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COMBINED SCIENCE**5129/22**

Paper 2 Theory

May/June 2026**1 hour 45 minutes**

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [].
- The Periodic Table is printed in the question paper.

This document has **24** pages. Any blank pages are indicated.

- 1 Draw **four** straight lines from the box on the left to four different boxes on the right to make four correct sentences about the heart.

The heart ...

... contains 8 valves.

... contains 2 ventricles.

... contracts more slowly
during exercise.

... has walls made of muscle.

... has thicker walls round the
atria compared to the ventricles.

... pumps blood around
the body.

... pumps blood around
the lungs.

[4]



- 2 (a) Figure 2.1 shows the axes used to plot distance–time graphs and the axes used to plot speed–time graphs.

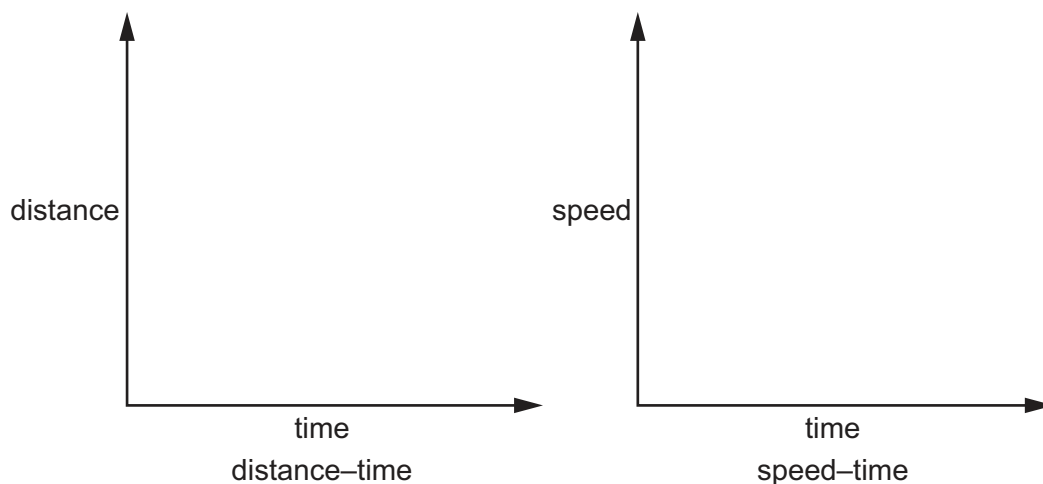


Figure 2.1

- (i) On the distance–time axes in Figure 2.1, draw a graph for an object that is moving with constant speed. [1]
- (ii) On the speed–time axes in Figure 2.1, draw a graph for an object that is moving with constant speed. [1]
- (b) Acceleration, force and mass are related by the equation shown.

$$a = \frac{F}{m}$$

Determine a mass m and an acceleration a that combine to produce a force F of 2.8 N.

State the units of mass and acceleration in your answer.

$m =$ unit

$a =$ unit [2]

[Total: 4]

- 3 (a) Impure liquids can be purified by distillation.

Choose **one** word from the list to complete the following sentence about distillation.

evaporate freeze melt react

During distillation, the impure liquid is heated to the liquid and then the pure liquid is condensed.

[1]

- (b) Describe how impure water from rivers and lakes is treated to make it suitable for domestic use.

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

[Total: 4]



- 4 Figure 4.1 shows a photomicrograph of a structure containing a green pigment. The structure is found in some plant cells.

