Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/22**

Paper 2 Multiple Choice (Extended) **October/November 2021**

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.

[Turn over

1 Which processes do green plants carry out?

1 detect stimuli and make appropriate responses

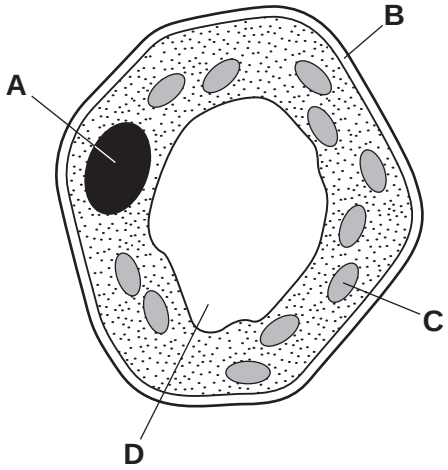
2 break down nutrient molecules to release energy for metabolism

3 take in carbon dioxide, water and ions for energy, growth and development

A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

2 The diagram shows a plant cell as seen under a light microscope.

Which structure is also found in animal cells?



3 Which molecule contains carbon?

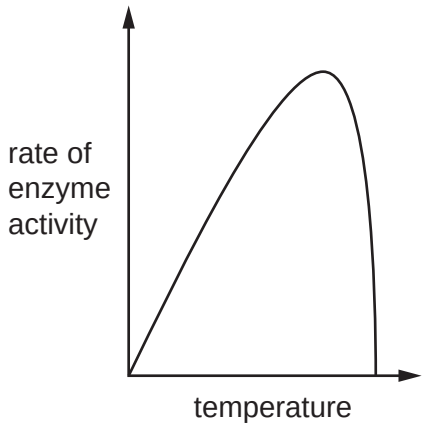
A ammonia

B fat

C sulfuric acid

D water

4 The graph shows the effect of temperature on an enzyme's activity.



The three statements describe what is happening at different positions on the graph.

What is the correct order for the statements as the temperature increases?

1 The maximum frequency of effective collisions is happening.

2 The enzyme is denatured.

3 Kinetic energy of the molecules increases so the rate of reaction increases.

A $1 \rightarrow 2 \rightarrow 3$ **B** $1 \rightarrow 3 \rightarrow 2$ **C** $2 \rightarrow 3 \rightarrow 1$ **D** $3 \rightarrow 1 \rightarrow 2$

5 What will cause plant leaves to turn yellow?

A a lack of magnesium in the soil

B a lack of starch in the leaves

C a reduction in the rate of photosynthesis

D a reduction in the rate of respiration

6 What is the name of the process which moves soluble food molecules through the wall of the small intestine into the blood?

A absorption

B assimilation

C digestion

D ingestion

7 Which statement correctly describes the opening and closing of the valves in the heart during contraction of the ventricles?

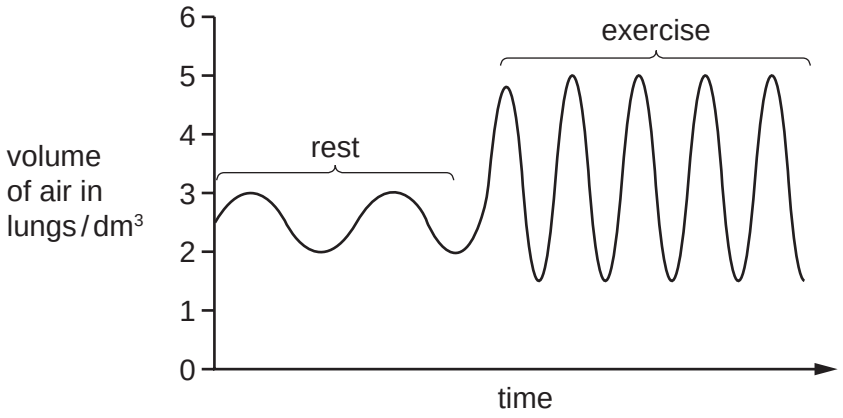
A The atrioventricular valves close and the semi-lunar valves close.

