UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

COMBINED SCIENCE **5129/02**

Paper 2 **May/June 2008**

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.

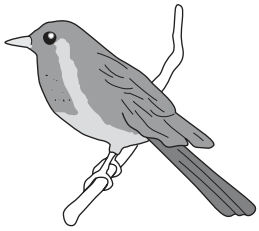
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use

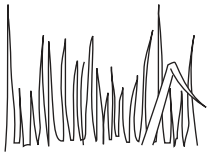
This document consists of **19** printed pages and **1** blank page.

For Examiner's Use

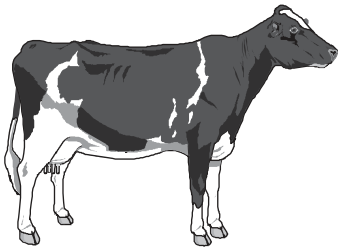
1 Fig. 1.1 shows some organisms in an ecosystem.
They are not drawn to the same scale.



small bird

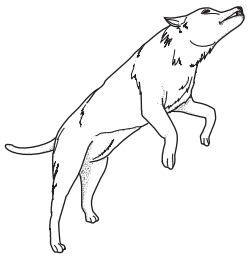


grass

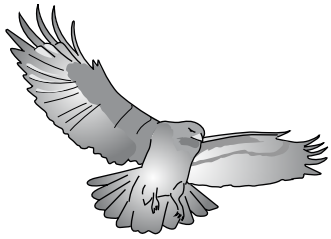


cow

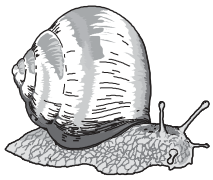
flower



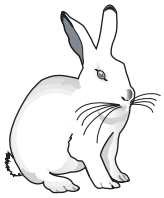
wild dog



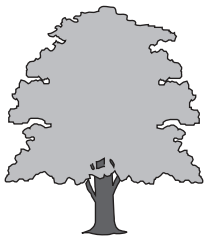
hawk



snail



rabbit



tree

Fig. 1.1

(a) From Fig. 1.1 name

(i) a producer,

.....[1]

(ii) a herbivore.

.....[1]

For Examiner's Use

(b) Choose organisms from Fig. 1.1 to complete this food chain.

1		2		3		4
grass	→		→	small bird	→	

[2]

(c) State the energy source for the food chain.

.....[1]

(d) State the essential type of organism **not** shown in the ecosystem.

.....[1]

(e) Suggest why a food chain rarely has more than five stages.

.....

.....

.....[2]

2 The following is a list of metals.

aluminium	**copper**	**iron**
magnesium	**potassium**	**zinc**

Complete the sentences by choosing metals from the list.
Each metal may be used once, more than once or not at all.

(a) ..... is used for electrical wiring in houses. [1]

(b) ..... reacts vigorously with water producing hydrogen. [1]

(c) ..... is extracted from haematite. [1]

(d) ..... does not react with dilute sulphuric acid. [1]

(e) ..... is used to galvanise iron to prevent it from rusting. [1]

For Examiner's Use

3 Fig. 3.1 shows two resistors, **A** and **B**, connected in series. The resistance of **A** is 7.0 Ω. The ammeter reads 0.20 A.

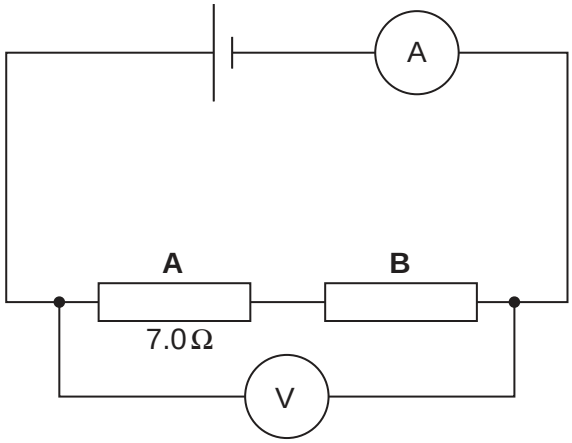


Fig. 3.1

(a) Calculate

(i) the charge that passes through resistor **A** in 3.0 minutes,

charge = ... C [2]

(ii) the potential difference across resistor **A**.

potential difference = ... V [2]

(b) The voltmeter reads 2.0 V.