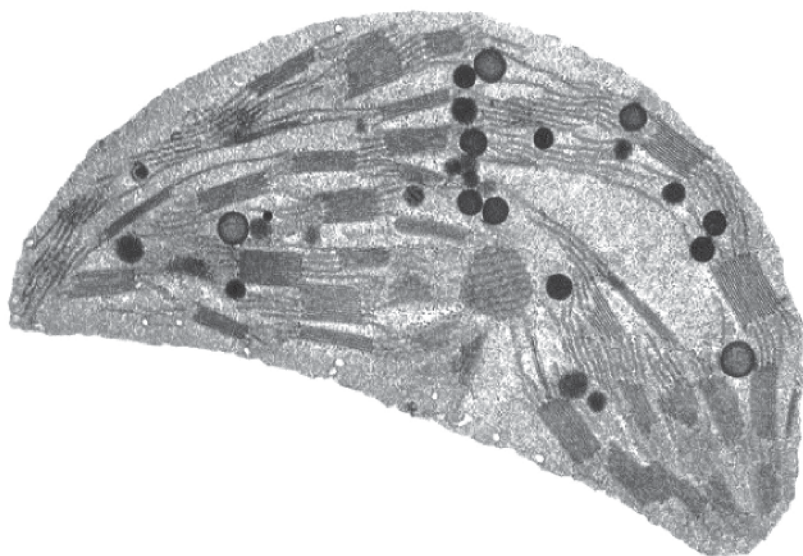


Figure 4.1

State the name of the cell structure shown in Figure 4.1 and describe its function.

name of cell structure

function of cell structure

.....

[2]

5 Figure 5.1 shows a large pendulum bob.

The bob is attached to a hook on the ceiling of a room by a length of rope. The bob is swinging.

When the bob is in the position shown in Figure 5.1, forces **A**, **B** and **C** are acting on the bob and on the rope as shown.

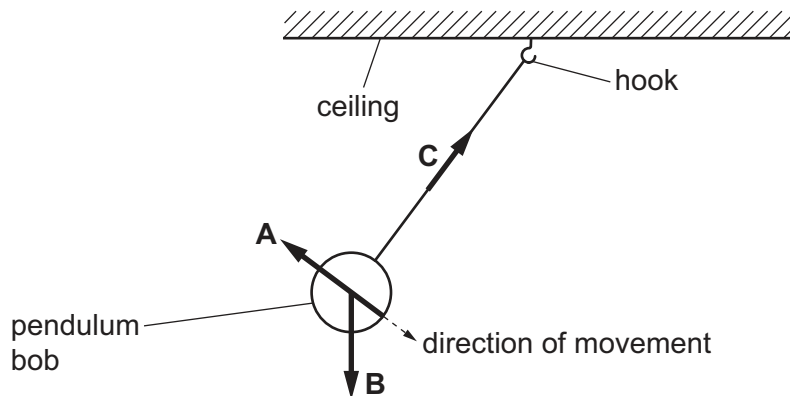


Figure 5.1

(a) State the names of forces **A**, **B** and **C**.

force **A**

force **B**

force **C**

[3]

(b) The pendulum bob swings from side to side.

As the bob swings from the side to the middle, the bob falls until it is directly below the hook. The bob then rises as it swings to the other side.

State how the size of force **A** changes as the bob falls and then rises.

Explain your answer.

.....

.....

..... [2]

[Total: 5]



6 Farmers use calcium oxide to neutralise acidic soil.

(a) (i) Draw a ring around a pH change that occurs when acidic soil is neutralised.

5 to 7

5 to 10

9 to 6

10 to 7

[1]

(ii) State the name of the ion that makes solutions acidic.

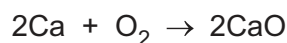
..... [1]

(b) Complete the word equation for the reaction between calcium oxide and nitric acid.

calcium oxide + nitric acid → +

[2]

(c) Calcium oxide, CaO, is made by the reaction of calcium, Ca, and oxygen, O₂.



The relative atomic masses, A_r , of calcium and oxygen are shown.

[A_r : Ca, 40; O, 16]

Calculate the mass of oxygen, O₂, needed for the complete reaction of 16 g of calcium.

mass =g [1]

(d) Strontium and calcium are in the same group in the Periodic Table.

Suggest the formula of strontium oxide.

..... [1]

[Total: 6]



- 7 The graph in Figure 7.1 shows the percentage of the total pollution in the oceans which is caused by different plastic items.

