

Centre Number	Candidate Number	Name
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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.

For Examiner's Use	
TOTAL	

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

- 1 Rock salt is a mixture of sodium chloride and sand. A student added some rock salt to 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.

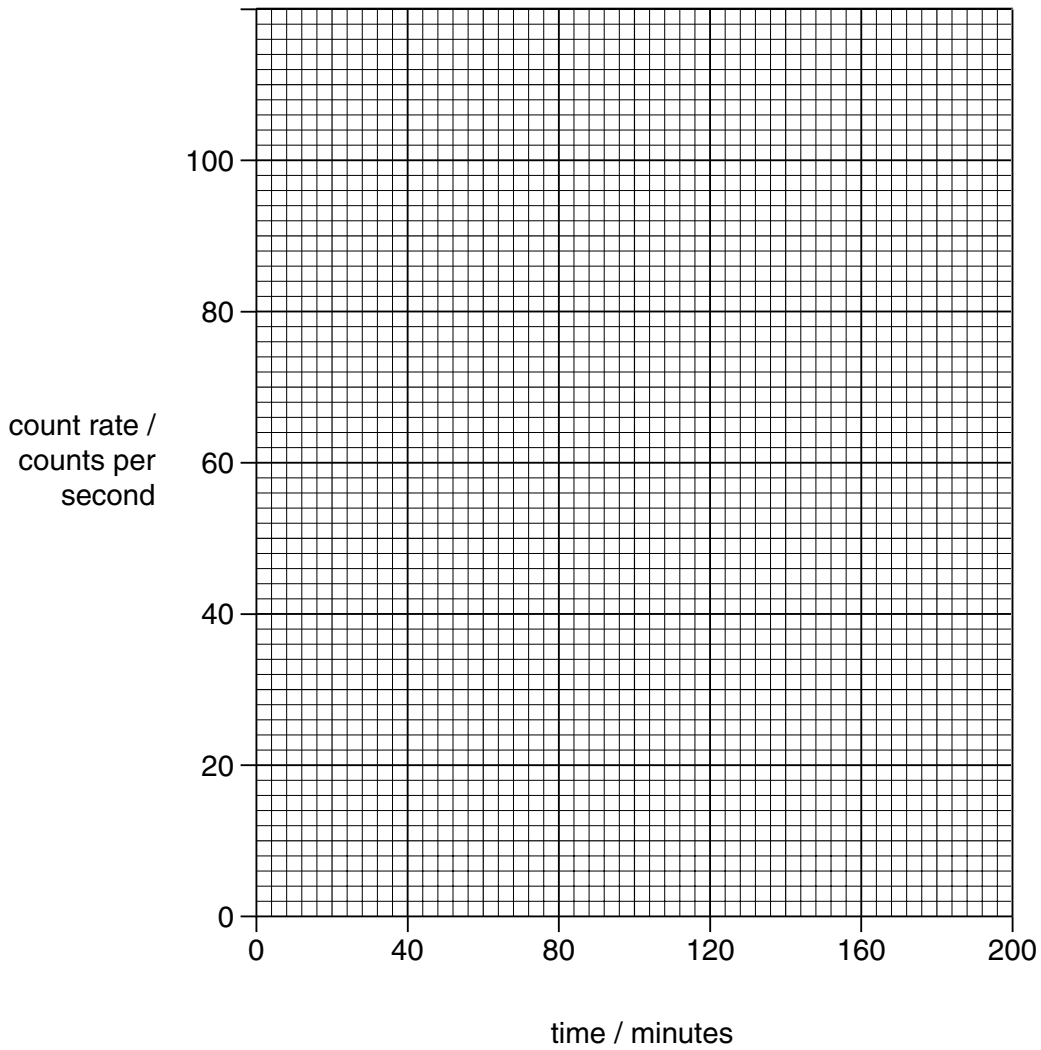
..... [1]

- 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

- (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]

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]

