Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

COMBINED SCIENCE **0653/02**

Paper 2

May/June 2005

1 hour 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 pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
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	
1	
2	
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Total	

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

1 Fig. 1.1 shows a plant cell taken from the inside of a leaf.

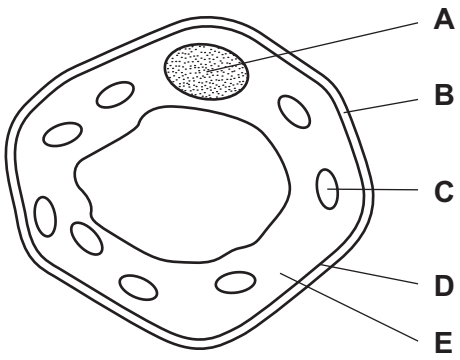


Fig. 1.1

(a) Give the **letter** of the part which matches each of these descriptions.

This controls what enters and leaves the cell. .....

This contains DNA. .....

This is where photosynthesis takes place. ..... [3]

(b) The leaf cell shown in Fig. 1.1 requires a steady supply of water.

(i) Name the tissue in which water is transported from the roots to the leaves.

..... [1]

(ii) Describe how water from the leaf cells moves out of the leaf and into the air surrounding it.

.....

.....

.....

..... [2]

2 Fig. 2.1 shows a developing fetus in the uterus.

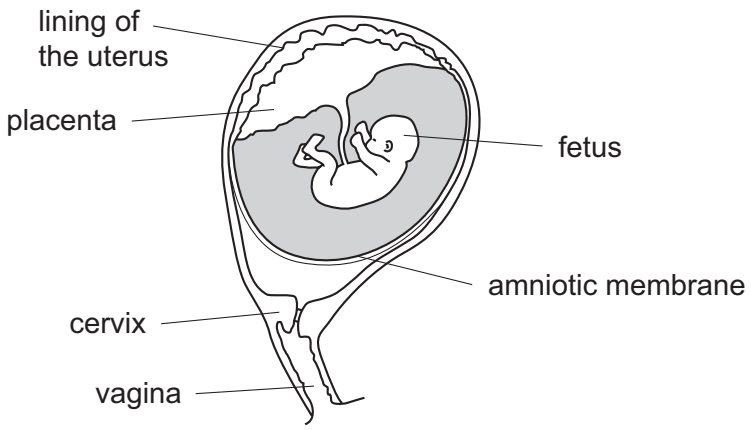


Fig. 2.1

(a) Use Fig. 2.1, and your own knowledge, to help you to complete these sentences.

A developing fetus obtains its oxygen through the ..... , from its mother's ..... . It is supported by ..... fluid. [3]

(b) AIDS is caused by a virus. If a woman has AIDS, her baby may also develop this illness.

(i) Explain why this may happen.

.....

..... [1]

(ii) Describe **one** way in which a woman can reduce the chance that she will get AIDS.

.....

..... [1]

(c) Explain why a pregnant woman should make sure that her diet contains plenty of calcium.

.....

.....

..... [2]

3 **(a)** The full chemical symbols of four elements are shown below.

$^{1}_{1}H$ $^{16}_{8}O$ $^{24}_{12}Mg$ $^{40}_{18}Ar$

Use this information to answer **(i)** to **(iv)** below.

(i) Name the element which does not react with any of the others and explain your answer.

name .....

explanation .....

..... [2]

(ii) Name a pair of elements which combine together to form an *ionic* compound.

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

(iii) Name two elements whose atoms have electrons in three energy levels (shells).

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

(iv) State and explain which of the symbols above shows an atom which does **not** contain any neutrons.

symbol .....

explanation .....

.....

..... [2]

(b) Magnesium reacts with dilute hydrochloric acid according to the equation below.

$$Mg + 2HCl \longrightarrow MgCl_2 + H_2$$

Explain why this equation is said to be *balanced*.

.....