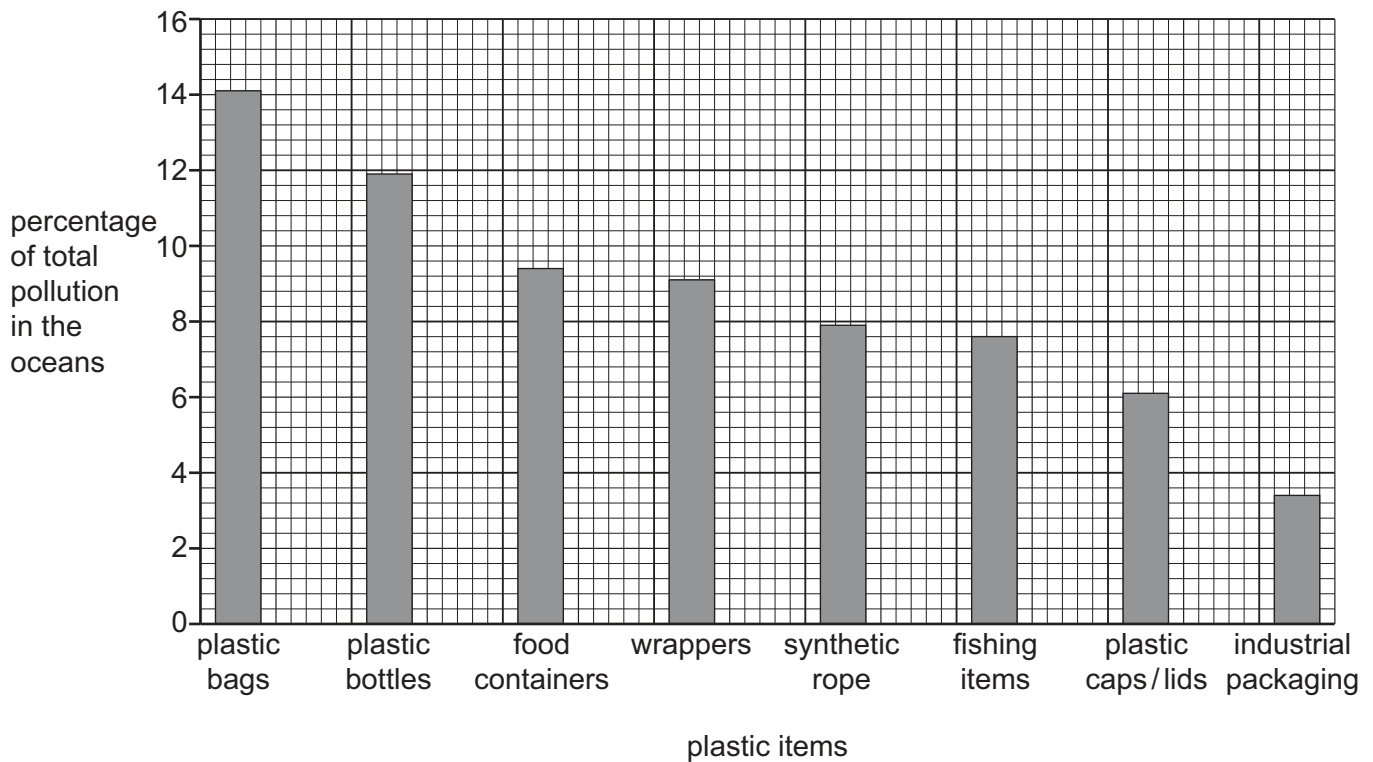


Figure 7.1

- (a) (i) State the plastic item that causes 7.6% of the total pollution.

..... [1]

- (ii) Calculate the combined percentage of the total pollution that is caused by plastic bags and plastic bottles.

combined percentage =% [1]

- (iii) Name a pollutant other than plastic that causes damage to ocean ecosystems.

..... [1]



- (b) Figure 7.2 shows how the mass of plastic waste deposited in the oceans by one country changed between 2011 and 2020.