Calculate the potential difference across resistor **B**.

potential difference = ... V [1]

For Examiner's Use

4 Methane is the main constituent of natural gas.
Methane burns in excess oxygen to form carbon dioxide and water.

The equation for the reaction is

$$CH_4 + 2O_2 \longrightarrow 2H_2O + CO_2$$

(a) Describe a test to show that carbon dioxide is produced.

test .....

result .....[2]

(b) **(i)** Calculate the relative molecular mass of

methane, ...

carbon dioxide. ..... [2]

(A_r: C, 12; H, 1; O, 16.)

(ii) Calculate the mass of carbon dioxide produced by burning 4 g of methane.

mass = ... g [2]

For Examiner's Use

5 Pieces of blue cobalt chloride paper are placed on the upper and lower surfaces of a plant leaf. They are held in place by glass slides as shown in Fig. 5.1.

The plant is watered normally.

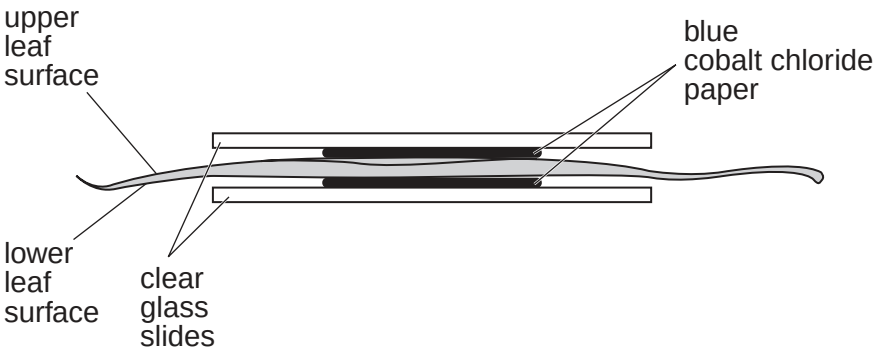


Fig. 5.1

Cobalt chloride paper is blue when dry and pink when it absorbs water.

(a) Complete the table to show the colour of each piece of cobalt chloride paper after one hour.

	upper surface	lower surface
start	blue	blue
after one hour		

[1]

(b) **(i)** Name the process by which water is lost from the leaf.

.....[1]

(ii) State two ways in which the upper surface of a leaf differs from the lower surface, causing a difference in the rate of water loss.

1. .....

2. .....[2]

(c) Name the cells through which most water enters a plant and also the process involved.

name of cells .....

process .....[2]

For Examiner's Use

6 Fig. 6.1 shows apparatus used to investigate the reaction between copper(II) oxide and hydrogen.

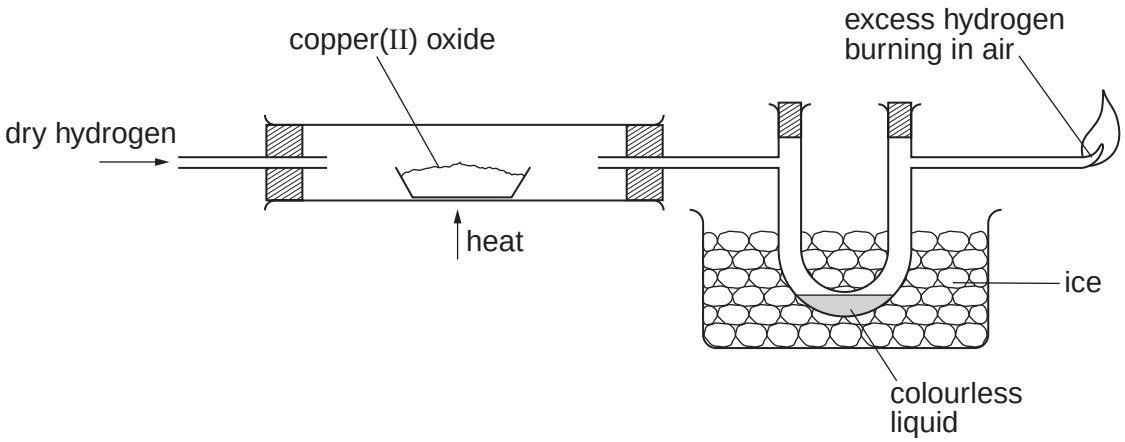


Fig. 6.1

The equation for the reaction is

$$CuO + H_2 \longrightarrow Cu + H_2O$$

(a) What type of reaction does the copper(II) oxide undergo?

.....[1]

(b) State two properties that show that copper is a metal.

property 1 .....

property 2 .....[2]

(c) Suggest a test to prove that the colourless liquid is **pure** water.

.....

