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Centre Number	Candidate Number	Name

CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

COMBINED SCIENCE **5129/02**

Paper 2

October/November 2003

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 in the spaces provided on the Question Paper.
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.

Answer **all** questions.
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.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

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TOTAL	

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

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1 Rock salt is a mixture of sodium chloride and sand. A student added some rock water and stirred the mixture.

(a) Use words from the list below to complete the following sentences.

insoluble **soluble** **solute** **solution** **solvent**

The sodium chloride dissolved in the water to form a colourless ..... .

The sand did not dissolve because it is ..... in water.

Sodium chloride is acting as the ..... in this experiment. [3]

(b) Name a process that could be used to separate the sand from the salt solution.

..... [1]

2 A student set up an experiment to measure the half-life of a radioactive isotope that emits alpha-particles. Fig. 2.1 shows the count rate measured at 30 minute intervals after the start of the experiment.

time / minutes	0	30	60	90	120	150	180
count rate / counts per second	100	69	47	32	22	15	10

Fig. 2.1

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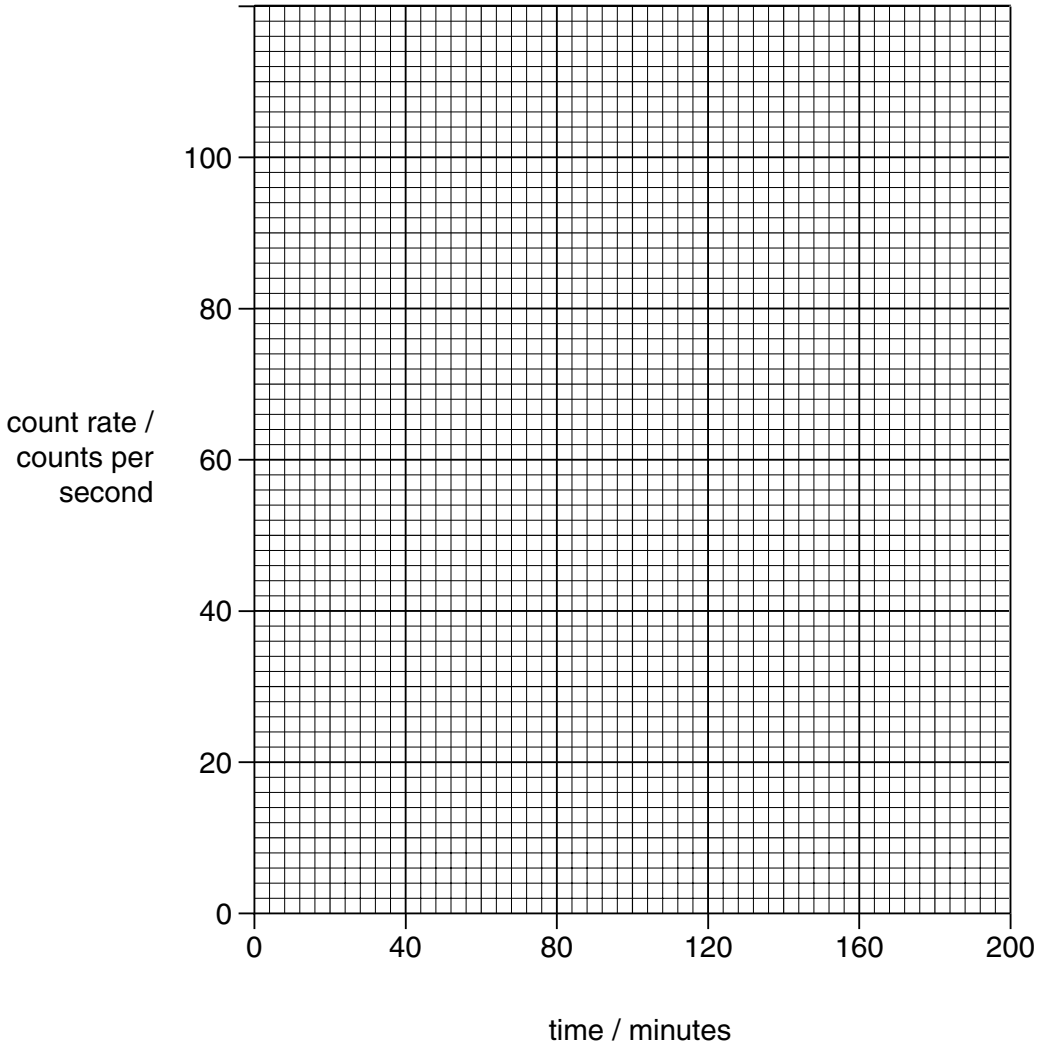
(a) On Fig. 2.2, plot a suitable graph of the results. Draw a line of best fit.



