UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

COMBINED SCIENCE **5129/02**

Paper 2 **October/November 2007**

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 ON 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 **18** printed pages and **2** blank pages.

UNIVERSITY *of* CAMBRIDGE
International Examinations

[Turn over

1 Fig. 1.1 is a diagram of a mains plug with its cover removed. Component **P** ha labelled.
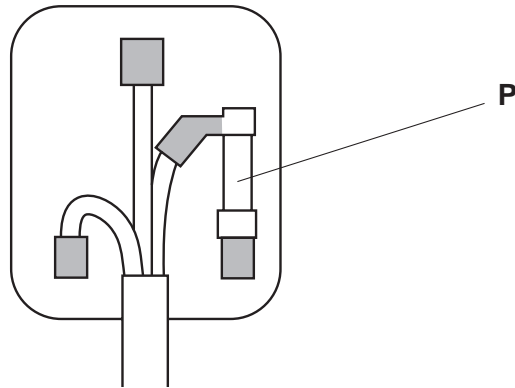
Fig. 1.1

(a) Name component **P**. …………………………………… [1]

(b) State the colour of

(i) the earth wire, ……………………………………

(ii) the live wire. …………………………………… [2]

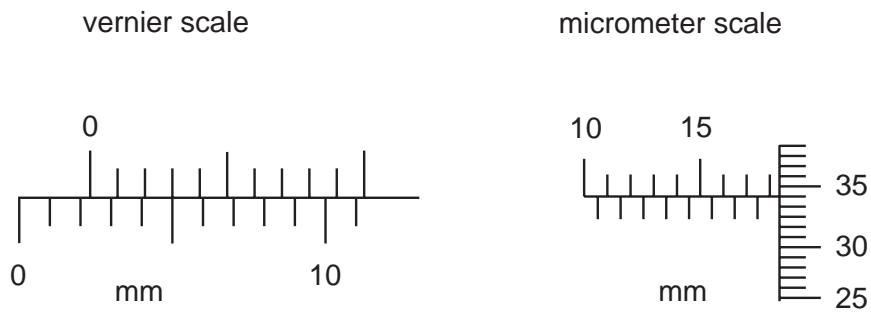2 Fig. 2.1 shows a vernier scale and a micrometer scale.

Fig. 2.1

(a) The vernier scale reads …………………… mm. [1]

(b) The micrometer scale reads …………………… mm. [1]

3 Fig. 3.1 shows some animal cells and Fig. 3.2 shows a plant cell, seen under a micro
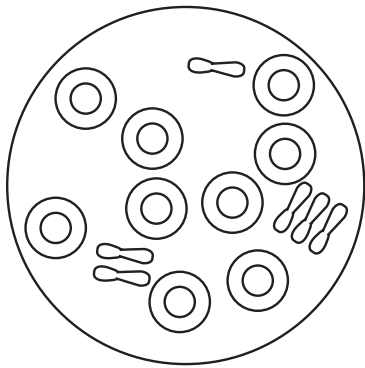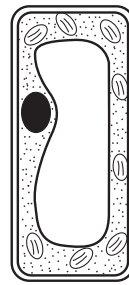

Fig. 3.1   **Fig. 3.2**

(a) (i) The cells are placed in pure water.

Name the process, involving water movement, that is now likely to occur.

.... [1]

(ii) After 30 minutes, the animal cells have burst, but the plant cell has not.

Explain why.

....

....

.... [2]

(b) Fig. 3.1 shows red blood cells.

(i) What is the function of red blood cells?

....

(ii) What do red cells contain that helps them to carry out this function?

.... [2]

4 Copper(II) sulphate crystals are made using the following method.

One spatula measure of copper(II) carbonate is added to 20 cm^3 of dilute sulphuric ac... Once it has all reacted, further spatula measures are added until no more gas is given off. The reaction mixture is filtered. The filtrate is evaporated to about half its volume and then allowed to cool. The crystals are filtered off and dried.

(a) Name the gas given off in the reaction.

.... [1]

(b) (i) Explain why copper(II) carbonate is added until no more gas is given off.

....

.... [1]

(ii) Explain why the reaction mixture is filtered.

....

.... [1]

(iii) Explain why the filtrate is allowed to cool after being evaporated to half its volume.

....