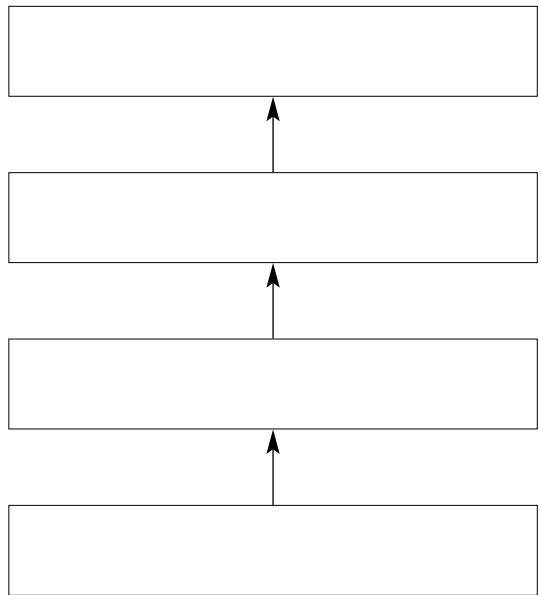
(b) Name a producer in the ecosystem.

..... [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]

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

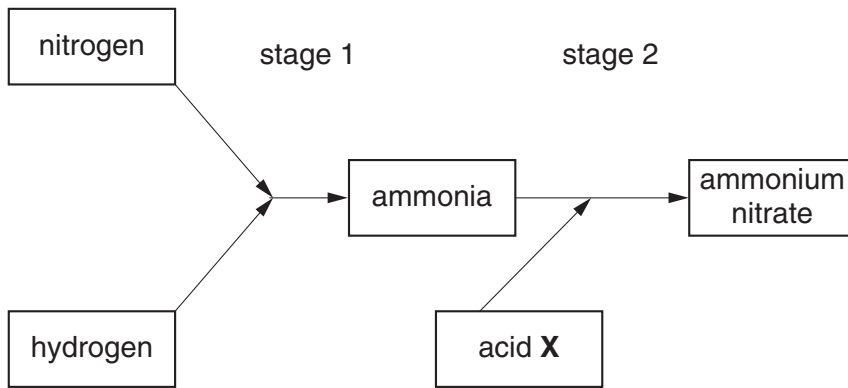


Fig. 4.1

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

.....

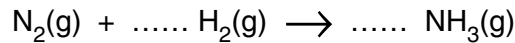
(ii) Why is a catalyst used in a reaction?

.....

.....

[2]

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



(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]

