



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

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COMBINED SCIENCE

0653/02

Paper 2 (Core)

May/June 2007

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 | |
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| 6 | |
| 7 | |
| 8 | |
| 9 | |
| Total | |

This document consists of **18** printed pages and **2** blank pages.



BLANK PAGE

- 1 Fig. 1.1 shows a vertical section through a human heart, drawn as though the person is facing you.

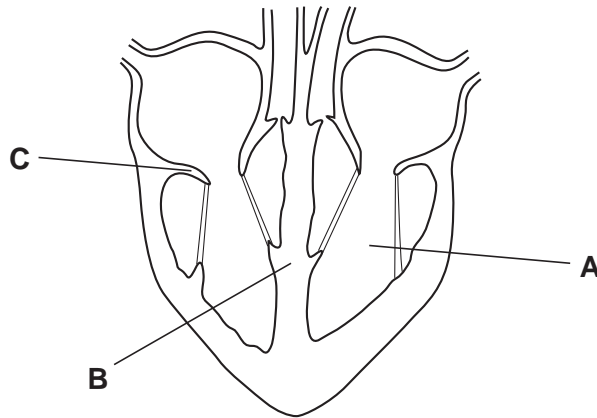


Fig. 1.1

- (a) Name the parts of the heart labelled **A**, **B** and **C**.

A

B

C

[3]

- (b) (i) Use a pencil to lightly shade in the places in Fig. 1.1 where there is oxygenated blood. [1]

- (ii) Where does the blood become oxygenated?

..... [1]

- (c) On the diagram, draw **two** arrows to show how blood travels through the left hand side of the heart. [1]

- (d) The heart muscle is supplied with blood through the coronary arteries.

Explain why a blockage in these arteries can cause a heart attack.

.....

 [2]

- 2 Fig. 2.1 shows the structure of an atom of an element **Q**.

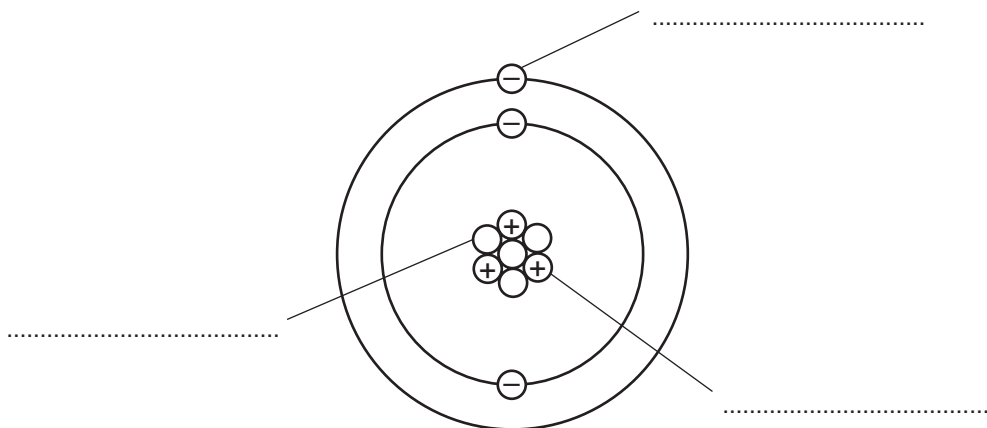


Fig. 2.1

- (a) (i) Label the particles shown in Fig. 2.1. [3]

- (ii) Use the Periodic Table on page 20 to find the chemical symbol of element **Q**, and explain your answer.

chemical symbol of **Q**

explanation

..... [2]

- (b) Fig. 2.2 shows calcium metal reacting in water which contains Universal Indicator. The gas produced during the reaction was tested as shown.