..... [1]

(c) A student investigated factors affecting the rate of reaction between magnesium and dilute hydrochloric acid. She wanted to investigate the effects of changing

- the surface area of the magnesium
- the temperature of the hydrochloric acid.

The apparatus she used is shown in Fig. 3.1.

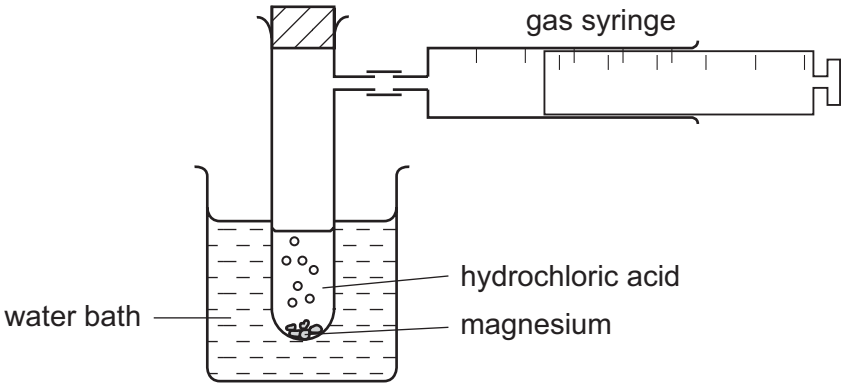


Fig. 3.1

Results of three of her experiments are shown in Table 3.2

Table 3.2

experiment	mass of magnesium /g	volume of acid /cm^3	volume of hydrogen gas collected in 2 minutes /cm^3
1	2.0	20.0	45
2	2.0	20.0	15
3	2.0	20.0	70

(i) State **one** other important factor (variable) that the student must keep the same in each experiment.

.....[1]

(ii) In one of the experiments the student used both a large surface area of magnesium and a high temperature of acid.
Suggest and explain in which experiment, 1, 2 or 3, this was done.

.....

.....

.....[2]

4 **(a)** An elephant can communicate with other elephants using infra-sound. This is a very low frequency vibration, which is usually impossible for a human to hear.

(i) Suggest a possible frequency for this vibration.

..... Hz [1]

(ii) Explain what is happening to the molecules when these vibrations travel through the air. You may use a diagram to help you to answer this question.

..... [2]

(b) A spider climbs vertically upwards along a thread.

(i) It travels 21 cm in 7 seconds.

Calculate the speed at which it travels.

Show your working and state the formula that you use.

formula used

working

..... cm / s [2]

(ii) The spider weighs 0.02N.

Calculate the work done when it climbs 21 cm up the thread.

Show your working and state the formula that you use.

formula used

working

..... joules [3]

(c) A polar bear is a large white furry mammal that lives on the Arctic ice.

Suggest and explain **one** way in which the polar bear is adapted to reduce heat loss in this cold climate.

.....

.....

..... [2]

5 Sulphur dioxide is an unpleasant gas that is released into the air when coal is burnt.

(a) Breathing in harmful gases, such as sulphur dioxide or the gases in cigarette smoke, often stops the cilia lining a person's airways from working properly.

(i) Explain how the cilia usually help to keep the lungs clean.

.....

.....

..... [2]

(ii) Using your answer to **(i)**, explain how breathing in sulphur dioxide, or smoking cigarettes, can lead to bronchitis.

.....

.....

..... [2]

(b) Fig. 5.1 shows the concentration of sulphur dioxide in the air of a large city, and also the number of people who died, from December 1st to December 15th in 1952.