B The atrioventricular valves close and the semi-lunar valves open.

C The atrioventricular valves open and the semi-lunar valves close.

D The atrioventricular valves open and the semi-lunar valves open.

8 The graph shows the changes in volume of air in the lungs at rest and during exercise.



What was the effect of exercise on the rate and depth of breathing?

	rate of breathing	depth of breathing
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

9 Adrenaline increases blood glucose concentration. It does this by changing the levels of glucagon and insulin.

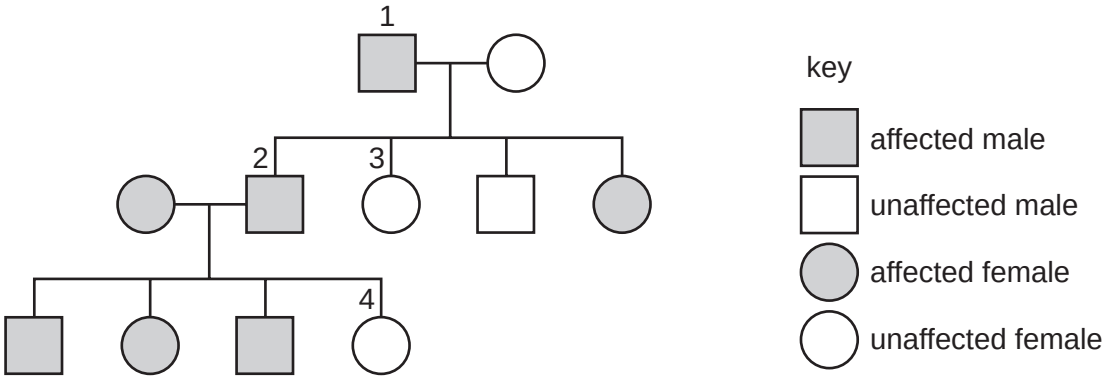
Which row is correct?

	adrenaline level	glucagon level	insulin level
A	decrease	decrease	decrease
B	decrease	increase	decrease
C	increase	increase	increase
D	increase	increase	decrease

10 Which row describes the exchange of substances between a mother and her fetus in mammals?

	substances moving from the mother to fetus	substances moving from the fetus to mother
A	glucose and carbon dioxide	urea and oxygen
B	glucose and oxygen	urea and carbon dioxide
C	urea and carbon dioxide	glucose and oxygen
D	urea and oxygen	glucose and carbon dioxide

11 The pedigree diagram shows inheritance of a disease caused by a dominant allele.



Which statement is correct?

A Individual 1 is homozygous dominant.

B Individual 2 is homozygous dominant.

C Individual 3 is homozygous recessive.

D Individual 4 is heterozygous.

12 What is an ecosystem?

A a chart showing the flow of energy from one organism to another

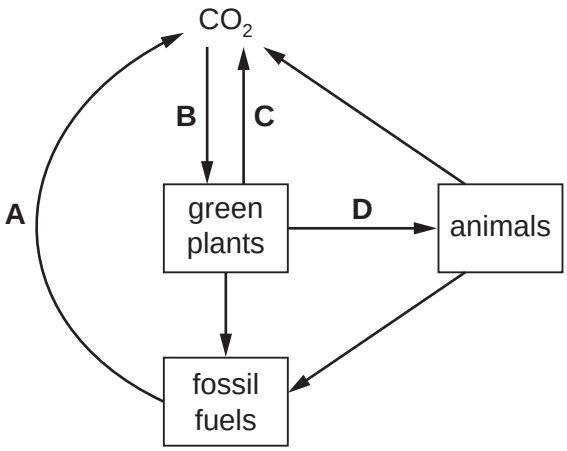
B a diagram giving the energy level of an organism in its environment

C a network of interconnected organisms

D a unit containing all of the organisms and their environment

13 The diagram shows a simplified carbon cycle.

Which labelled arrow represents respiration?