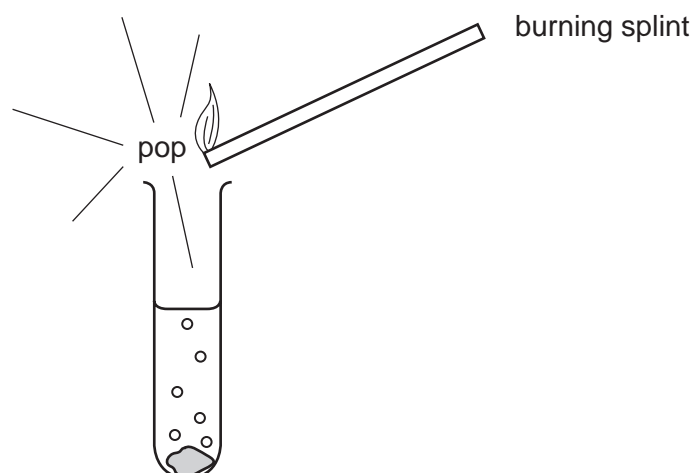


Fig. 2.2

- (i) Name the gas produced in this reaction.

..... [1]

(ii) State and explain the colour change of the Universal Indicator during the reaction.

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

(c) The piece of iron in Fig. 2.3 will take part in a chemical reaction which involves water.

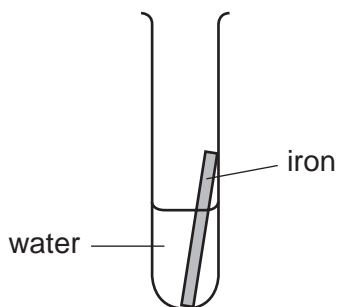


Fig. 2.3

State two ways in which the reaction of iron in Fig. 2.3 is different from the reaction of calcium in Fig. 2.2.

1.
.....
2.
..... [2]

3 (a) A model car is at rest. A force is applied and it starts to move.

(i) Complete the formula for calculating the work done on the model car using some of the words in the list.

acceleration distance moved force applied speed time taken

work done on model car = X [2]

(ii) State **one** other way in which a force can affect an object.

..... [1]

(b) Fig. 3.1 shows the speed-time graph for a car journey.

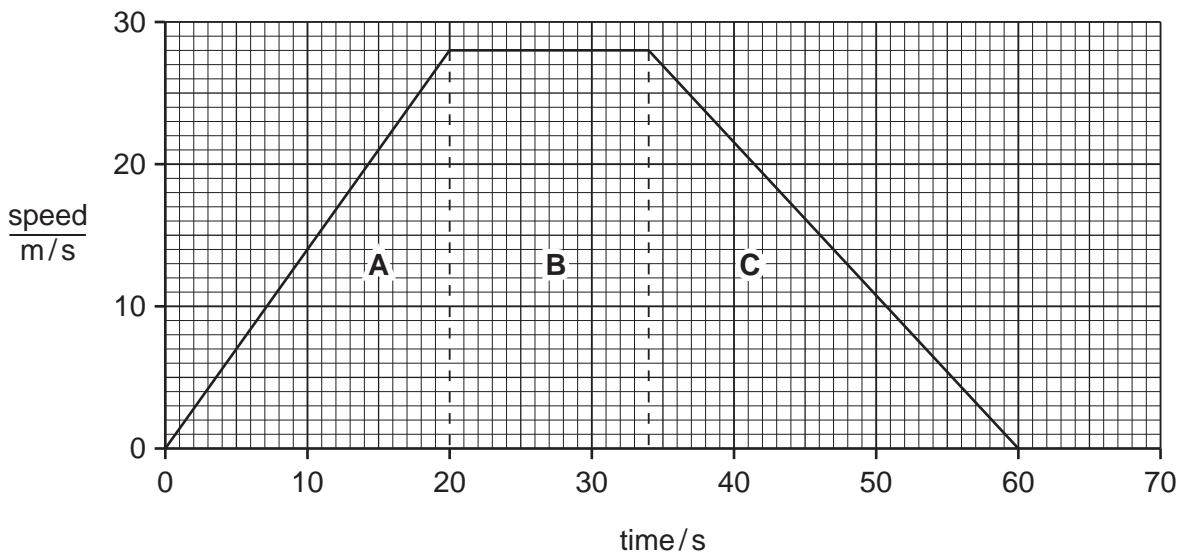


Fig. 3.1

(i) Which section of the graph, **A**, **B**, or **C**, represents a constant speed?