.... [1]

(c) State **one** substance, other than copper(II) carbonate, which can be added to sulphuric acid to make copper(II) sulphate crystals.
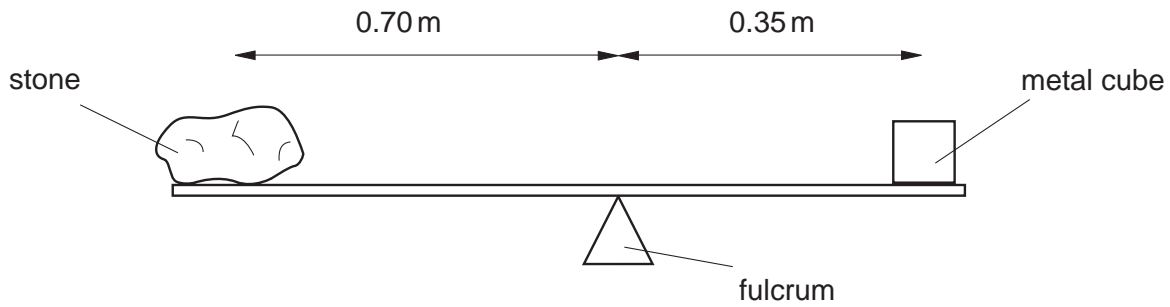
.... [1]

5 A metal cube has a mass of 0.05 kg.
On Earth, the gravitational field strength g = 10 N/kg.

(a) Calculate the weight of the metal cube.

[2]

(b) Fig. 5.1 shows a stone and the metal cube on a balanced lever.

Fig. 5.1

The distance of the stone from the fulcrum (pivot) is 0.70 m.
The distance of the metal cube from the fulcrum is 0.35 m.

(i) State the principle of moments.

....

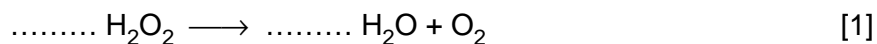.. [1]

(ii) Calculate the weight of the stone.

[2]

6 The decomposition of hydrogen peroxide, H_2O_2, produces oxygen.

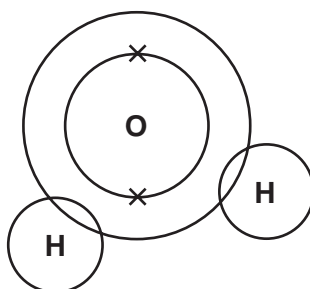(a) Complete the equation for the decomposition of hydrogen peroxide.

$$......... \; H_2O_2 \longrightarrow .... \; H_2O + O_2 \qquad \text{[1]}$$

(b) Describe a test for oxygen.

test ....

result .... [2]

(c) (i) Complete the diagram to show the arrangement of the electrons in a molecule of water.

[2]

(ii) State the type of bonding in a water molecule. ……………………………… [1]

7 (a) What product of protein digestion is transported to the liver?

.... [1]

(b) Suggest three uses for the products of protein digestion.

1. ....

2. ....

3. .... [3]

(c) What happens in the liver to excess products of protein digestion?

....

....

.... [2]

