UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8579467583

COMBINED SCIENCE **0653/02**

Paper 2 (Core) **October/November 2009**

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.
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.
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	
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

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

For Examiner's Use

1 Table 1.1 shows the results of food tests made on two different foods.

Table 1.1

food	colour with iodine solution	colour with biuret solution
A	blue-black	blue
B	brown	purple

(a) Use the results in Table 1.1 to state the nutrient present in food **A** and in food **B**.

food **A** .....

food **B** ..... [2]

(b) The enzyme amylase is present in saliva. It helps to digest starch in the mouth.

(i) Explain what is meant by the term *enzyme*.

.....

.....

..... [2]

(ii) Some people do not produce amylase in their saliva or other digestive juices.

Explain why these people **cannot** obtain energy from the starch in their diet.

.....

.....

.....

..... [3]

(iii) The inability to produce amylase can be passed on from parents to their children.

Suggest what causes this inability.

..... [1]

(iv) Dogs are carnivores. Dogs do not produce amylase.

Explain why carnivores, such as dogs, do not need to produce amylase.

..... [1]

For Examiner's Use

2 **(a)** Fig. 2.1 shows some of the gases which are released into the air when volcanoes erupt.

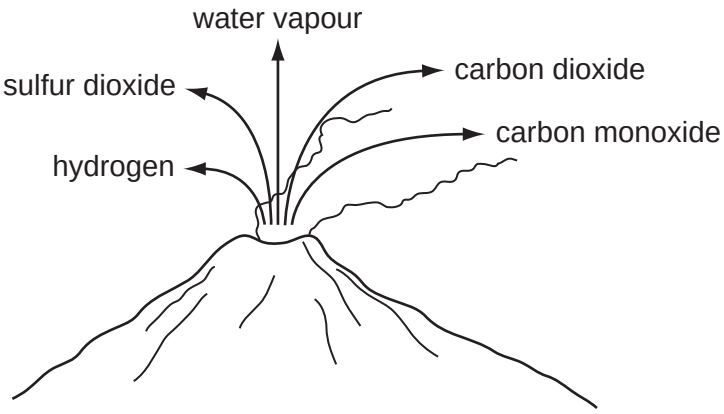


Fig. 2.1

(i) Which gas shown in Fig. 2.1 is an element? ..... [1]

(ii) Explain how volcanic eruptions could cause acid rain.

.....

.....

..... [2]

(b) Carbon dioxide molecules are formed when two non-metallic elements combine.

(i) State the type of chemical bonding in a carbon dioxide molecule.

..... [1]

(ii) Complete Table 2.1 by drawing the displayed (graphical) formula of carbon dioxide.

Table 2.1

	molecular formula	**displayed formula**
water	H_2O	H – O – H
carbon dioxide	CO_2	

[2]

For Examiner's Use

3 Radiation can be used to monitor the thickness of paper in a paper mill.

Fig. 3.1 shows a radiation detector connected to a control unit. This sends messages to machines that adjust the gap between the rollers.

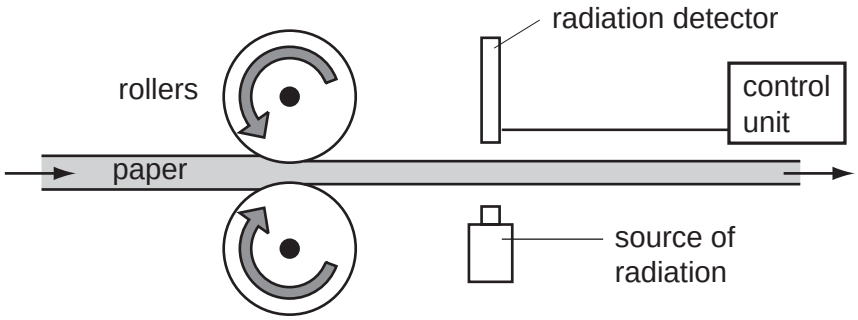


Fig. 3.1

(a) The following sentences describe what happens if the paper sheet produced is too thin.

The sentences are in the wrong order.

A The gap between the rollers is increased.

B The paper sheet is now rolled a little thicker.

C A signal goes from the detector to the control unit.

D The paper sheet absorbs less beta radiation so more reaches the detector.

Arrange the sentences in the correct order.

[2]

(b) Explain why an alpha radiation source **cannot** be used to monitor the thickness of the paper sheet.

.....

..... [1]

For Examiner's Use

(c) Radioactive materials give out radiation.

Describe how this radiation can harm people.

.....

.....

..... [2]

(d) The technician servicing this equipment must be able to handle radioactive substances safely. Suggest two safety precautions that he uses.