Explain your answer.

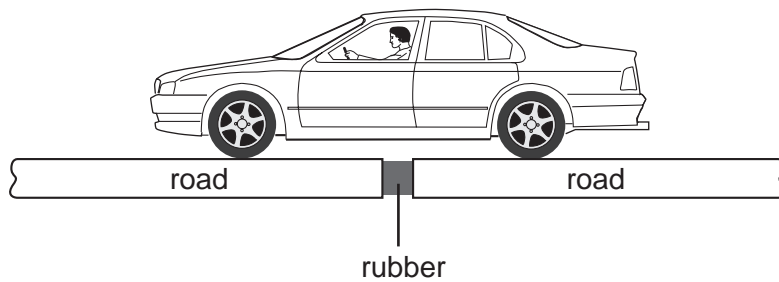
.....
..... [1]

(ii) Calculate the acceleration of the car during the first 20 seconds.

Show your working.

.....m/s² [2]

(c) The car travels over a long bridge. The bridge is made in sections, with gaps between each section. The gaps are filled with rubber.



Suggest why

(i) these gaps are left,

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

(ii) these gaps are filled with rubber.

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

- 4 In Mexico, some areas of tropical rainforest have been cleared for growing cacao trees. Beans from cacao trees are used for making chocolate. The beans are seeds, and they develop from fertilised flowers.

Bats are flying mammals. Table 4.1 shows information about the numbers of bats found in an undisturbed tropical rainforest and in a cacao plantation.

Table 4.1

| habitat | number of different species of bats | number of bat species found only in that habitat | number of individual bats |
|------------------------|-------------------------------------|---|---------------------------|
| undisturbed rainforest | 27 | 14 | 423 |
| cacao plantation | 21 | 1 | 644 |

- (a) Which habitat has the higher species diversity of bats?

Explain your answer.

habitat

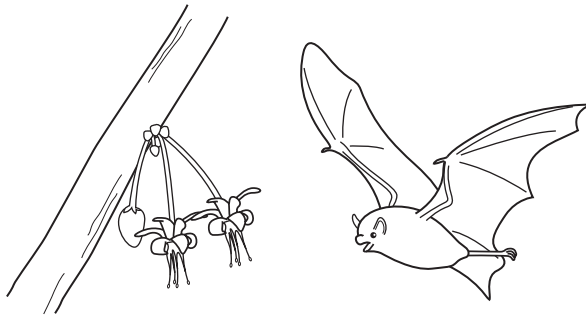
explanation [1]

- (b) Using the data in Table 4.1, suggest **one** reason, other than species diversity, why leaving some areas of tropical rainforests undisturbed is important for the conservation of bats.

.....

..... [1]

(c) Some bats feed on nectar.



(i) How might this explain the results for the numbers of individual bats in the two habitats?

.....
 [1]

(ii) Explain how bats could help to increase the yield of beans from a cacao plantation.

.....

 [2]

(d) Complete these sentences, using some of the words in the list.

clones genetically not sexually unhealthy zygotes

Cacao trees can reproduce, using flowers and making seeds.

The new trees that are produced are different from each other.

Farmers can propagate cacao trees asexually. The new trees that are produced are
 [3]

(e) Farmers allow other plants to grow underneath the cacao trees.

Explain how this could help to reduce soil erosion.

.....

 [2]

- 5 Lead bromide is a compound. It can be broken down into its elements by using the apparatus shown in Fig. 5.1.