14 Which row correctly identifies the named changes?

	physical changes	chemical changes
A	condensation and combustion	evaporation and neutralisation
B	evaporation and neutralisation	condensation and combustion
C	condensation and evaporation	combustion and neutralisation
D	combustion and neutralisation	condensation and evaporation

15 Which statements explain why graphite conducts electricity and why it can act as a lubricant?

1 It is a macromolecule.

2 It has mobile electrons.

3 It has strong covalent bonds.

4 It has weak forces between its layers.

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

16 When aqueous chlorine is added to aqueous potassium bromide, bromine is produced.

What is the ionic equation for this reaction?

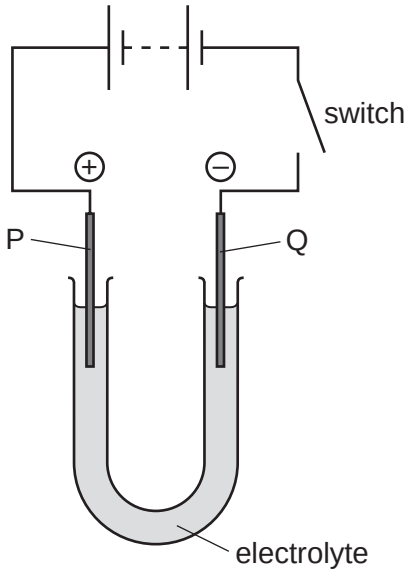
A $Cl_2 + Br^- \rightarrow 2Cl^- + Br$

B $Cl_2 + 2Br^- \rightarrow 2Cl^- + Br_2$

C $Cl_2 + 2Br^- \rightarrow Cl^- + Br_2$

D $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

17 The diagram shows the electrolysis of a compound.



When the switch is closed, the solution around electrode P turns orange because a halogen is formed.

The positive electrode P is called the ……1……, and the halogen is ……2…… .

Which words complete gaps 1 and 2?

	1	2
A	anode	bromine
B	anode	chlorine
C	cathode	bromine
D	cathode	chlorine

18 Calcium carbonate reacts with dilute hydrochloric acid.

The equation for this reaction is shown.

$$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$$

Three methods for investigating rates of reaction are listed.

1 observing a colour change

2 measuring gas volume

3 measuring mass

Which methods are suitable for investigating the rate of this reaction?

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

19 Which equation shows a reaction in which a metal is reduced?

A $CuCO_3 \rightarrow CuO + CO_2$

B $2Li + 2H_2O \rightarrow 2LiOH + H_2$

C $2Fe^{3+} + 2I^- \rightarrow Fe^{2+} + I_2$

D $Mg + 2H^+ \rightarrow Mg^{2+} + H_2$

20 Zinc oxide reacts with both dilute sulfuric acid and aqueous sodium hydroxide.

Which type of oxide is zinc oxide?

A acidic

B amphoteric

C basic

D neutral

21 Some properties of different metals are shown.

	$\frac{\text{density}}{\text{g/cm}^3}$	melting point / °C	colour of compound formed by the metal
1	1.54	851	white
2	8.91	1455	green
3	5.80	1890	lilac
4	11.3	328	white

Which metals are transition elements?

A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

22 Why does the steel used to make a drill contain manganese?

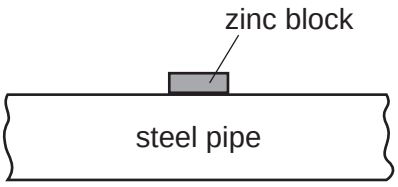
A to increase the density of the steel

B to increase the hardness of the steel

C to increase the malleability of the steel

D to increase the melting point of the steel

23 A block of zinc is attached to an underground steel pipe as shown.



The zinc stops the steel rusting by sacrificial protection.

Which statement is **not** correct?

A Zinc is more reactive than the iron in steel.

B Zinc is oxidised in preference to the iron in steel.