8 The half-life of a radioactive source is 20 days.
Fig. 8.1 shows the initial activity (1000 emissions per second) and the activity after 60 (120 emissions per second).
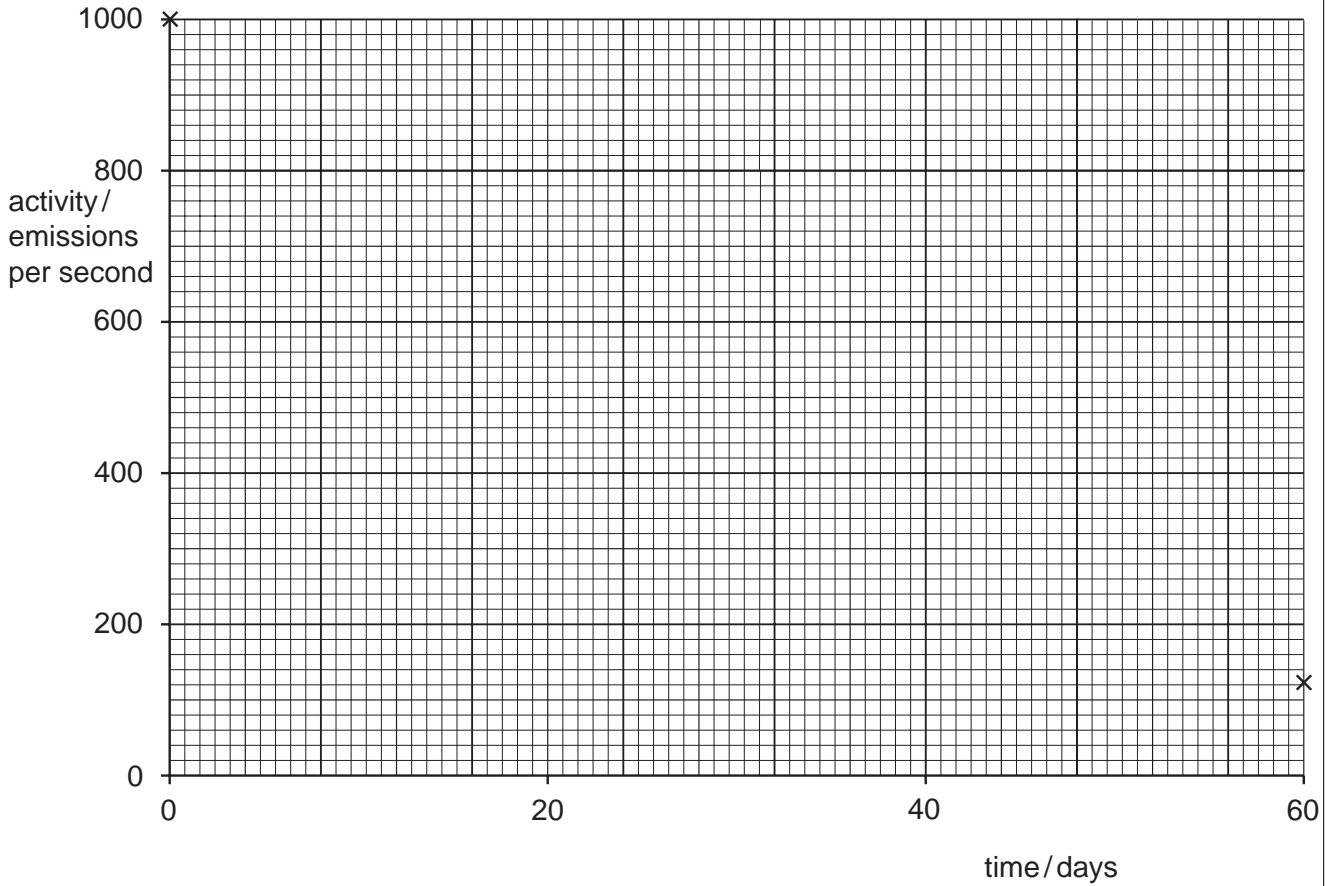
Fig. 8.1

(a) (i) On Fig. 8.1, plot points to show the activity after 20 days and after 40 days. [2]

(ii) Draw a line of best fit for the plotted points. [1]

(b) A radioactive source is used in a laboratory experiment by a student.

State two safety precautions that should be taken by the student.

1. ....

....

2. ....

.... [2]

9 Fig. 9.1 shows the structure of an unsaturated hydrocarbon, ethene.

$$H \quad\quad\quad H$$
$$\diagdown \quad\quad\quad \diagup$$
$$C = C$$
$$\diagup \quad\quad\quad \diagdown$$
$$H \quad\quad\quad H$$
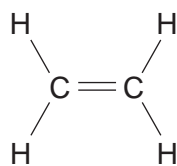
Fig. 9.1

(a) Explain the meaning of the terms

   (i) *unsaturated,* ....

   .... [1]

   (ii) *hydrocarbon.* ....

   ....

   .... [2]

(b) Describe a test to show that ethene is unsaturated.

   test ....

   ....

   result ....

   .... [2]

(c) Ethene burns in excess oxygen to produce carbon dioxide and water.

   Construct an equation for this reaction.

   .... [2]

10 Fig. 10.1 shows a human eye seen from the front, at two different times.

time **1**   time **2**
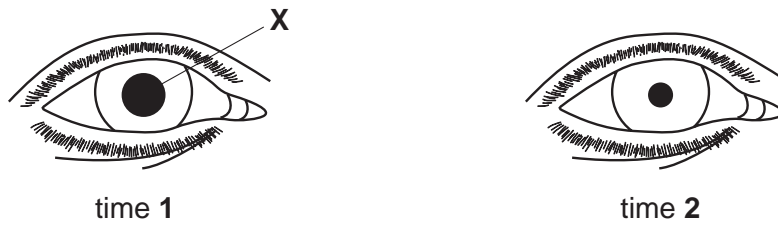
Fig. 10.1

(a) State the name of the part labelled **X**.