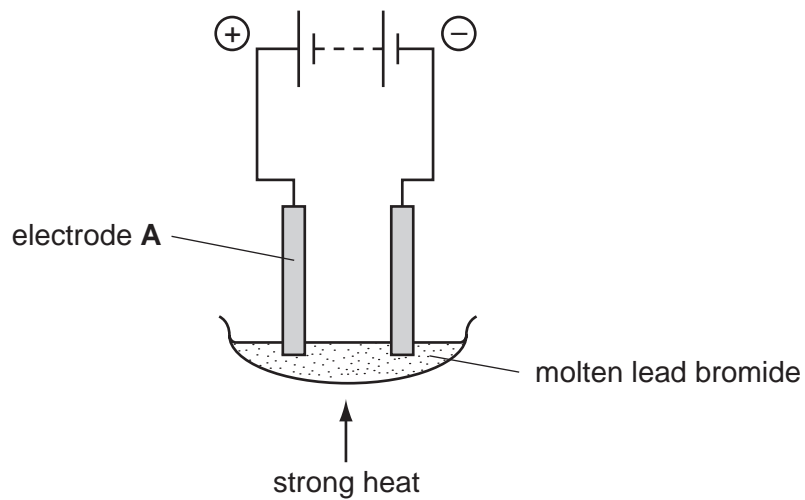


Fig. 5.1

- (a) (i) Name the process shown in Fig. 5.1.

..... [1]

- (ii) Name the non-metallic element which is produced in this process.

..... [1]

- (iii) Explain why the lead bromide shown in Fig. 5.1 has to be molten in order for the process to work.

.....
 [1]

- (iv) Is electrode **A** in Fig. 5.1 the anode or the cathode?

Explain your answer.

.....
 [1]

(b) A process similar to that in Fig. 5.1 is used in the chemical industry to produce the important element chlorine.

(i) The formula of the molecules in chlorine gas is Cl_2 .

Explain what is meant by this formula.

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

(ii) Chlorine is used to treat water supplies.

Explain this use of chlorine.

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

(iii) Chlorine reacts with aluminium to form aluminium chloride.
The symbolic equation for this reaction is shown below.

Complete the balancing of this equation.



[1]

6 (a) Fig. 6.1 shows a simple circuit containing two identical lamps.

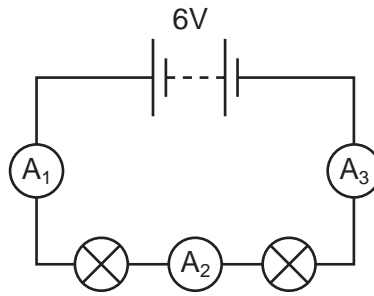


Fig. 6.1

Ammeter **A**₁ reads 0.15 A.

Write down the readings on

ammeter **A**₂,

ammeter **A**₃.

[1]

(b) Fig. 6.2 shows an electricity generating station.