.....[1]

7 A free-fall parachutist jumps out of an aircraft. Fig. 7.1 shows how his **downward** velocity changes with time.

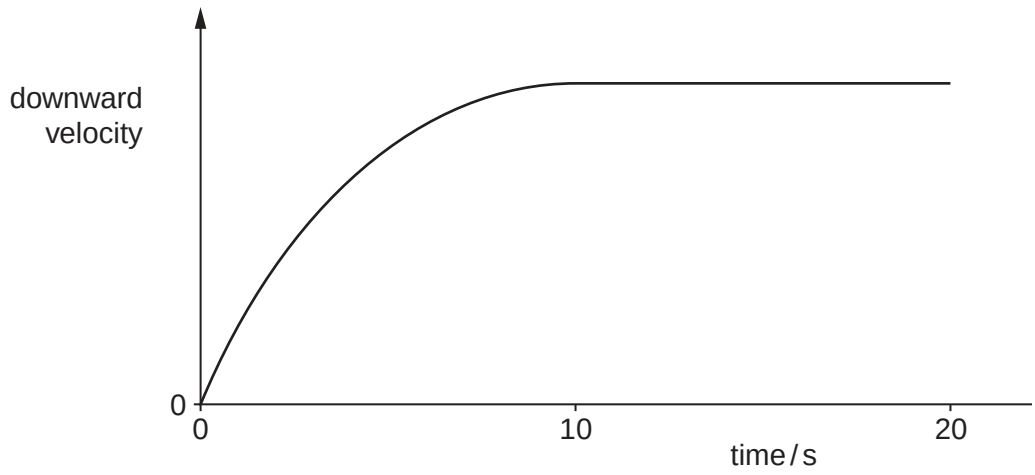


Fig. 7.1

(a) Name

(i) the downward force acting on the parachutist, ...[1]

(ii) the form of energy lost by the parachutist as he falls. .....[1]

(b) The parachutist accelerates during the first 10 seconds.

Explain how Fig. 7.1 shows that the acceleration is **not** constant.

.....

.....[1]

(c) The parachutist has a mass of 80 kg. At one point during his descent, the net downward force on him is 300 N.

Calculate his acceleration.

acceleration = ... [3]

8 Fig. 8.1 shows two similar metal cans.

For Examiner's Use

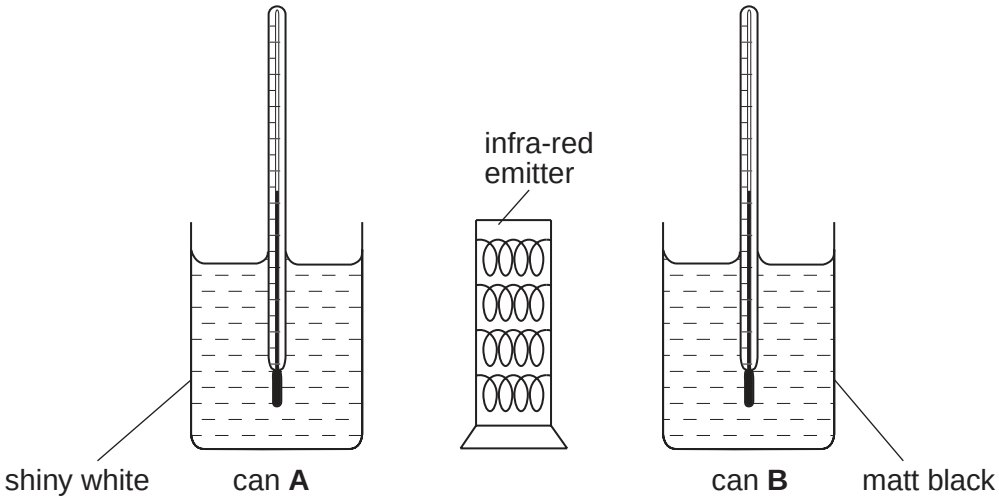


Fig. 8.1

Can **A** has a shiny white surface and can **B** has a matt black surface.
Both cans contain equal masses of cold water at the same initial temperature.
The cans are placed equal distances from a heater that emits infra-red radiation.

(a) Explain why the temperature of the water begins to rise more quickly in can **B** than in can **A**.

.....

.....[1]

(b) As the water in the cans is heated, the volume of the water increases.

State the change, if any, that occurs in

(i) its mass, ...[1]

(ii) its density. .....[1]

(c) Infra-red radiation is one component of the electromagnetic spectrum.