[3]

Fig. 2.2

(b) Use the graph to find the time taken for the count rate to fall from 100 counts per second to 25 counts per second.

..... [1]

(c) Use your answer to **(b)** to calculate the half-life of this isotope.

[2]

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3 Some of the organisms in an ecosystem are listed below.

frogs	**grass**	**grasshoppers**	**hawks**
rabbits	**sheep**	**snails**	**thrushes**

In this ecosystem, the following feeding habits are seen.

Hawks eat rabbits, thrushes and young sheep.

Rabbits, sheep and grasshoppers eat grass.

Snails eat grass and are eaten by thrushes.

Frogs and thrushes eat grasshoppers.

(a) Name the energy source for the ecosystem.

..... [1]

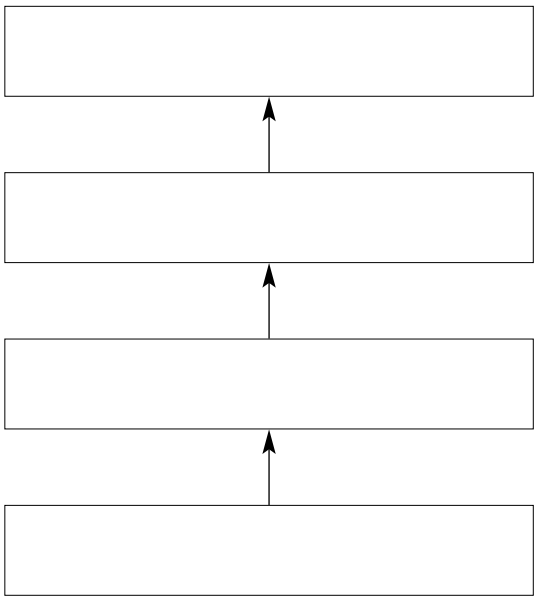
(b) Name a producer in the ecosystem.

..... [1]

(c) How many of the named organisms are herbivores?

..... [1]

(d) Use the information above to construct a food chain with **four** stages in the boxes below.



[2]

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4 Fig. 4.1 is a flow diagram for the manufacture of fertilisers.

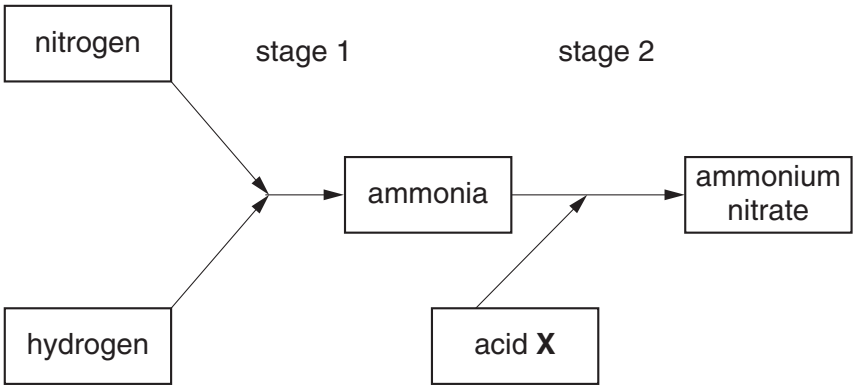

Fig. 4.1

(a) **(i)** Name the catalyst used in stage 1.

.....

(ii) Why is a catalyst used in a reaction?

.....

.....
[2]

(b) **(i)** Balance the equation for the reaction in stage 1.

$$N_2(g) + \ldots\ldots H_2(g) \longrightarrow \ldots\ldots NH_3(g)$$

(ii) What does the symbol (g) in the equation mean?

.....
[3]

(c) **(i)** Name acid **X**, used in stage 2.

.....

(ii) Name the type of reaction that occurs between acid **X** and ammonia in stage 2.

.....
[2]

(d) The fertiliser, ammonium nitrate, contains nitrogen, an element essential for the growth of plants. Name **two** other elements essential for the growth of plants.

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

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5 Fig. 5.1 shows the change of speed of a car with time.