1st precaution .....

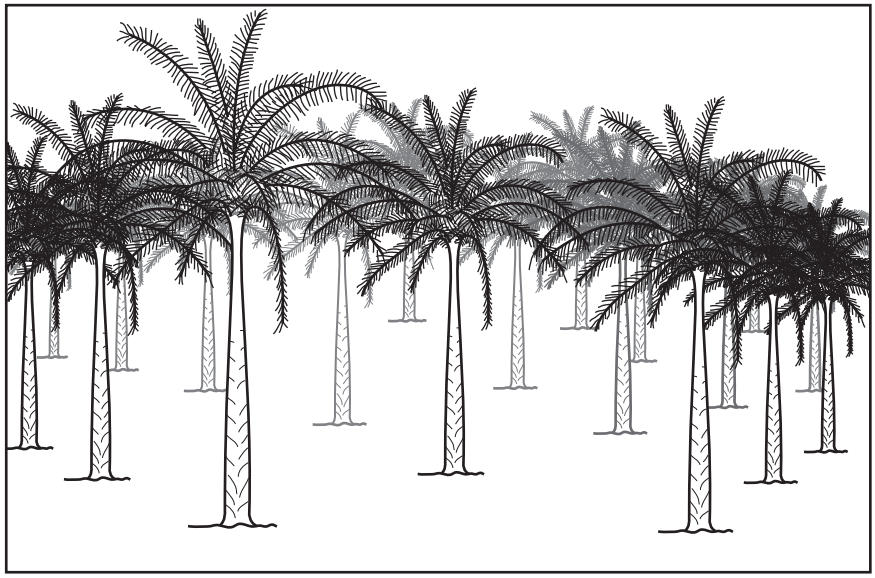
.....

2nd precaution .....

..... [2]

For Examiner's Use

4 In some countries in south-east Asia, large areas of tropical rainforest have been cut down to clear the land. The land has then been planted with oil-palm trees.



(a) Explain how cutting down tropical rainforest may affect each of the following.

(i) soil erosion

.....

.....

..... [2]

(ii) species diversity

.....

.....

..... [2]

(b) Oil palm rats often live in oil-palm plantations. The rats eat the oil-palm fruits. Owls prey on the oil-palm rats.

For Examiner's Use

(i) Draw a food chain to show this information.

[2]

(ii) For each organism in your food chain, state whether it is a producer or a consumer.

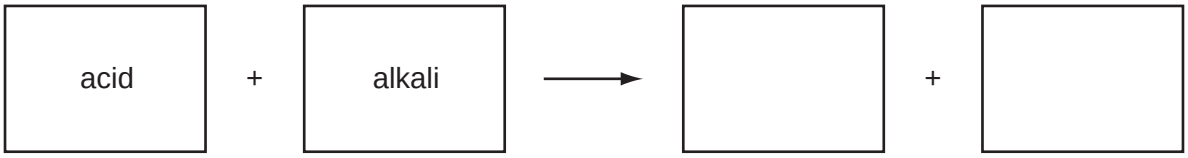
.....

..... [1]

5 Plastics are suitable materials for making containers in which to store acids. Acids are not stored in containers made of galvanised steel.

(a) Acids are neutralised by alkalis.

(i) Complete the general word equation below.



[2]

(ii) State the element which is present in all acids.

.....

[1]

(iii) Sodium hydroxide solution is an example of an alkali.

Write the chemical formula of sodium hydroxide.

.....

[1]

(b) (i) Name the main metallic element in steel.

.....

[1]

(ii) Describe what is meant by the term *galvanised*, and state briefly why some steel is galvanised.

.....

.....

.....

[2]

(iii) Explain why galvanised steel is **not** a suitable material for making containers used for storing acids.

.....

.....

[1]

(c) Poly(propene) is a compound used in making plastics. Poly(propene) is a polymer made of the monomer, propene (C_3H_6).

For Examiner's Use

(i) State the total number of atoms combined in one molecule of propene.

..... [1]

(ii) Explain why propene is an example of a hydrocarbon.

..... [1]

(iii) Poly(propene) molecules are formed when propene is heated with a catalyst.

Describe how propene molecules react to form poly(propene). You may draw a simple diagram if it helps you to answer this question.

.....

.....

..... [2]

For Examiner's Use

6 A motorcyclist begins a journey on his motorcycle. The motorcycle starts from rest and stops at a road junction after 80 seconds. The motorcycle then moves off again and completes the journey.

(a) Fig. 6.1 shows a graph of the motion of the motorcycle.