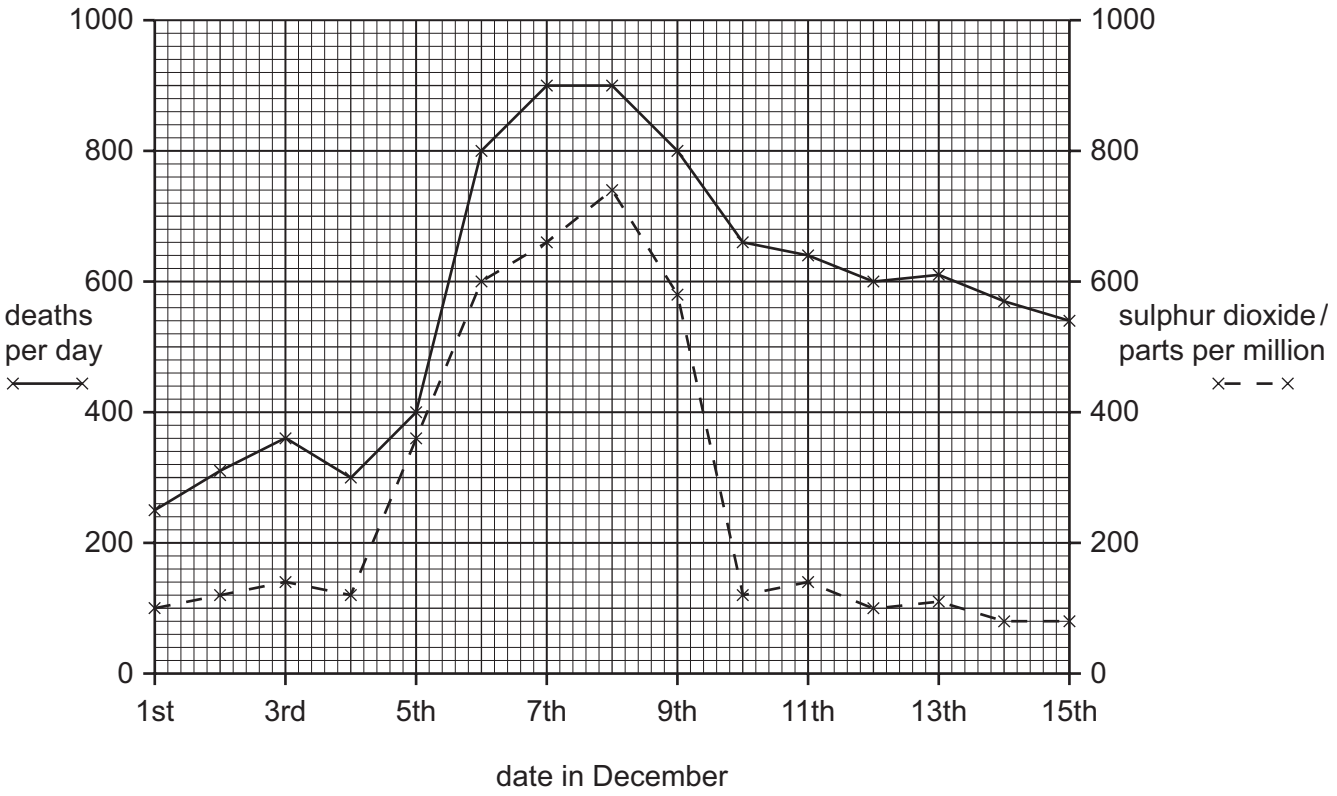


Fig. 5.1

(i) How many more people died on December 8th than on December 1st?

.....

[1]

(ii) Explain how the information in the graph in Fig. 5.1 supports the idea that sulphur dioxide is harmful to health.

.....

.....

.....

[1]

(iii) Suggest why the numbers of deaths were still high on December 15th, even though the concentration of sulphur dioxide had returned to a low level.

.....

.....

[1]

6 Fig. 6.1 shows what is observed when a piece of potassium reacts in a container of chlorine to form potassium chloride.