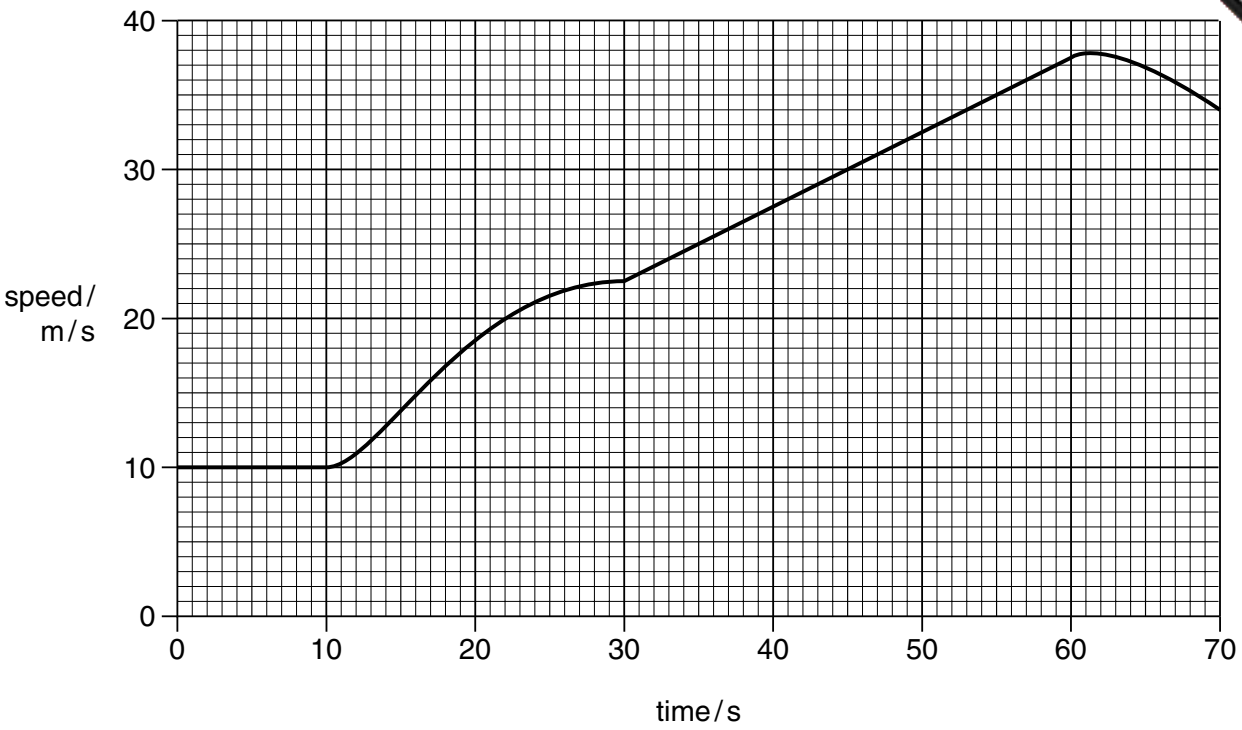

Fig. 5.1

(a) Between which two times is the car

(i) moving with constant speed,

..... s to ..... s [1]

(ii) moving with a constant acceleration?

..... s to ..... s [1]

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(b) Explain the difference between *speed* and *velocity*.

.....

..... [2]

(c) When the brakes are used to stop the car, one form of energy is converted into another.

Name these two forms of energy.

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

(d) The car has a mass of 920 kg. The maximum forward force produced by the car is 230 N.

Calculate the maximum acceleration.

[2]

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6 **(a)** Explain what is meant by a *balanced diet*.

.....

.....

..... [2]

(b) Study this list of eight foods.

banana	**chicken**	**egg**	**orange**
peanuts	**rice**	**tomato**	**tuna fish**

Choose **one** food from those listed above that would

(i) increase the quantity of vitamin C in a diet,

..... [1]

(ii) increase the quantity of protein in a diet,

..... [1]

(iii) help a person suffering from constipation.

..... [1]

(c) State three advantages of feeding babies on breast milk.

1. .....

2. .....

3. ..... [3]

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7 Fig. 7.1 shows the properties of some elements. The letters A-E are **not** the symbols elements.

element	melting point / °C	boiling point / °C	conducts electricity	addition to water	electronic structure
A	119	444	no	insoluble	2,8,6
B	659	2447	yes	insoluble	2,8,3
C	63	766	yes	reacts violently	2,8,8,1
D	–7	59	no	soluble	2,8,18,7
E	–248	–246	no	insoluble	2,8,8

Fig. 7.1

Use the letters A-E to answer the questions.