C Zinc prevents oxygen from reaching the steel.

D Zinc transfers electrons to the iron in the steel.

24 Ammonia is manufactured by the Haber process from nitrogen and hydrogen.

What is the source of hydrogen for this process?

A the electrolysis of dilute sulfuric acid

B the fractional distillation of liquid air

C the reaction of an acid with a reactive metal

D the reaction of steam with natural gas

25 Sulfuric acid is manufactured by the Contact process.

Which reaction in this process uses a catalyst?

A $S + O_2 \rightarrow SO_2$

B $2SO_2 + O_2 \rightarrow 2SO_3$

C $SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$

D $H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$

26 Which compound is used to neutralise acidic gases?

A calcium carbonate

B calcium chloride

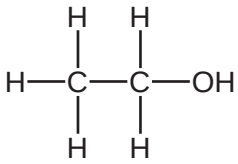
C calcium phosphate

D calcium sulfate

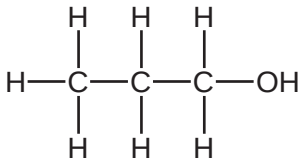
27 Four molecules are shown.

Which structure represents ethanol?

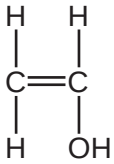
A



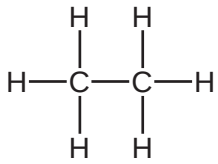
B



C



D

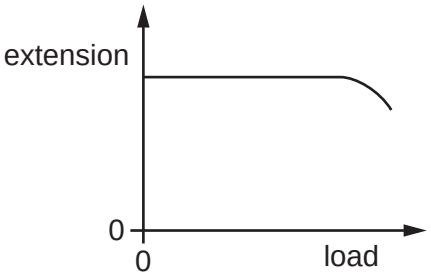


28 A rubber band and a copper wire are each stretched by hanging a load on one end. At first, both obey Hooke's Law.

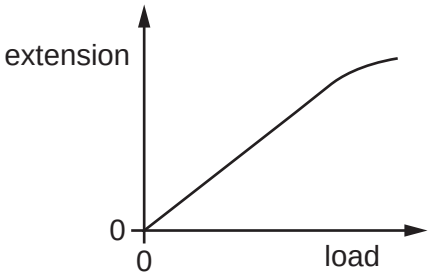
When the rubber band reaches its limit of proportionality it becomes more difficult to stretch.

When the copper wire reaches its limit of proportionality it becomes easier to stretch.

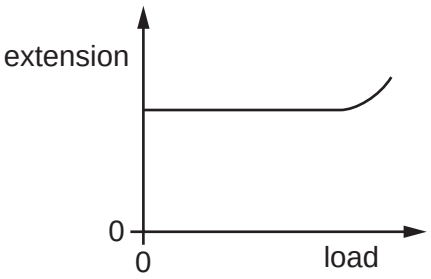
Which two graphs are the extension–load graphs for the rubber band and the copper wire?



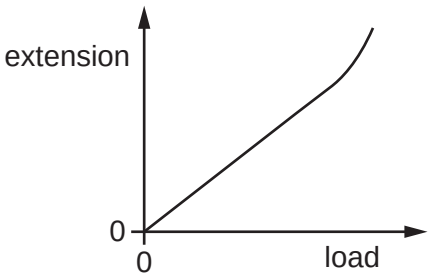
graph 1



graph 2



graph 3



graph 4

	rubber band	copper wire
A	graph 1	graph 3
B	graph 2	graph 4
C	graph 3	graph 1
D	graph 4	graph 2

29 What is meant by the *moment* of a force?

A the speed of an object moved by a force

B the time taken for a force to move an object

C the turning effect of a force

D the work done by a force

30 What **cannot** be used as a unit for pressure?

A N/m^2 **B** N/cm^2 **C** Pa **D** Pa/m^2

31 A stone falls from a bench.

Which row describes how the gravitational potential energy and the kinetic energy of the stone change as it falls?