Name **two** other components of the electromagnetic spectrum that have longer wavelengths than infra-red radiation.

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

For Examiner's Use

9 **(a)** Explain **two** ways in which chewing aids the process of digestion.

1. .....

.....

2. .....

.....[2]

(b) Describe the function of the salivary glands in the process of digestion.

.....

.....

.....[2]

(c) Complete the following sentences about dental hygiene.

When ..... grow between teeth, they produce acid.

This acid attacks the teeth causing ..... . [2]

10 Hydrochloric acid, HC*l*, and sulphuric acid, H_2SO_4, are strong acids.
Ethanoic acid, CH_3CO_2H, is a weak acid.

(a) State the name of the ion that causes acidity. .....[1]

(b) State the colour of the solution obtained when Universal Indicator is added to a solution of

(i) hydrochloric acid, ... [1]

(ii) ethanoic acid. ..... [1]

(c) Acids react with alkalis to form salts.
Magnesium sulphate is prepared by reacting magnesium metal with sulphuric acid.
Hydrogen is also produced in the reaction.

(i) Write the equation for the reaction between magnesium and sulphuric acid.

.....[1]

(ii) Suggest the names of **two** other substances that produce magnesium sulphate when they are added to sulphuric acid.

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

11 Fig. 11.1 shows paint droplets sprayed from a paint gun.

For Examiner's Use

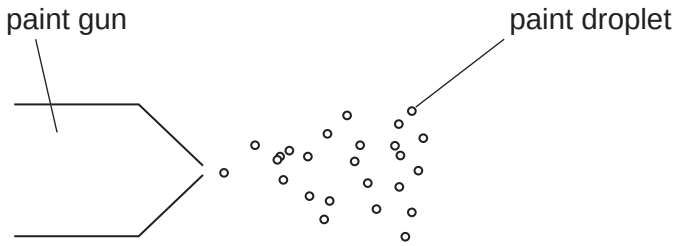


Fig. 11.1

Each droplet has a negative charge.

(a) Explain why the paint droplets move away from each other.

.....

.....[1]

(b) The paint droplets are attracted to a metal surface.

State whether the surface is uncharged, positively charged or negatively charged.

.....[1]

12 Fig. 12.1 lists some quantities that may be measured in physics experiments.

quantity measured	unit
frequency of a wave	
period of a pendulum	

Fig. 12.1

Complete the table by writing down the units in which each quantity could be measured. [2]

For Examiner's Use

13 **(a)** The electronic structures of nitrogen and hydrogen are shown in Fig. 13.1.

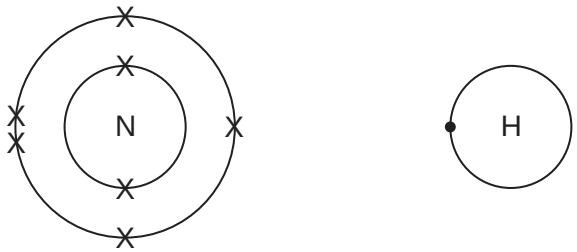


Fig. 13.1

Construct a dot and cross diagram to show the electronic arrangement in a molecule of ammonia.

[2]

(b) Ammonia is manufactured from nitrogen and hydrogen using the Haber process.
State the essential conditions for the Haber process.

temperature ..... °C

pressure ..... atm

catalyst ..... [3]

(c) Ammonia is used to make the fertiliser ammonium sulphate.
This contains nitrogen which is essential for the growth of plants.
State the names of two **other** elements essential for the growth of plants.

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

For Examiner's Use

14 **(a)** Describe what is meant by the term *famine*.

.....

.....[1]

(b) State and explain two ways by which famine may be caused.

1. .....

.....

.....

2. .....

.....

.....[4]

15 **(a)** Complete Fig. 15.1 to show how the voltage output of a simple a.c. generator changes with time. Show the voltage change for **two** complete rotations of the coil.

Fig. 15.1

[3]

(b) State **one** way by which the maximum voltage output of an a.c. generator could be increased.

.....[1]

For Examiner's Use

16 A uniform metre rule is placed on a knife edge so that it balances horizontally.
A soft-iron rod of weight 0.10 N is hung at the 20 cm mark. The rule is balanced by placing a lead disc at the 70 cm mark, as shown in Fig. 16.1.