(a) Which element is a liquid at room temperature?

..... [1]

(b) Which elements are metals? Give a reason for your choice.

elements .....

reason .....

..... [3]

(c) Which element is in Group I of the Periodic Table?

..... [1]

(d) Which element is an inert gas? Give a reason for your choice.

element .....

reason ..... [2]

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8 Fig. 8.1 shows a simple transformer. The output of the transformer is connected to a

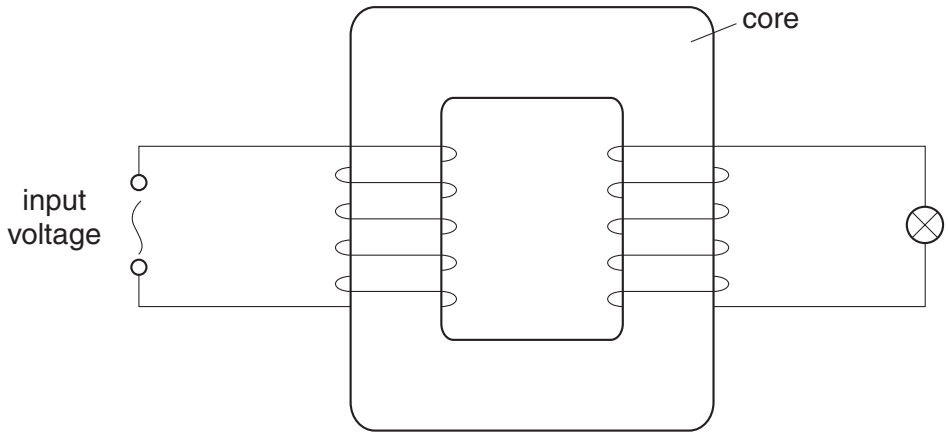

Fig. 8.1

(a) Name the two coils.

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

(b) Name a suitable material for the core.

..... [1]

(c) The transformer is used with an alternating input voltage. Explain why it is not used with a constant input voltage.

.....

.....

.....

..... [2]

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(d) The potential difference across the lamp is 6.0 V and its resistance is 24 Ω.

Calculate

(i) the current through the lamp,

[2]

(ii) the power of the lamp.

[2]

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9 Fig. 9.1 shows a section through part of a green leaf.