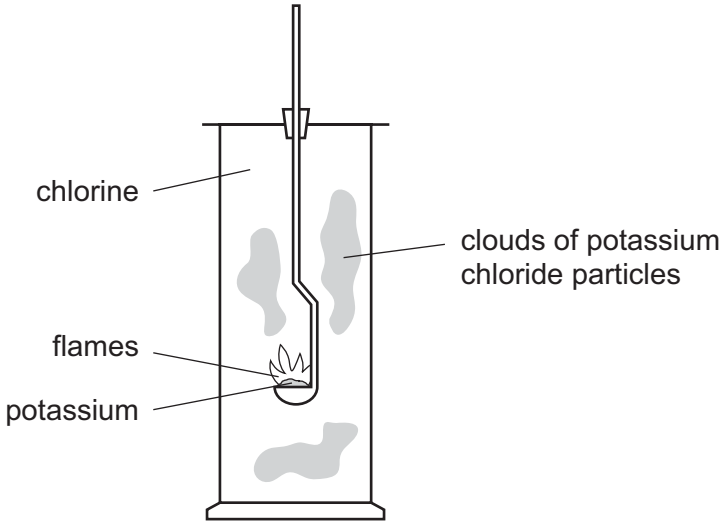


Fig. 6.1

(a) (i) Write the word equation for this reaction.

..... [1]

(ii) Explain which observation in Fig. 6.1 shows that the reaction is *exothermic*.

.....

.....

..... [2]

(b) Potassium chloride can also be made by reacting an alkali with an acid.

(i) Name the type of chemical reaction that occurs between an acid and an alkali.

..... [1]

(ii) Name the acid and the alkali that react to produce potassium chloride solution.

name of acid .....

name of alkali ..... [2]

(iii) Suggest how the solution of potassium chloride could be tested to make sure that it does not contain excess acid or alkali.

.....

.....

..... [2]

(iv) Describe briefly how a sample of dry potassium chloride crystals could be obtained in a short time from potassium chloride solution.

.....

.....

.....

..... [2]

7 **(a)** Fig. 7.1 shows a toy bird, made from wood and suspended from a ceiling by a spring.

Fig. 7.1

(i) The direction of the upward force of the spring has been labelled **A**.
Draw another arrow on the diagram to show the direction of the other force acting on the bird.
Label it **B**. [1]

(ii) The bird is not moving. What can be stated about the sizes and directions of forces **A** and **B**?

.....

..... [1]

(iii) Name force **B**.

..... [1]

(b) The mass of the bird is 25 g and its volume is 30 cm^3.
Calculate the density of the bird.

Show your working and state the formula that you use.

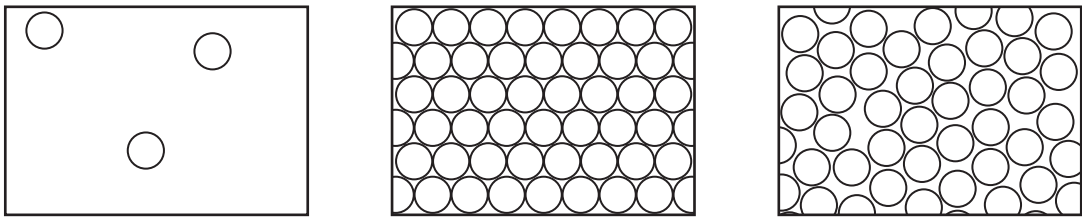
formula used

working

..... g/cm^3 [2]

(c) The metal in the spring is an example of a solid material.

Fig. 7.2 shows the arrangement of particles in a solid, a liquid and a gas.



X **Y** **Z**

Fig. 7.2

Which diagram **X**, **Y** or **Z** shows the arrangement of particles in the spring?

Explain your answer.

.....

.....

..... [3]

