium 71	101 Md Mendelevium 101	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		187 Lu Lutetium 71	102 No Nobelium 102	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					
		188 Lu Lutetium 71	103 Lr Lawrencium 103	101 Ru Ruthenium 44	103 Rh Rhodium 45	192 Ir Iridium 77					

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

Key

a	X
b	†

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

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).