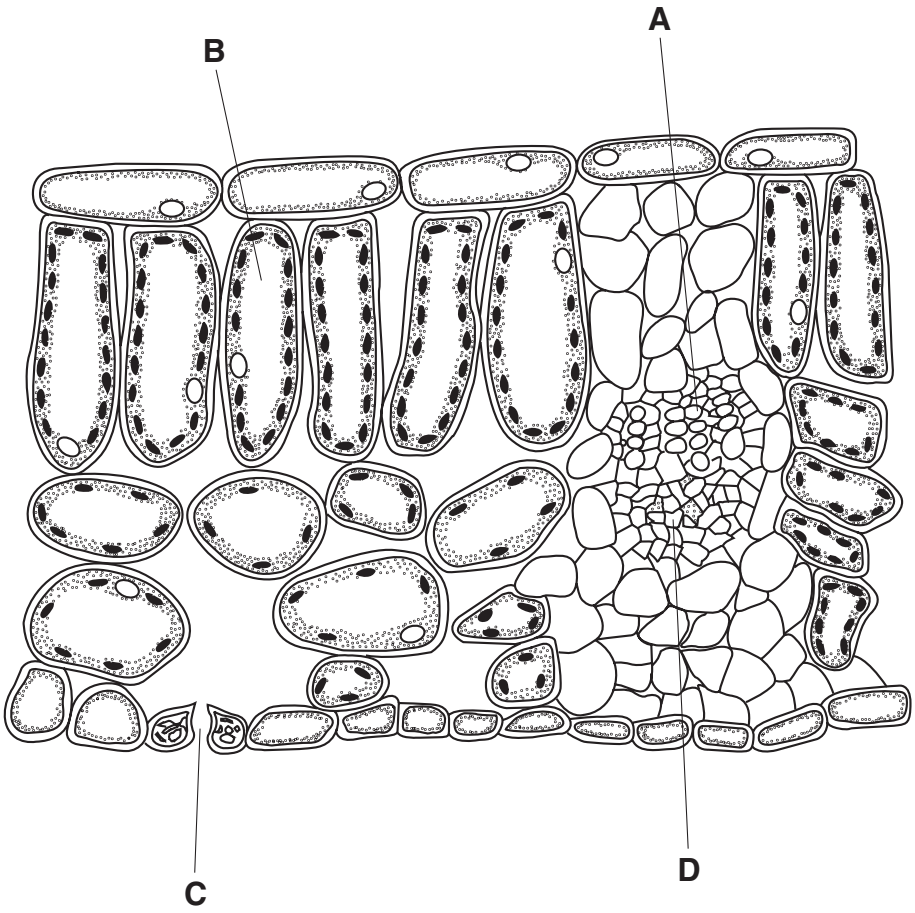

Fig. 9.1

(a) Name

(i) the process by which the plant makes carbohydrates,

.....

(ii) the green pigment required for the process named in **(i)**,

.....

(iii) the type of cell that carries out the process named in **(i)**.

.....
[3]

(b) From Fig. 9.1 give the letter that identifies cells that carry out the process named in **(a)(i)**.

..... [1]

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(c) **(i)** From Fig. 9.1 give the letter that identifies a place where gas exchange w
atmosphere occurs.

.....

(ii) Name the structure through which this gas exchange takes place.

.....

(iii) Name the gas that passes out of the structure in **(ii)** during

1. the day, ...

.....

2. the night. .....

.....

[4]

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10 Fig. 10.1 shows apparatus used to pass steam over heated magnesium.

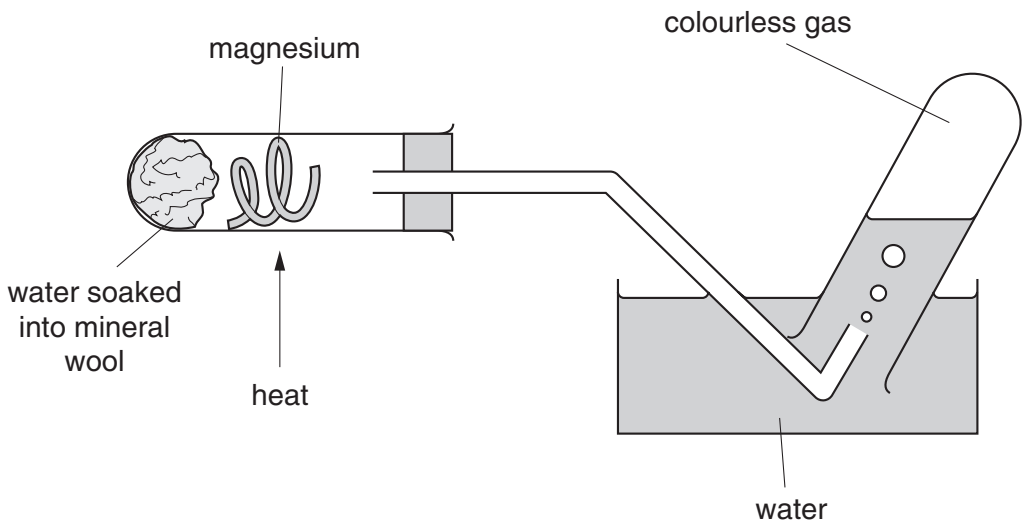

Fig. 10.1

The products of the reaction are magnesium oxide and a colourless gas.

(a) Complete the equation for the reaction between magnesium and steam.

$$Mg + H_2O \longrightarrow MgO + \ldots\ldots\ldots$$ [1]

(b) Explain why the magnesium has been oxidised and the steam reduced during the reaction.

.....

..... [2]

(c) **(i)** Calculate the relative molecular mass of magnesium oxide.
(A_r: Mg, 24; O, 16)

.....

.....

(ii) Use your answer to **(i)** to calculate the mass of magnesium oxide produced when 1.2 g of magnesium reacts with excess steam.

.....

.....
[3]

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11 Fig. 11.1 shows apparatus to demonstrate the transfer of thermal energy. The electric heater glows red. The metal plate heats up, the wax melts and the cork falls.