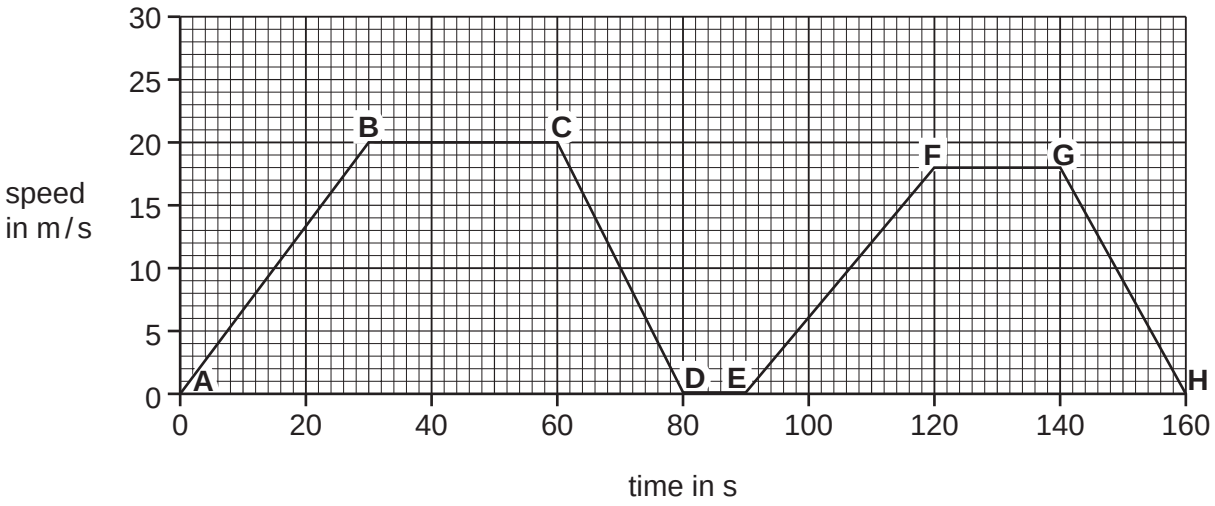


Fig. 6.1

(i) From the start of the journey, how long did it take the motorcyclist to reach a speed of 10 m/s?

..... s [1]

(ii) For how long was the motorcyclist travelling at a steady speed of 20 m/s?

..... s [1]

(iii) During which two parts of the journey was the motorcyclist slowing down?

from ..... to .....

and from ..... to ..... [1]

(b) Describe the motion of the moving motorcycle if the total frictional force it experiences is the same as the force produced by the engine.

Explain your answer.

.....

..... [2]

(c) Motorcycle engines use petrol as a fuel.

When motorcycle engines are tested at the factory, a tube should be attached to the exhaust pipe.

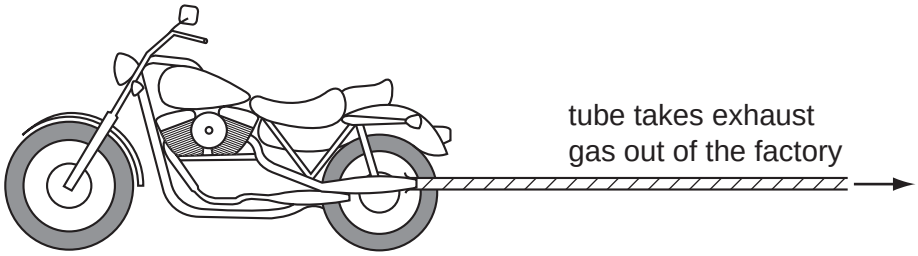


Fig. 6.2

(i) Explain why the exhaust gas must be removed from the factory.

.....

.....

..... [2]

(ii) Complete the sentences to show the energy changes involved in the motorcycle engine.

- Fuel contains ..... energy.
- Fuel burns in the engine to produce ..... energy and ..... energy. [3]

For Examiner's Use

7 Fig. 7.1 shows a transverse section of part of a leaf. The arrows show water movement.

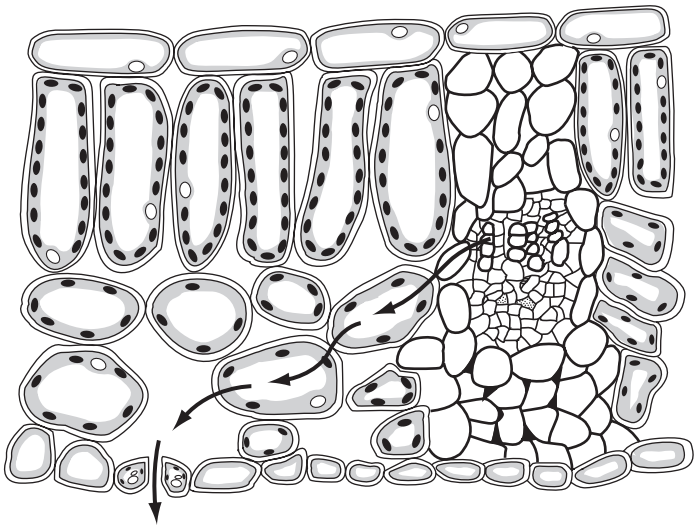


Fig. 7.1

(a) On Fig. 7.1, label each of following structures, using label lines.