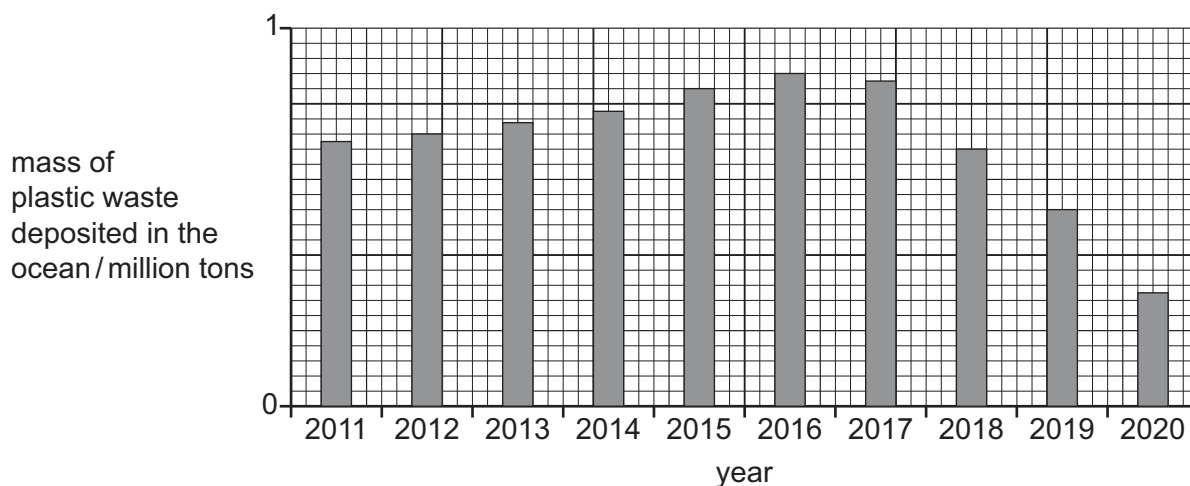


Figure 7.2

Describe the changes shown by the data in Figure 7.2.

.....

.....

.....

.....

.....

..... [3]

[Total: 6]

- 8 A plastic block is attached to a spring as shown in Figure 8.1.

The spring extension x is 6.0 cm.

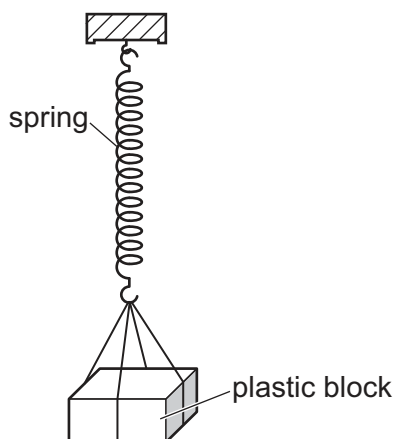


Figure 8.1

The spring constant k of the spring is 25 N/m.

The spring constant k is given by the equation $k = \frac{F}{x}$ where F is the force applied to extend the spring.

- (a) Determine the weight of the block.

weight = N [3]

- (b) A student pulls the plastic block downwards. This increases the extension of the spring. The student releases the block and it is pulled upwards by the spring.

Energy is transferred between stores.

- (i) Choose **two** words from the list to complete the following sentence about energy transfers as the block moves upwards.

chemical **decreases** **electrostatic** **gravitational**
increases **kinetic** **nuclear**

As the block starts to move upwards, the energy store
 increases and the elastic energy store in the spring [1]

- (ii) The student observes that the block on the spring moves up and down. The size of the up-and-down movement gradually decreases.

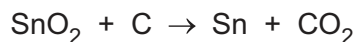
State **one** other energy store that increases as the size of the up-and-down movement decreases.

..... [1]

[Total: 5]



- 9 (a) The equation for the reaction between tin oxide, SnO_2 , and carbon, C, is shown.



- (i) Explain how the equation shows that this is a redox reaction.

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

- (ii) Carbon dioxide, CO_2 , is produced during the reaction.

State an adverse effect of increased carbon dioxide levels in the atmosphere.

..... [1]

- (b) Tin is a metal.

- (i) Describe where most metals are found in the Periodic Table.

..... [1]

- (ii) State **one** general property of metals.

..... [1]

[Total: 5]

10 Figure 10.1 shows the female reproductive system.

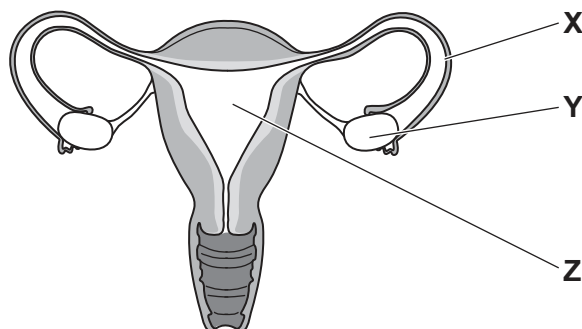


Figure 10.1

- (a) Complete Table 10.1 by describing **one** function for each of the structures **X**, **Y** and **Z** labelled in Figure 10.1.

Table 10.1

structure	one function of the structure
X	
Y	
Z	

[3]

- (b) On Figure 10.1, draw an **S** to show where sperm are deposited during sexual intercourse. [1]



(c) Describe **two** methods which are used to control the spread of HIV infection.

method 1

.....