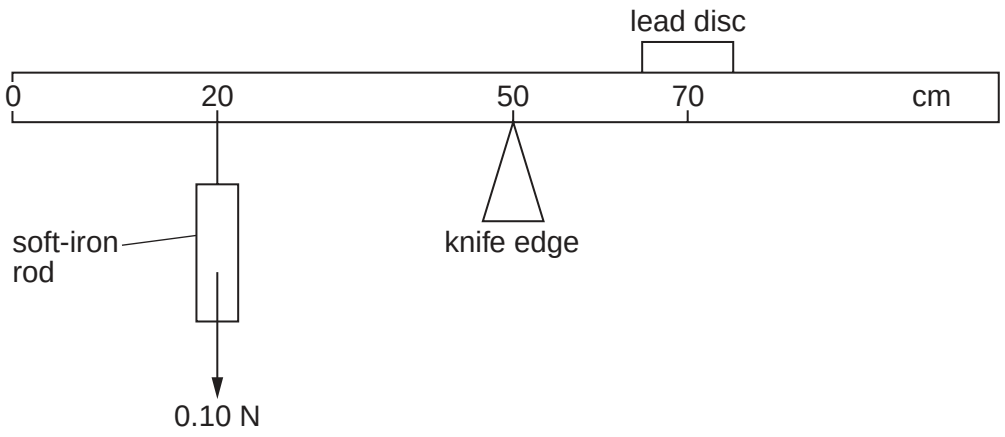


Fig. 16.1

(a) Calculate the weight of the lead disc.

weight = ... N [2]

(b) A magnet is held under the soft-iron rod.

Explain what will happen to the balanced metre rule.

.....

.....

.....[2]

17 The electronic structure of aluminium is shown in Fig. 17.1.

For Examiner's Use

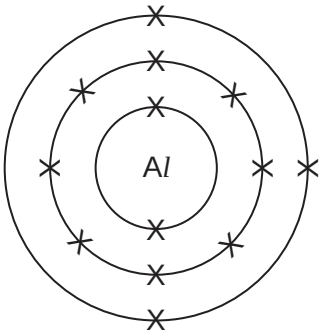


Fig. 17.1

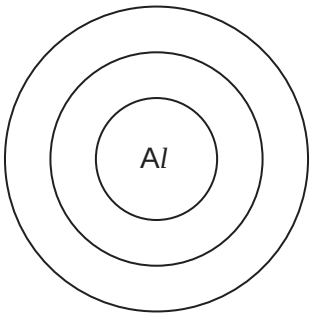


Fig. 17.2

(a) **(i)** Complete Fig. 17.2 to show the electronic structure of an aluminium **ion**. [1]

(ii) State the charge on the aluminium ion. .....[1]

(b) Using the electronic structure and the Periodic Table, explain why aluminium is a metal.

.....

.....

.....[2]

(c) Aluminium is used to make food containers because it is resistant to corrosion.

Explain why aluminium is resistant to corrosion.

.....

.....[2]

18 Fig. 18.1 shows a germinating seed.

For Examiner's Use

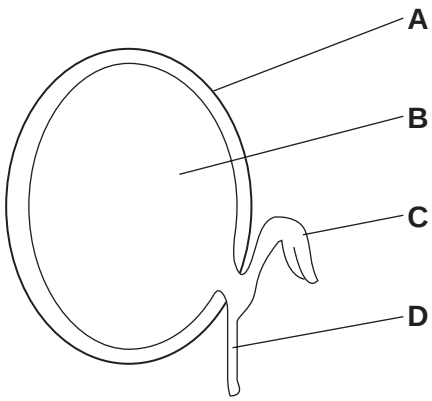


Fig. 18.1

(a) Name the parts labelled in Fig. 18.1.

A .....

B .....

C .....

D ..... [4]

(b) State three conditions that affect the germination of seeds.

1. .....

2. .....

3. .....[3]

19 Fig. 19.1 shows a measuring cylinder that contains some water.
Fig. 19.2 shows the same measuring cylinder with 50 metal spheres added.