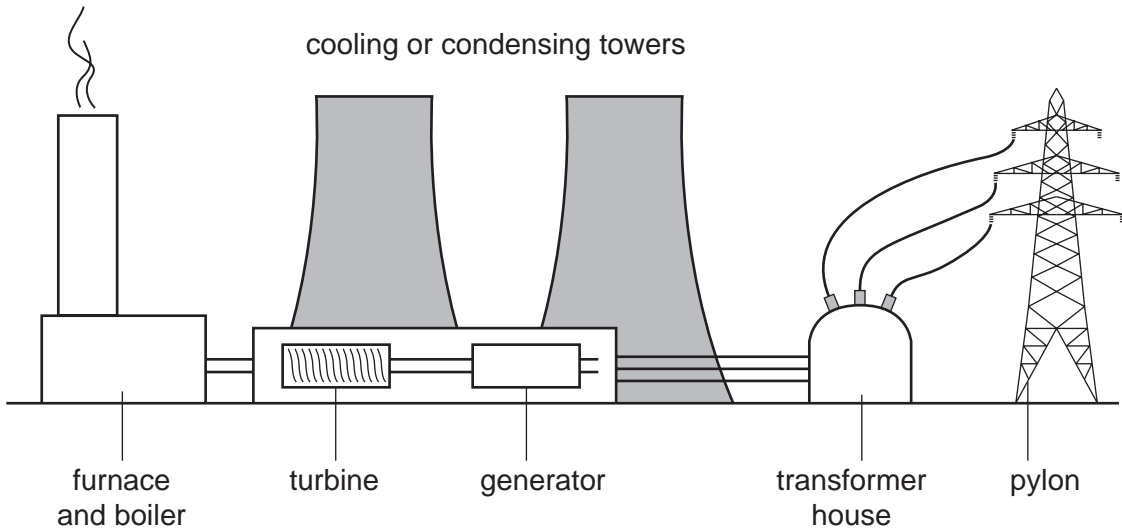


Fig. 6.2

(i) Name two fossil fuels which could be burned in the furnace to heat water in the boiler.

1.

2.

[2]

(ii) Complete the energy transfer statements below.

In the furnace energy is converted into heat energy.

In the turbine the energy in the steam is converted into the
energy of the turbine.

The generator converts kinetic energy into energy. [3]

(iii) The electrical output from a power station is at 25 000 V. The voltage is stepped up to 400 000 V by a transformer. The number of turns on the primary coil is 20 000.

Calculate the number of turns on the secondary coil.

State the formula that you use and show your working.

formula used

working

..... turns [3]

(iv) Why does the electrical output from this power station have to be a.c.?

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

- 7 Fig. 7.1 shows a car in motion. The energy which is needed to make the car move comes from the burning of a mixture of air and fuel in the engine.

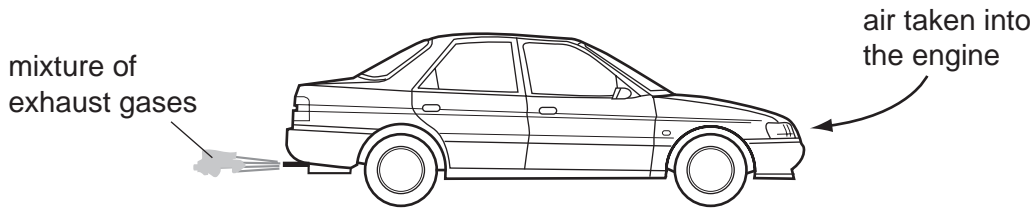


Fig. 7.1

(a) Air is a mixture of gases.

(i) Which gas makes up the greatest percentage of the air?

..... [1]

(ii) Describe **one** difference between a **mixture** of two gases and a **compound** formed from two gases.

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

(b) In some modern cars, two fuels are used. One of these is hydrogen gas and the other is gasoline, a mixture of hydrocarbons. Only one fuel is used at a time.

(i) Explain why the fuel is said to be oxidised in the engine.

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

(ii) Suggest why, when hydrogen is used, the exhaust gases are not toxic (poisonous), but when gasoline is used the exhaust gases are toxic.

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

- (iii) Describe a chemical test which could be used to show that the exhaust gases contain carbon dioxide.

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

- (c) The car battery contains sulphuric acid.

- (i) State the chemical formula of sulphuric acid.

..... [1]

- (ii) Underline **one** of the following substances to show which could be used to neutralise a spillage of sulphuric acid **safely**.

sodium **sodium carbonate** **sodium chloride** **sodium sulphate** [1]

8 (a) Explain why sound needs a medium to travel through.

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

(b) Fig. 8.1 shows a student carrying out an experiment to find the speed of sound in air.