.....

method 2

.....

.....

[2]

[Total: 6]



11 Figure 11.1 shows a water-heating tank.

Cold water enters at the bottom of the tank where there is an electric heater.

Hot water is removed at the top of the tank.

Insulation covers the walls of the tank.

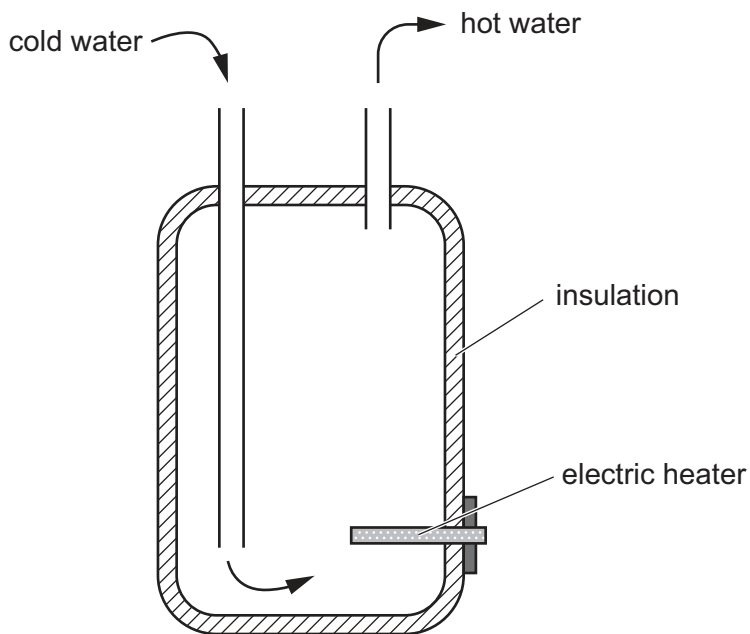


Figure 11.1

- (a) State the name of the process by which the cold water at the bottom of the tank rises to the top of the tank when the water is heated.

Explain why the water rises.

name of process

explanation

.....

[2]





(b) The electric heater has a power rating of 1.2 kW.

The cost of 1 kilowatt-hour (kWh) is 30 cents.

Calculate the cost, in cents, of using the electric heater for 2 hours.

cost = cents [2]

(c) The water is heated to 75 °C.

Explain why the insulation surrounding the tank reduces the cost of heating the water to 75 °C.

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

[Total: 6]





12 This question is about gases.

(a) Draw one straight line from each gas on the left to the correct test for that gas on the right.

You should draw **three** lines in total.

gas	test
ammonia	turns limewater milky
	turns damp red litmus blue
hydrogen	pops with a lighted splint
	relights a glowing splint
oxygen	bleaches damp litmus paper

[2]

(b) Explain why oxygen is a gas at room temperature and pressure.

Use ideas about bonding and the structure of oxygen.

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

(c) State what happens to the volume of a gas when it is heated at constant pressure.

..... [1]

[Total: 5]



- 13 Table 13.1 contains descriptions of processes associated with the digestive system.

Complete Table 13.1 by stating the name of each process.

Table 13.1

description of process	name of process
Food is taken into the mouth.	
Teeth chew large pieces of food and make smaller pieces.	
Enzymes break down large molecules of food into smaller molecules.	
Nutrient molecules move from the intestines into the blood.	
Nutrient molecules move into cells and are used in cellular reactions.	

[5]

- 14 Complete the following sentences about water waves.

The number of waves that pass a point per unit time is the

The distance between two consecutive peaks is the

The maximum distance above the mean position is the

[3]

15 Table 15.1 shows the atomic numbers and melting points of three Group I metals.

The melting point of a fourth metal, potassium, is missing from Table 15.1.

Table 15.1

Group I metal	atomic number	melting point/°C
lithium	3	180
sodium	11	98
potassium	19	
rubidium	37	39

(a) (i) Suggest the melting point of potassium.

..... °C [1]

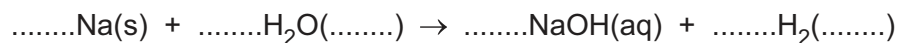
(ii) Deduce the state of rubidium at 10 °C.

..... [1]

(b) Sodium reacts with water to produce sodium hydroxide and hydrogen.

Balance the equation for the reaction.