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

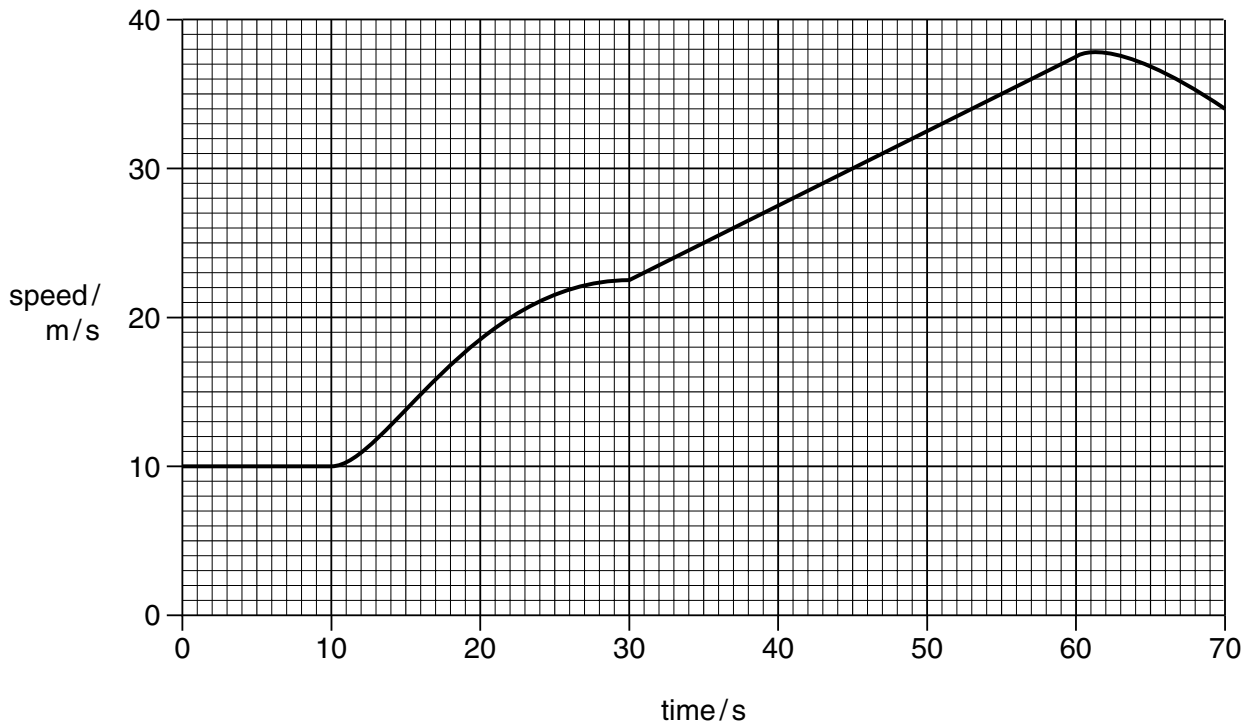


Fig. 5.1

(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]

(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]

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]

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

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

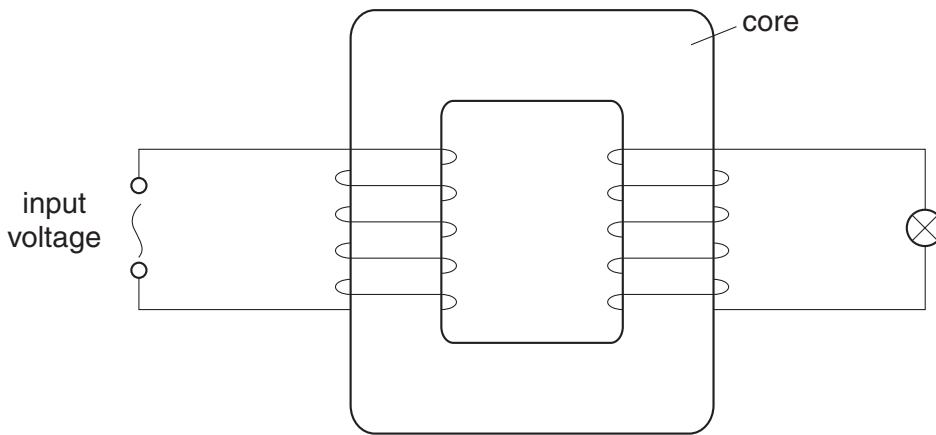


Fig. 8.1

(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]

(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]