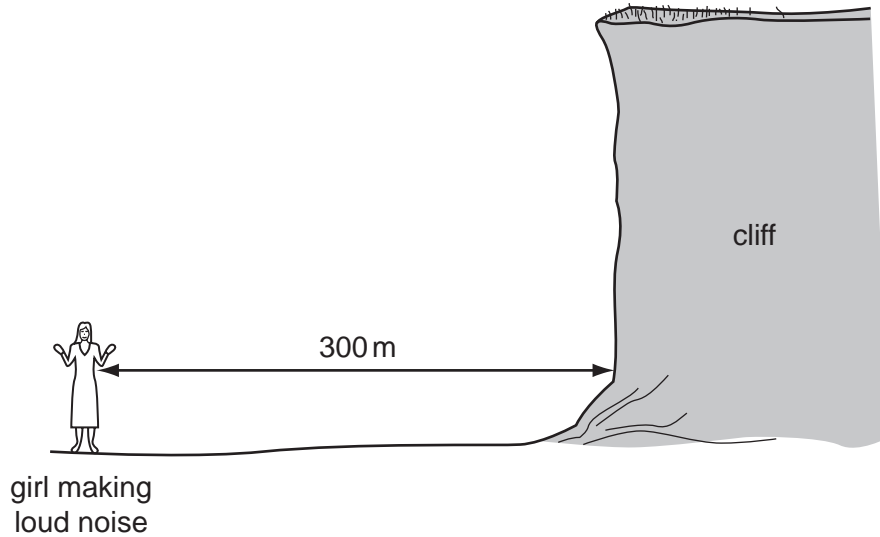


Fig. 8.1

She stood 300 m from the edge of a cliff and made a loud noise. The echo reached her 2.0 s later.

Calculate the speed of sound in air using these results.

State the formula that you use and show your working.

formula used

working

..... m/s [2]

(c) A sound has a frequency of 500 Hz.

(i) Explain the meaning of the term *frequency*.

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

(ii) State the approximate range of audible frequencies detected by the normal human ear.

..... [1]

(d) Fig. 8.2 shows the oscilloscope trace of two different sounds, **P** and **Q**. The settings on the oscilloscope are exactly the same for both.

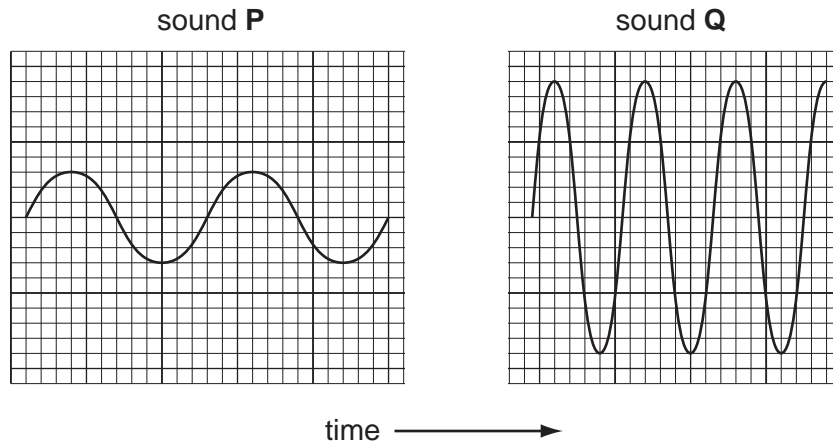


Fig. 8.2

State two ways in which sound **P** differs from sound **Q**.

1.
.....
2.
..... [2]

9 (a) Cells in all of our tissues need a constant supply of glucose. Glucose is transported around the body in the blood.

(i) Name the part of the blood in which glucose is transported.

..... [1]

(ii) Explain why cells in the human body need glucose.

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

(b) Plants make glucose in photosynthesis. They can then build the glucose into other substances, including cellulose and proteins.

(i) State the function of cellulose in a plant.

..... [1]

(ii) Describe how you would test part of a plant to see if it contains proteins.

.....
.....
.....
..... [3]

(c) All metabolic reactions in animals and plants are catalysed by enzymes. The temperature at which an enzyme works best is called its optimum temperature.