.... [1]

(b) (i) At time **2**, the part labelled **X** is smaller than at time **1**.

What is the effect of part **X** becoming smaller?

....

.... [2]

(ii) State a change in the environment that will cause part **X** to become smaller.

.... [1]

(c) Fig. 10.2 shows a section through the eye.
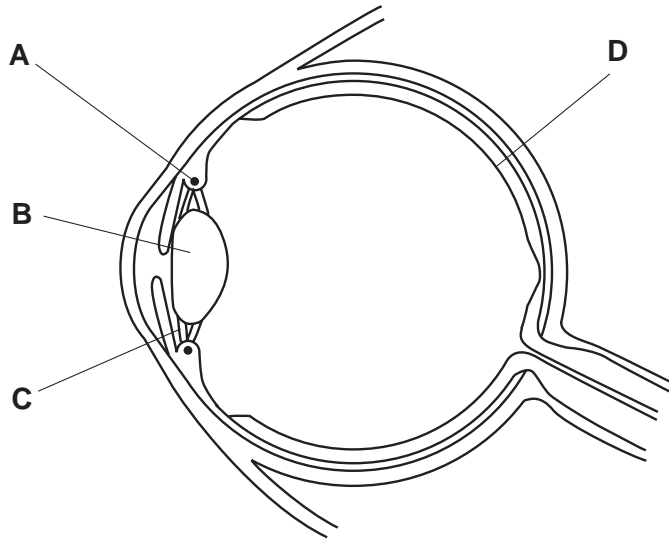
Fig. 10.2

  (i) Name the parts labelled **A**, **B**, **C** and **D**.

  A ....

  B ....

  C ....

  D .... [4]

  (ii) State the changes that occur in the parts labelled **A** and **B** as the eye is focusing on a distant object.

  A ....

   ....

  B ....

   .... [2]

11 Fig. 11.1 shows a measuring cylinder that contains water.
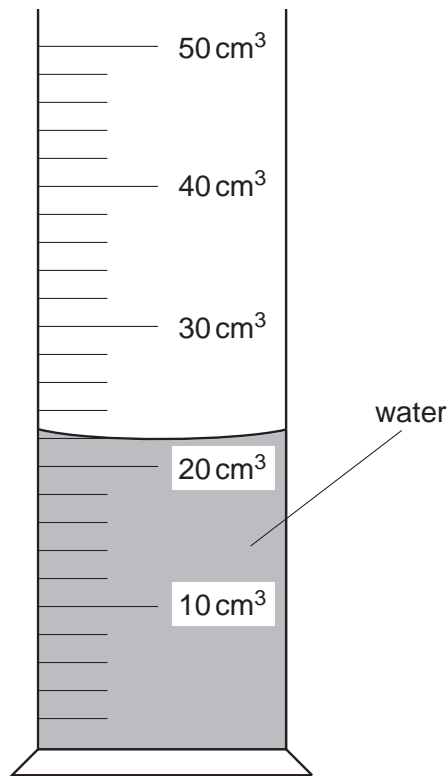
Fig. 11.1

(a) State the volume of water in the measuring cylinder. ……………………… cm³ [1]

(b) A stone of volume 26 cm³ is placed in the water in the measuring cylinder. The stone is completely below the surface of the water. The water rises to a new level.

(i) On Fig. 11.1, mark the new level of the water. [1]

(ii) The stone has a mass of 65 g.
Calculate the density of the stone.

density = ……………………… [3]

12 When calcium carbonate is heated strongly, it decomposes to form calcium oxide and ~~carbon~~ dioxide.

The equation for the reaction is

$$CaCO_3 \longrightarrow CaO + CO_2$$
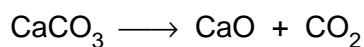
(a) Calculate the relative molecular mass of

(i) calcium carbonate,   ……………………

(ii) calcium oxide.   ……………………   [2]

(b) Calculate the mass of calcium oxide produced from 5 g of calcium carbonate.

....

.... [2]

(c) Explain why calcium carbonate is added to a blast furnace during the extraction of iron.