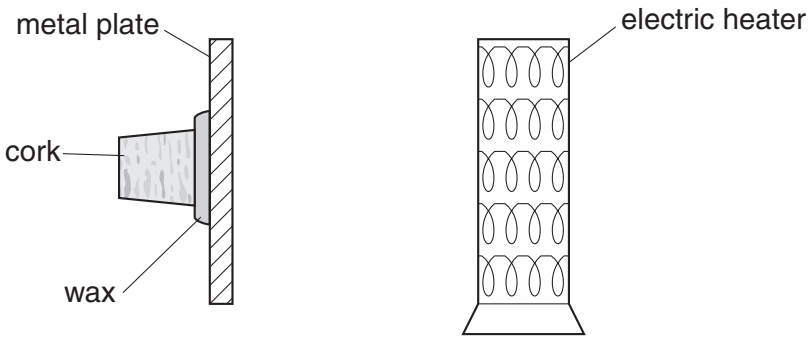

Fig. 11.1

(a) There is air in the space between the heater and the metal plate.

Explain why very little heat is transferred from the electric heater to the metal plate by

(i) conduction,

.....

..... [1]

(ii) convection.

.....

..... [1]

(b) Name the process by which most of the thermal energy is transferred from the electric heater to the metal plate.

..... [1]

(c) What is the best colour to paint the metal plate so that the cork falls in the shortest time? Explain your answer.

.....

..... [2]

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12 Fig. 12.1 shows a section through the heart.

The four chambers are labelled **A**, **B**, **C** and **D**.

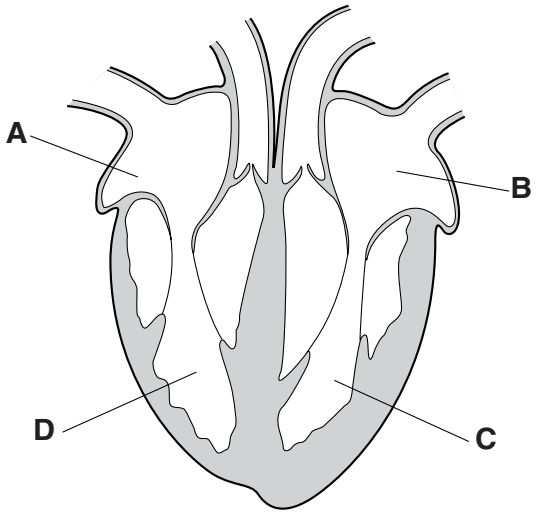

Fig. 12.1

(a) A red blood cell from the liver is pumped through the heart to the lungs.

(i) Give the letters of the two chambers through which it passes.

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

(ii) Give the letters of two chambers that have blood with the highest concentration of carbon dioxide.

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

(iii) Give the letter of the chamber that has blood with the highest pressure.

..... [1]

(iv) On Fig. 12.1 mark a cross (**X**) on a valve that closes when chambers **C** and **D** contract. [1]

(b) Name the type of tissue that forms the wall of chamber **C**.

..... [1]

(c) When a person is excited, a chemical substance is released from the adrenal glands. This is carried in the blood to the heart, where it causes the heart to beat faster.

Name this type of substance.

..... [1]

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13 Petrol contains the hydrocarbon octane, C_8H_{18}. Petrol is used as a liquid fuel in cars. car engine, some petrol is changed from a liquid to a gas, mixed with air and then ignite

(a) What term describes the change of state from liquid to gas?

..... [1]

(b) Describe the **arrangement** and **movement** of the octane molecules when it is

(i) a liquid, ...

.....

.....

(ii) a gas. .....

.....

.....

[4]

(c) Name the homologous series containing octane.

..... [1]

(d) Name the poisonous gas produced when octane burns in a **limited** supply of oxygen.

..... [1]

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14 Fig. 14.1 shows some regions of the electromagnetic spectrum.

radio	microwave	infra-red	visible light	**region A**	X-ray	gamma

Fig. 14.1

(a) Name **region A**.

..... [1]

(b) In which region of the electromagnetic spectrum are the longest wavelengths found?

..... [1]

(c) State a property that is the same for all electromagnetic waves in a vacuum.

.....

..... [1]

(d) Sound and light are both wave motions. State two differences between sound and light.

1. .....

.....

2. .....

..... [2]

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15 Choose some of the words below and fill in the gaps to complete the following sent
You may use each word once, more than once, or not at all.

condoms **contraceptive pills** **penis** **sperm**

sperm ducts **testes** **vagina** **vasectomy**

Contraceptive methods in males include the use of condoms, which cover the

penis and prevent both fluid and ..... from

entering the woman's ..... .

Another method, called ....., involves cutting the ..... .

Using ..... can also prevent transmission of HIV. [5]

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	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	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** otassium	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	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	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	226 **Ra** Radium 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** Lawr 10

3-71 Lanthanoid series
0-103 Actinoid series

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

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

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