Plant enzymes are denatured at lower temperatures than human enzymes.

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

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

(ii) Explain why it is an advantage to plants that their enzymes have a lower optimum temperature than human enzymes.

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

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DATA SHEET
The Periodic Table of the Elements

| | | Group | | | | | | | | | | | | | | | | | | | |
|-----|----------|---|--|-------------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|---------------------------------------|---------------------------------------|------------------------------------|--|-------------------------------------|---------------------------------------|------------------------------------|----------------------------------|----------------------------------|--|--|--|
| | | I | II | III | IV | V | VI | VII | 0 | | | | | | | | | | | | |
| | | 1 H Hydrogen 1 | | | | | | | | | | | | | | | | | | | |
| 7 | 9 | Li Lithium 3 | Be Beryllium 4 | | | | | | | | | | | | | | | | | | |
| 23 | 24 | Na Sodium 11 | Mg Magnesium 12 | | | | | | | | | | | | | | | | | | |
| 39 | 40 | K Potassium 19 | Ca Calcium 20 | 51 V Vanadium 23 | 48 Ti Titanium 22 | 45 Sc Scandium 21 | 59 Co Cobalt 27 | 56 Fe Iron 26 | 55 Mn Manganese 25 | 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 | 88 | Rb Rubidium 37 | Sr Strontium 38 | 93 Nb Niobium 41 | 91 Zr Zirconium 40 | 89 Y Yttrium 39 | 103 Rh Rhodium 45 | 101 Ru Ruthenium 44 | 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 | 137 | Cs Caesium 55 | Ba Barium 56 | 181 Ta Tantalum 73 | 178 Hf Hafnium 72 | 139 La Lanthanum 57 | 184 W Tungsten 74 | 190 Os Osmium 76 | 195 Pt Platinum 78 | 197 Au Gold 79 | 201 Hg Mercury 80 | 204 Tl Thallium 81 | 207 Pb Lead 82 | 209 Bi Bismuth 83 | 210 Po Polonium 84 | 210 At Astatine 85 | 222 Rn Radon 86 | | | | |
| | 226 | Fr Francium 87 | Ra Radium 88 | | | | | | | | | | | | | | | | | | |
| | 227 | Ac Actinium 89 | | | | | | | | | | | | | | | | | | | |
| | | *58-71 Lanthanoid series †90-103 Actinoid series | | | | | | | | | | | | | | | | | | | |
| | | <table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px;">a</td> <td style="padding: 2px;">X</td> </tr> <tr> <td style="padding: 2px;">Key</td> <td style="padding: 2px;">b</td> </tr> </table> | | | | | | | | | | a | X | Key | b | | | | | | |
| a | X | | | | | | | | | | | | | | | | | | | | |
| Key | b | | | | | | | | | | | | | | | | | | | | |
| | | a = relative atomic mass X = atomic symbol b = proton (atomic) number | | | | | | | | | | | | | | | | | | | |
| | | 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | 146 Pm Promethium 61 | 150 Sm Samarium 62 | 152 Eu Europium 63 | 157 Gd Gadolinium 64 | 162 Dy Dysprosium 66 | 163 Tb Terbium 65 | 167 Er Erbium 68 | 169 Tm Thulium 69 | 173 Yb Ytterbium 70 | 175 Lu Lutetium 71 | | | | | | | |
| | | 232 Th Thorium 90 | 238 Pa Protactinium 91 | 238 U Uranium 92 | 238 Np Neptunium 93 | 244 Pu Plutonium 94 | 254 Am Americium 95 | 262 Cm Curium 96 | 289 Bk Berkelium 97 | 289 Cf Californium 98 | 289 Es Einsteinium 99 | 289 Fm Fermium 100 | 289 Md Mendelevium 101 | 289 No Nobelium 102 | 289 Lr Lawrencium 103 | | | | | | |

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

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