....

....

.... [2]

13 (a) Use words from the following list to complete the sentences below.
Each word may be used once, or not at all.

addictive	**digestion**	**drug**	**enzyme**
hormone	**liver**	**reactions**	**skin**

Alcohol is a ……………………………… that damages the ……………………………… .

It slows a person's ……………………………… and is ……………………………… .
[4]

(b) State two problems associated with the drug heroin.

1. ....

....

2. ....

.... [2]

14 Fig. 14.1 shows a metal hot-water tank surrounded by insulation. Some connecting
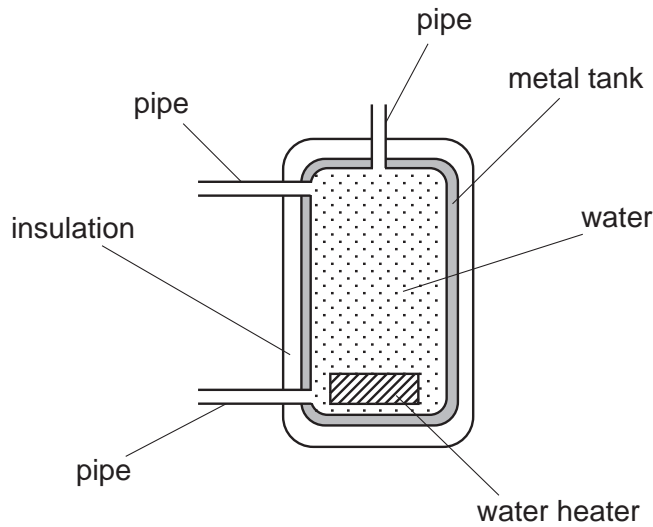   are also shown.

Fig. 14.1

(a) Heat can be transferred by conduction, convection or radiation.
State the main method by which heat is transferred

  (i) through the metal of the tank, ……………………………………

  (ii) through the water.   ……………………………………   [2]

(b) State the purpose of the insulation.

  ....

  .... [1]

(c) Some heat escapes and heats the surrounding air.

  Explain, in detail, why heated air rises.

  ....

  ....

  .... [2]

15 (a) Name the acid and the alkali reacted together to make ammonium sulphate.

acid ....

alkali .... [2]

(b) Ammonium sulphate contains ammonium ions, NH_4^+, and sulphate ions, SO_4^{2-}.

Deduce the formula of ammonium sulphate. ……………………………………… [1]

(c) A mixture of ammonium sulphate and calcium carbonate is used as a fertiliser.

(i) Name the element present in ammonium sulphate which makes it useful as a fertiliser.

.... [1]

(ii) Explain why calcium carbonate is used in the fertiliser.

....

.... [2]

16 The following is a list of metals.

aluminium   copper   iron   sodium   zinc

Use the list to answer the following questions.

(a) Name the metal that is

(i) used for electrical wiring in a house, ………………………………… [1]

(ii) extracted from haematite. …………………………………… [1]

(b) Which two metals are used to make brass?

……………………………………… and ……………………………………… [2]

17   Fig. 17.1 shows a pendulum in its highest position.

string   support
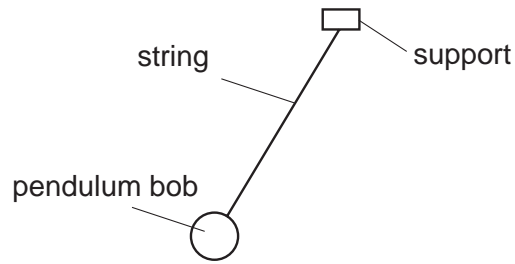
pendulum bob

Fig. 17.1

(a) On Fig. 17.1, draw an arrow to show the direction of the force of gravity on the pendulum
bob.   [1]

(b) In the space below, draw a diagram to show the position of the pendulum when it has
the most kinetic energy.

support
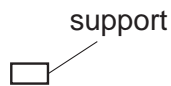
                                                                                                  [1]

(c) The period of the pendulum is 2.0 s. A student starts timing when the pendulum is in the
position shown in Fig. 17.1.