(i) a palisade cell [1]

(ii) a stoma [1]

(b) Describe the function of each of these parts of a palisade cell.

(i) nucleus .....

.....

..... [2]

(ii) cell surface membrane .....

..... [1]

(c) **(i)** Explain why palisade cells need a good supply of water.

.....

.....

..... [2]

(ii) Name the type of cell that transports water from the roots to a leaf.

..... [1]

(d) (i) Fig. 7.1 shows water moving through the leaf and out into the surrounding air.

In what state, solid, liquid or gas, is the water as it moves from the leaf into the air?

..... [1]

(ii) Name the process by which the water moves out of the leaf into the air.

..... [1]

For Examiner's Use

For Examiner's Use

8 **(a)** Fig. 8.1 shows an aluminium saucepan on a cooker. Vegetables are being cooked in boiling water in the pan.

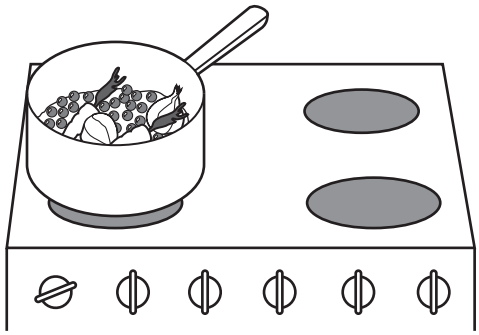


Fig. 8.1

(i) State how the energy passes from the hot cooker through the base of the pan to the water.

.....

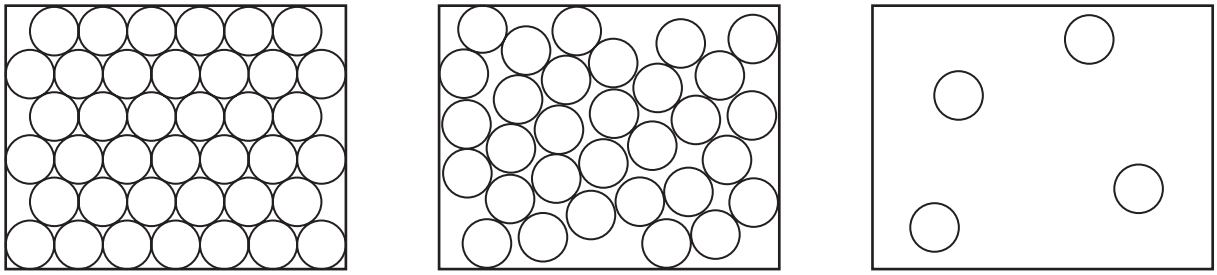
[1]

(ii) Suggest why saucepan handles are often made from plastic rather than metal.

.....

[1]

(b) Fig. 8.2 shows three different ways in which particles may be arranged in substances.



A **B** **C**

Fig. 8.2

(i) Which diagram best represents the way particles are arranged in the aluminium saucepan?

Explain your answer.

diagram .....

explanation .....

.....

[1]

(ii) Which diagram best represents the way particles are arranged in the water in the saucepan?

Explain your answer.

diagram .....

explanation .....

..... [1]

(c) Fig. 8.3 shows a block of aluminium which has a mass of 540 g.

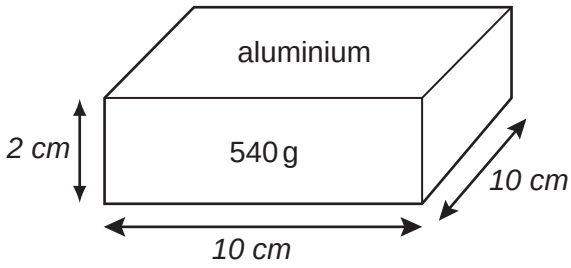


Fig. 8.3

(i) Calculate the density of the block.

State the formula that you use and show your working.

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

(ii) Calculate the weight of the block. Assume that the gravitational field strength of the Earth is 10 N / kg.