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

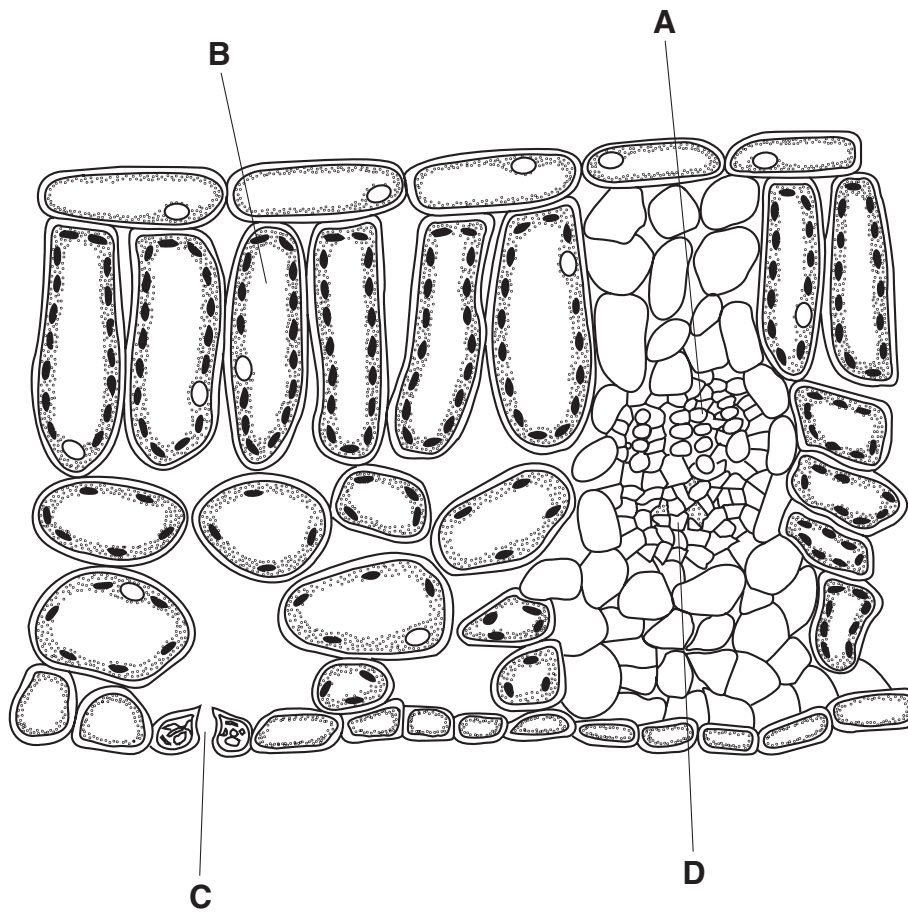


Fig. 9.1

(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]

(c) (i) From Fig. 9.1 give the letter that identifies a place where gas exchange with the 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]

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

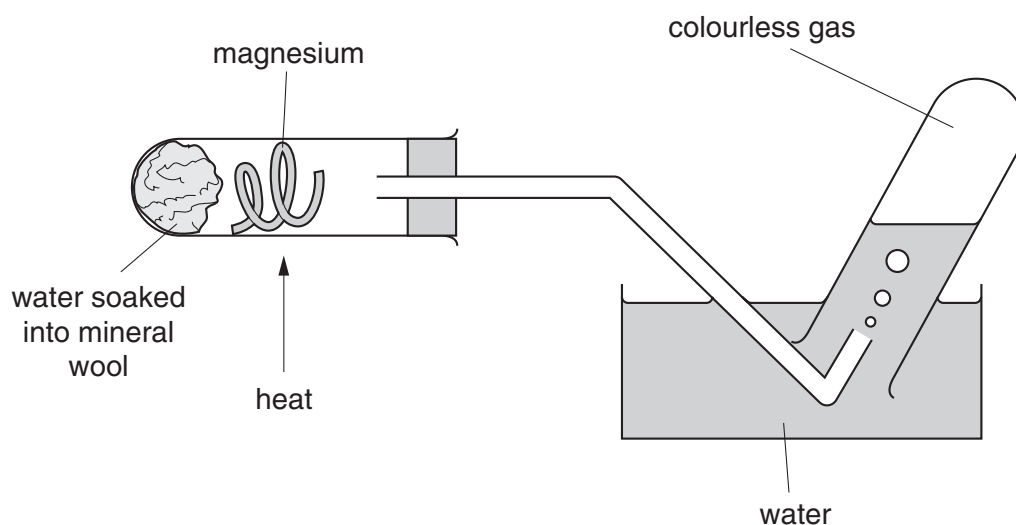


Fig. 10.1

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

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



(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]

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.