Include the state symbols.



[2]



(c) A sodium atom contains 11 electrons.

Figure 15.1 shows a **correct** representation of a sodium atom.

Figure 15.1 also shows an **incorrect** representation of the ion formed from a sodium atom.

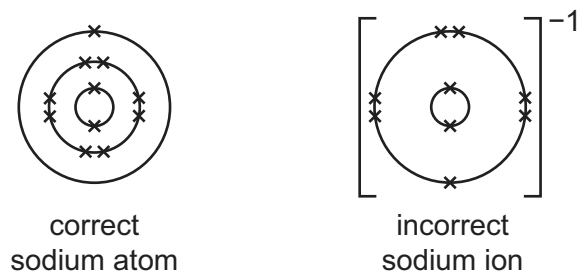


Figure 15.1

State **two** errors in the incorrect representation of the sodium ion in Figure 15.1.

error 1

.....

error 2

.....

[2]

[Total: 6]

- 16 Use words or phrases from the list to complete the sentences about the movement of substances in plants.

Each word or phrase may be used once, more than once, or not at all.

amino acids

guard cells

mineral ions

nitrogen

oxygen

respiration

root hair cells

translocation

water vapour

(a) Water is absorbed into the plant by [1]

(b) The xylem transports water and [1]

(c) The movement of sucrose in the phloem is called [1]

(d) Transpiration involves the movement of out of leaves. [1]

[Total: 4]



17 Insecticide is sometimes used on plants that are grown for food.

The insecticide is sprayed from a tube with a nozzle connected to a very high voltage.

This gives each tiny droplet of insecticide a positive electrical charge. The droplets form a mist surrounding the plants as shown in Figure 17.1.

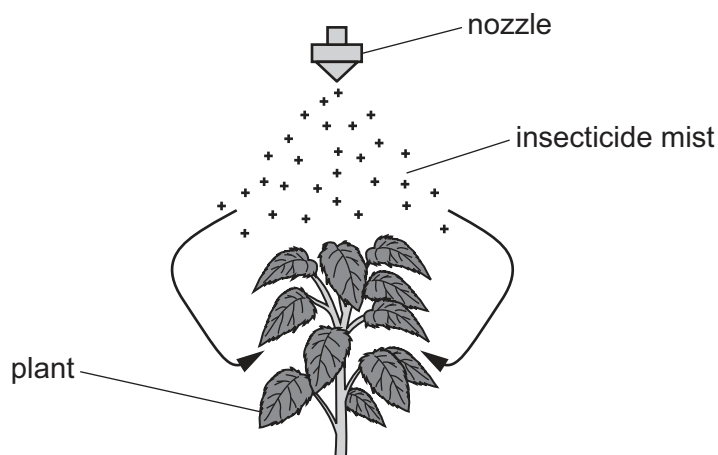


Figure 17.1

The difference in charge between the insecticide mist and the plant allows the mist to cover every part of the plant, including underneath the leaves.

Use ideas about electrostatics to explain:

- how the high voltage causes the insecticide to become positively charged
- why the droplets of insecticide spread out to form a mist
- why the mist covers every part of the plant.

.....

.....

.....

.....

.....

.....

..... [4]



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The Periodic Table of Elements

Group																	
I	II	1 H hydrogen 1										III	IV	V	VI	VII	VIII
3 Li lithium 7	4 Be beryllium 9	atomic number atomic symbol name relative atomic mass										5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
	11 Na sodium 23	12 Mg magnesium 24															
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium —	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —
87 Fr francium —	88 Ra radium —	89–103 actinoids	104 Rf rutherfordium —	105 Db dubnium —	106 Sg seaborgium —	107 Bh bohrium —	108 Hs hassium —	109 Mt meitnerium —	110 Ds darmstadtium —	111 Rg roentgenium —	112 Cn copernicium —	113 Nh nihonium —	114 Fl flerovium —	115 Mc moscovium —	116 Lv livermorium —	117 Ts tennessine —	118 Og oganesson —

lanthanoids														57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium —	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids														89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium —	94 Pu plutonium —	95 Am americium —	96 Cm curium —	97 Bk berkelium —	98 Cf californium —	99 Es einsteinium —	100 Fm fermium —	101 Md mendelevium —	102 No nobelium —	103 Lr lawrencium —

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