For Examiner's Use

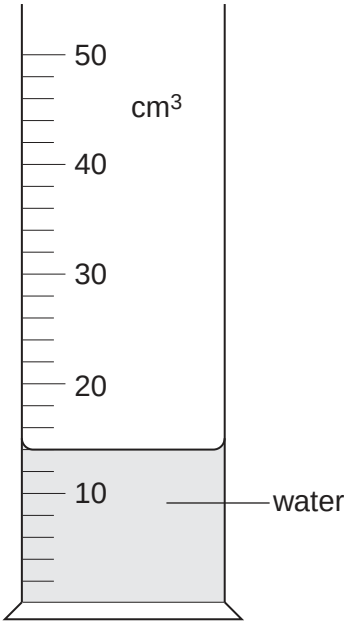


Fig. 19.1

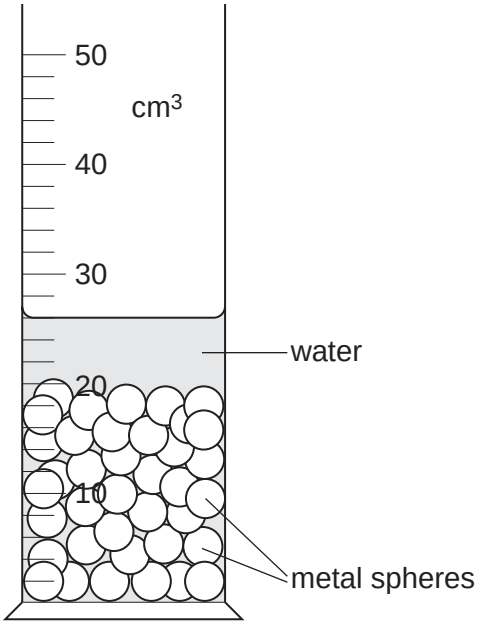


Fig. 19.2

Calculate

(a) the volume of the 50 metal spheres,

volume = ... cm^3 [2]

(b) the volume of a single metal sphere.

volume = ... cm^3 [1]

20 Fig. 20.1 shows an extension-load graph for a spring.

For Examiner's Use

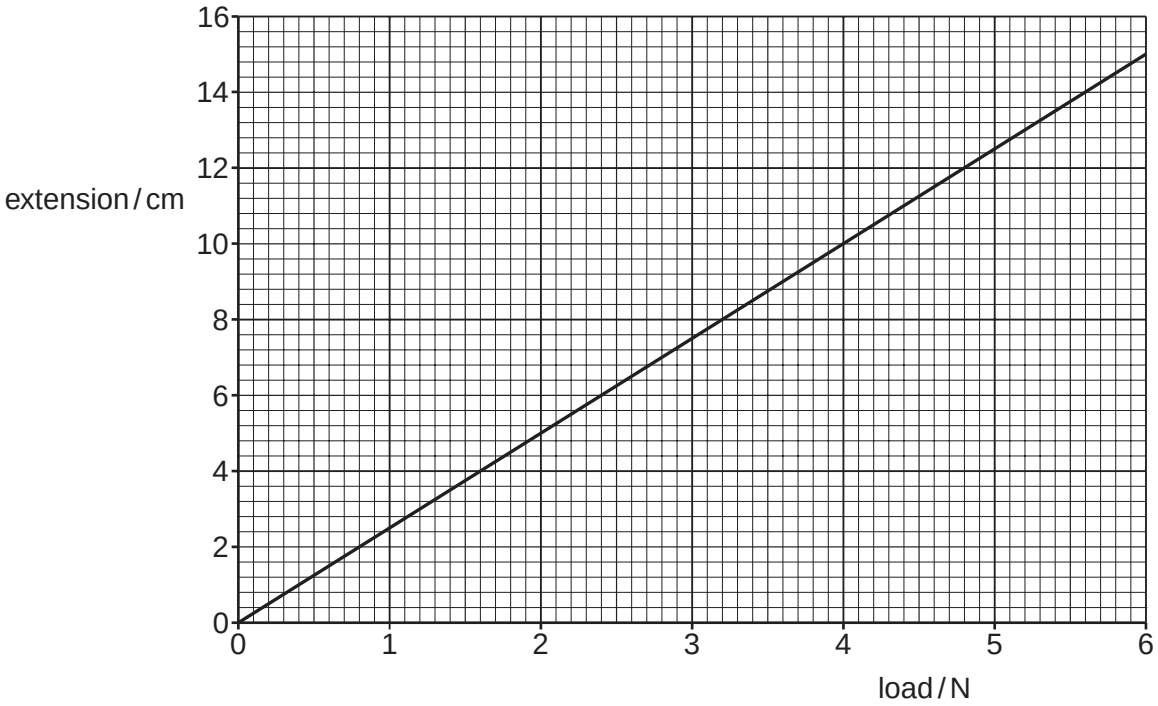


Fig. 20.1

(a) What is the extension for a load of 2.0 N?

..... cm [1]

(b) The length of the spring with no load is 20 cm.

What load gives the spring a total length of 30 cm?

load = ... N [2]

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DATA SHEET
The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 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	55 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 Radius 88	227 Ac Actinium 89 †															

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

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

Key: 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.).