8 Fig. 8.1 shows the structure of the human alimentary canal.

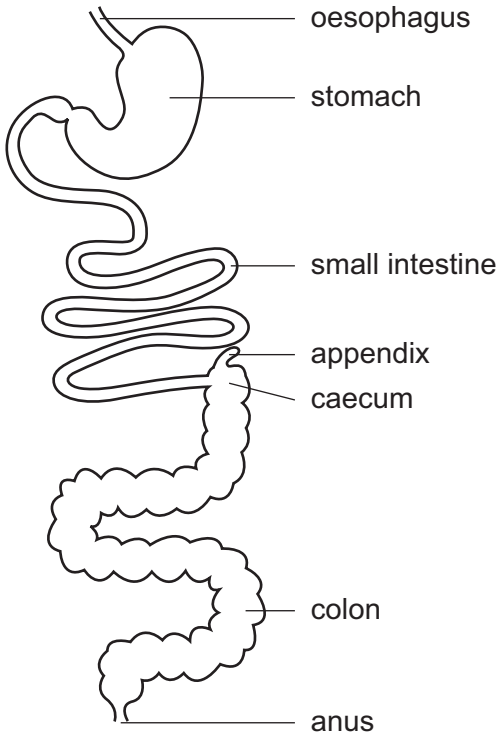


Fig. 8.1

(a) When a person eats a meal containing starch, the starch is broken down inside the alimentary canal and changed into glucose. The glucose is then absorbed into the blood.

(i) Name the type of chemical that helps to break down starch to glucose in the alimentary canal.

..... [1]

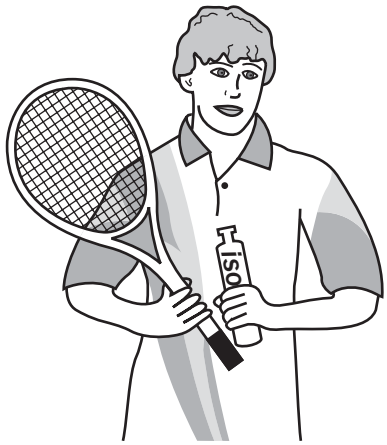
(ii) In which part of the alimentary canal is the glucose absorbed?

..... [1]

(iii) The walls of the alimentary canal contain muscles that can contract and relax. Suggest the function of these muscles.

..... [1]

(b) Glucose is a good energy food. Athletes often drink liquids containing glucose to provide them with energy quickly. The glucose is broken down in their muscles during respiration.



(i) Describe how you could test a drink to find out if it contains a reducing sugar, such as glucose.

.....

.....

..... [2]

(ii) Complete the word equation for respiration.

glucose + ... → ..... + ... [2]

9 **(a)** Wood is a solid fuel used in many countries. When it has been buried, compressed and heated underground for millions of years, wood is converted into another common type of solid fuel.
Both of these types of fuel contain large amounts of the element carbon.
Name the fuel formed from wood over millions of years.

.....[1]

(b) Fig. 9.1 shows two experiments, **A** and **B**, carried out on small pieces of wood.