In the space below, draw a diagram to show the position of the pendulum 5.0 s after the
student starts timing.

support
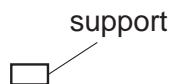
                                                                                                  [1]

18   Fig. 18.1 shows a vacuum flask containing germinating seeds and a thermometer.
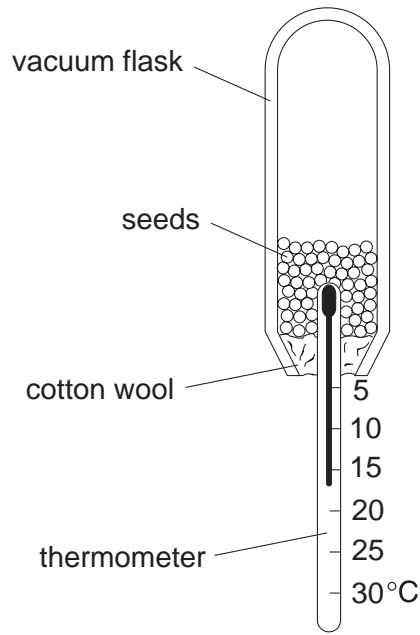
Fig. 18.1

(a) State three factors that are needed for the seeds to germinate.

1. ....

2. ....

3. .... [3]

(b) During germination, aerobic respiration takes place.

 (i) Write a word equation for aerobic respiration.

 ....

 .... [2]

 (ii) The temperature in the flask rises.

 Explain why.

 ....

 .... [1]

19 Fig. 19.1 shows a speed-time graph for a car.
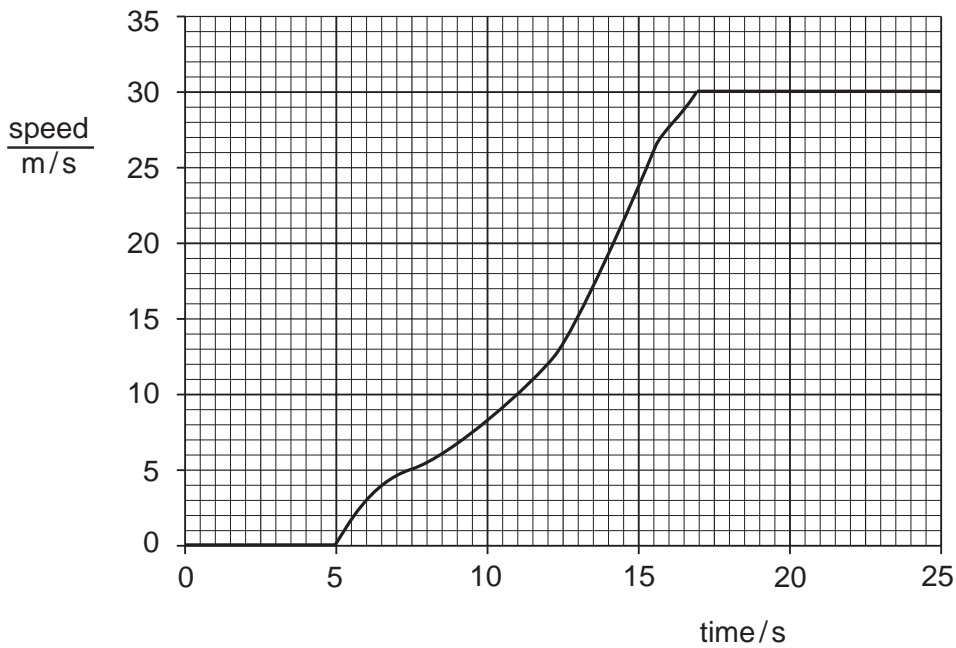
Fig. 19.1

(a) Complete the following sentences.

(i) The car is at rest from a time of …………… s to a time of …………… s.

(ii) It is accelerating from a time of …………… s to a time of …………… s. [2]

(b) The car travels around a circular track. When it is travelling with a constant speed it does not have a constant velocity.

Explain the difference between *speed* and *velocity*.

....

.... [1]

(c) The car has a mass of 1200 kg.

Calculate, in newtons, the force needed to give the car an acceleration of $0.3 \, \text{m/s}^2$.

[2]

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DATA SHEET
The Periodic Table of the Elements

Group

I	II		III	IV	V	VI	VII	O
								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		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		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		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							

Transition elements:

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
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
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
227 **Ac** Actinium 89 †									

1 **H** Hydrogen 1

58-71 Lanthanoid series
90-103 Actinoid series

* 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 |

† 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	a = relative atomic mass
b	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.).