..... N [1]

For Examiner's Use

9 A student uses dilute hydrochloric acid to test four pieces of rock, **W**, **X**, **Y** and **Z**.

She allows some of the acid to fall onto the samples and observes what happens.

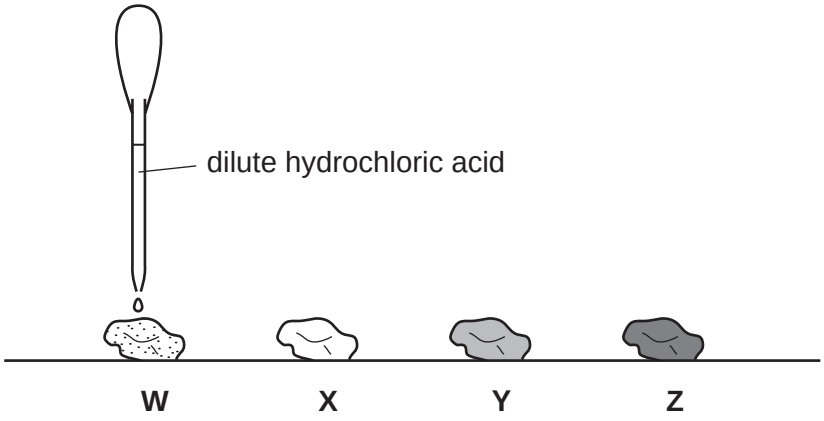


Fig. 9.1

Her observations are shown in Table 9.1.

Table 9.1

rock	appearance before acid added	reaction with acid
W	light grey	carbon dioxide gas produced
X	white	no reaction
Y	green	carbon dioxide gas produced
Z	dark grey	no reaction

(a) (i) State which of the rocks **W**, **X**, **Y** and **Z**, contain a carbonate.

Explain your answer.

rocks .....

explanation .....

..... [2]

(ii) Copper is a transition metal. Suggest and explain which rock contains the compound, copper carbonate.

rock .....

explanation .....

..... [2]

(b) Copper metal can be extracted from copper carbonate in two stages as shown in Fig. 9.2.

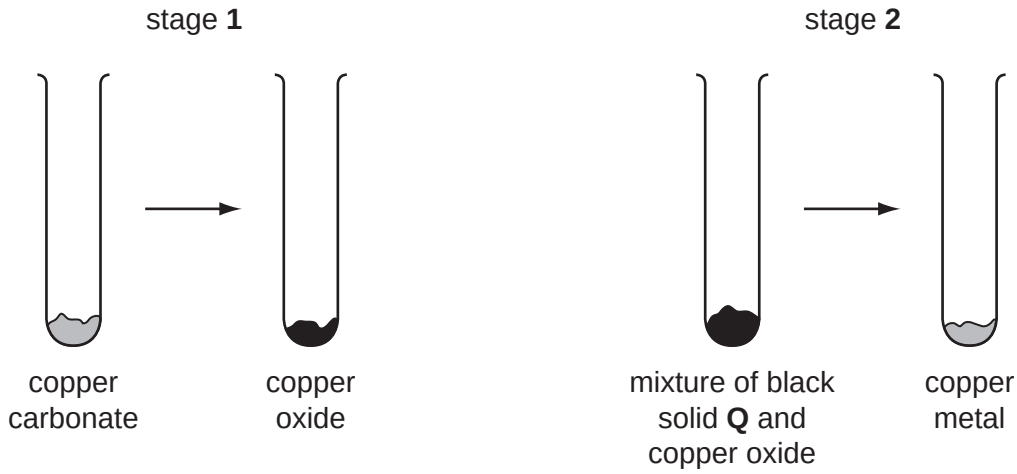


Fig. 9.2

(i) The reaction in stage **1** is an example of thermal decomposition.

State what has to be done to copper carbonate in order to cause this reaction to occur.

.....

[1]

(ii) A black solid **Q** is mixed with the copper oxide made in stage **1**.

The reaction in stage **2** occurs when this mixture is heated.

Complete the word equation for this reaction, using the correct chemical name for substance **Q**.

copper oxide + ... → copper + ...

[2]

(iii) Name the type of chemical reaction in **(ii)** and explain your answer briefly.

.....

.....

.....

[2]

[Turn over

(iv) Draw a diagram of a simple electrical circuit which could be used to show that the product of the reaction in stage **2** is a metal.

For Examiner's Use

[2]

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DATA SHEET
The Periodic Table of the Elements

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** Sulfur 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** Radium 88	227 **Ac** Actinium 89 †															

*58-71 Lanthanoid series
†90-103 Actinoid 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
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 above X above b

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.).