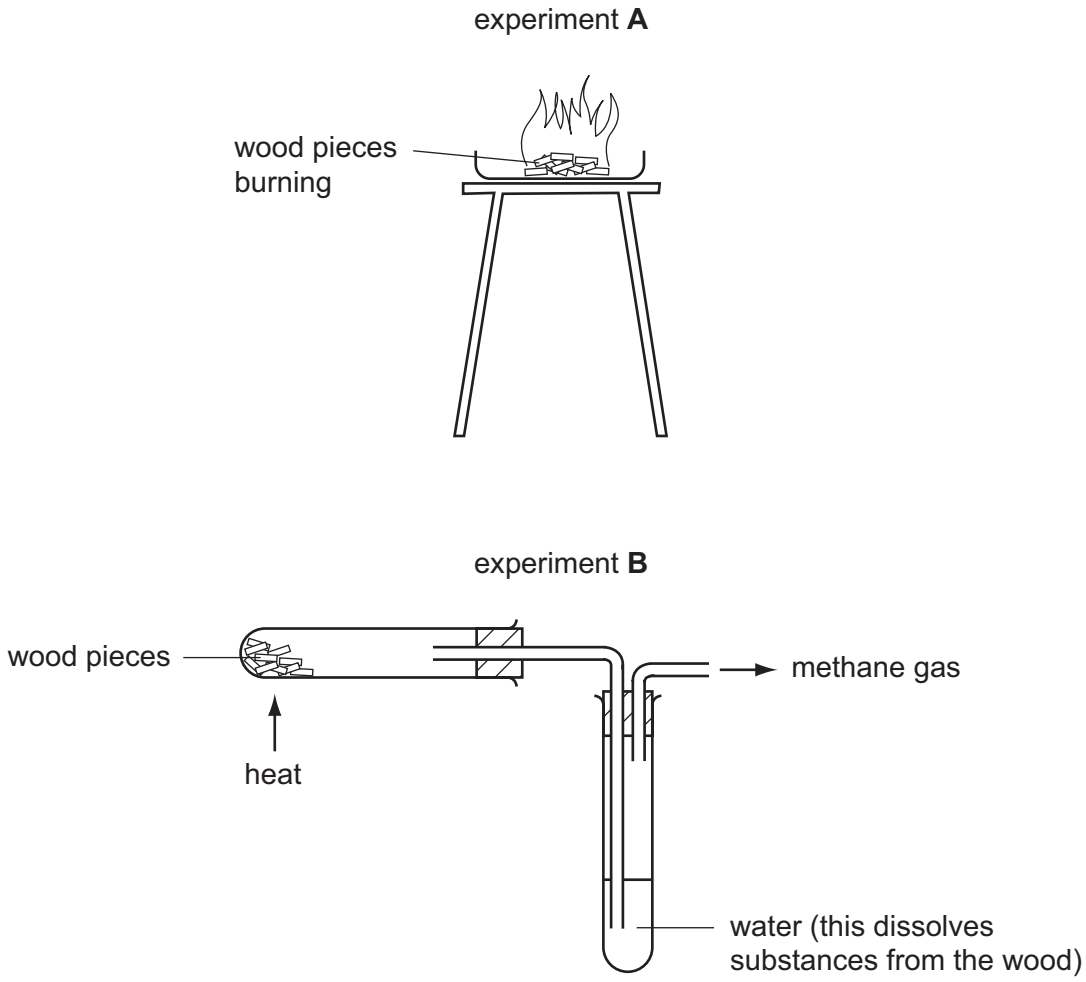


Fig. 9.1

(i) Explain in which experiment, **A** or **B**, the wood is undergoing oxidation.

.....

..... [1]

(ii) Suggest **one** gas produced in the reaction in experiment **A**.

..... [1]

(iii) The wood in experiment **B** does not catch fire.
Suggest the type of chemical reaction in experiment **B**.
Explain your answer briefly.

type of reaction .....

explanation .....

.....

..... [2]

(c) Charcoal is a solid fuel that contains mainly carbon. In ancient times, it is possible that charcoal and copper oxide might have been heated together in a fire.

(i) Suggest **one** observation which would show that a metal was produced in this process.

.....

..... [1]

(ii) Write a word equation for the reaction between carbon and copper oxide.

..... [1]

10 (a) An electric heater is designed to heat a fish tank. The circuit containing this heater is shown in Fig. 10.1.

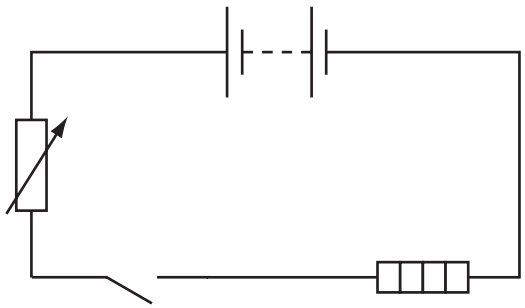


Fig. 10.1

The current flowing through the heater is 0.5 A and the voltage across it is 5.0 V.

Calculate the resistance of the heater.

Show your working and state the formula that you use.

formula used

working

..... Ω [2]

(b) The electric heater is placed at the bottom of the fish tank rather than at the top. Explain why this is more effective for heating the water in the tank.

.....

.....

..... [2]

(c) Choose words from the list below to complete the sentences.

colour	**convection**	**radio**
reflection	**refraction**	**sound**
speed	**transverse**	

Light waves form part of the electromagnetic spectrum.

They travel as ..... waves.

They change ..... when they move from water to air.

This causes the light waves to change direction. This is called .....

Another example of waves which form part of the electromagnetic spectrum is

..... waves. [4]

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											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	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.).