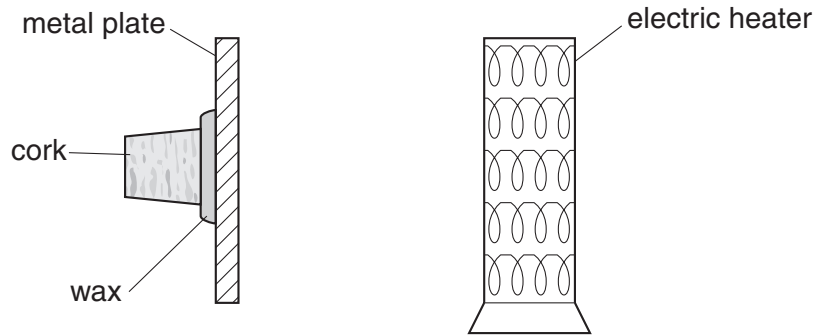


Fig. 11.1

(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]

12 Fig. 12.1 shows a section through the heart.

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

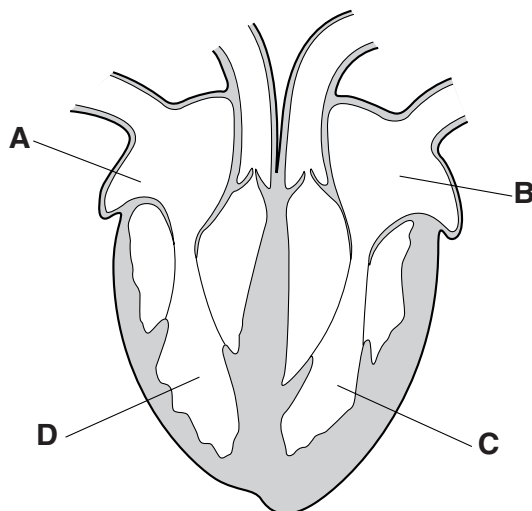


Fig. 12.1

(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]

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

(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]

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]

- 15 Choose some of the words below and fill in the gaps to complete the following sentences. 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	O					
7 Li Lithium 3	9 Be Beryllium 4	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">1 H Hydrogen 1</div> </div>										4 He Helium 2
23 Na Sodium 11	24 Mg Magnesium 12											11 B Boron 5
39 K Potassium 19	40 Ca Calcium 20	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					
85 Rb Rubidium 37	88 Sr Strontium 38	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36					
133 Cs Caesium 55	137 Ba Barium 56	65 Zn Zinc 30	64 Cu Copper 29	59 Ni Nickel 28	108 Ag Silver 47	127 I Iodine 53	131 Xe Xenon 54					
226 Ra Radium 88	227 Ac Actinium 89	112 Cd Cadmium 48	106 Pd Palladium 46	103 Rh Rhodium 45	197 Au Gold 79	209 Po Polonium 84	210 At Astatine 85					
		55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		52 Cr Chromium 24	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		51 V Vanadium 23	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		48 Ti Titanium 22	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		41 Nb Niobium 41	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		91 Zr Zirconium 40	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		181 Ta Tantalum 73	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		178 Hf Hafnium 72	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		139 La Lanthanum 57	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		226 Ra Radium 88	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		140 Ce Cerium 58	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		141 Pr Praseodymium 59	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		144 Nd Neodymium 60	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		150 Sm Samarium 62	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		157 Gd Gadolinium 64	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		162 Dy Dysprosium 66	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		165 Ho Holmium 67	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		167 Er Erbium 68	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		173 Yb Ytterbium 70	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		175 Lu Lutetium 71	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		181 Th Thorium 90	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		232 Pa Protactinium 91	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		238 U Uranium 92	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		90 Fr Francium 87	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		91 Th Thorium 90	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		92 Pa Protactinium 91	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		93 Np Neptunium 93	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		94 Pu Plutonium 94	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		95 Am Americium 95	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		96 Cm Curium 96	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		97 Bk Berkelium 97	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		98 Cf Californium 98	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		99 Es Einsteinium 99	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		100 Fm Fermium 100	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		101 Md Mendelevium 101	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		102 No Nobelium 102	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					
		103 Lr Lawrencium 103	55 Mn Manganese 25	59 Co Cobalt 27	101 Ru Ruthenium 44	122 Sb Antimony 51	128 Te Tellurium 52					

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

Key

a	X
b	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.).