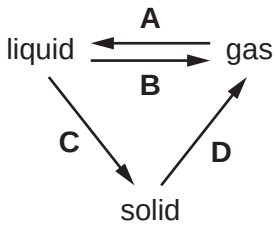
	gravitational potential energy	kinetic energy
A	decreases	increases
B	decreases	stays the same
C	increases	decreases
D	increases	stays the same

32 A lamp transfers 20 J of electrical energy into 12 J of useful light energy.

What is the efficiency of the lamp?

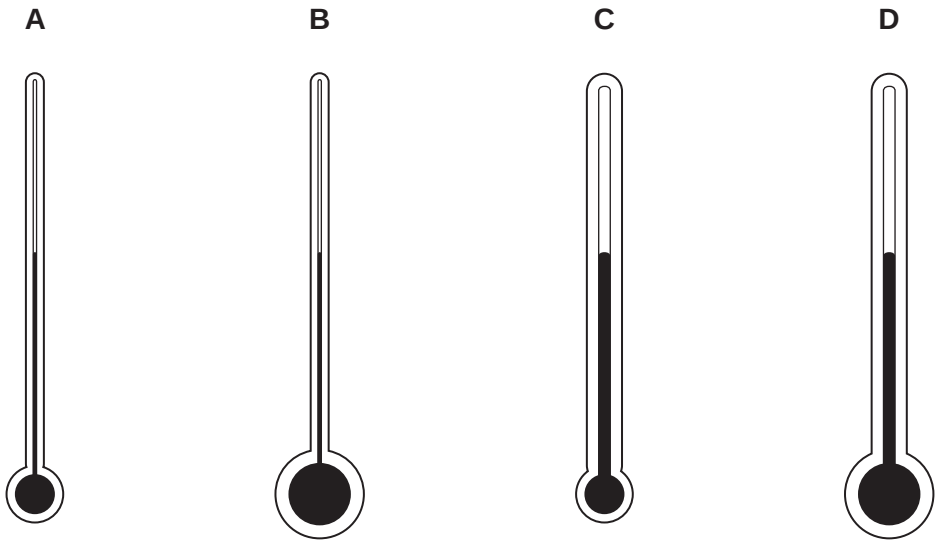
A 33% **B** 40% **C** 60% **D** 66%

33 Which labelled arrow on the diagram represents condensation?

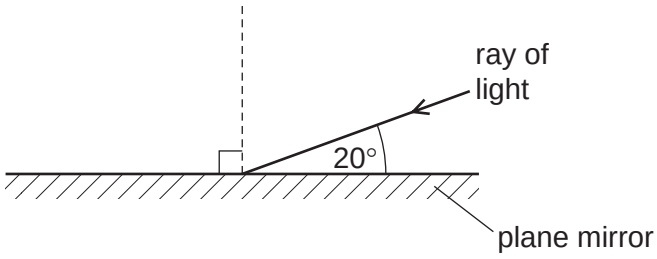


34 The diagrams show four liquid-in-glass thermometers, all drawn to the same scale.

Which thermometer has the greatest sensitivity?



35 The diagram shows a ray of light striking a plane mirror.



What is the angle of reflection?

A 20° **B** 40° **C** 70° **D** 90°

36 Light is travelling in a glass block.

The light reaches the edge of the block. The angle of incidence at the edge is much less than the critical angle.

What happens to the light?

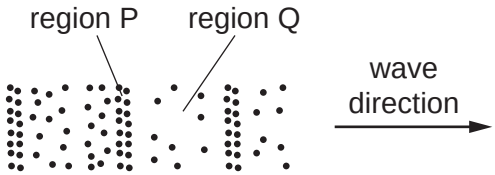
A All of the light emerges into the air.

B All of the light is reflected back into the block.

C Some of the light emerges into the air and some is reflected back into the block.

D Some of the light is reflected back into the block and some travels along the edge of the block.

37 The diagram represents a wave in air. Molecules are closer together in region P than they are in region Q.

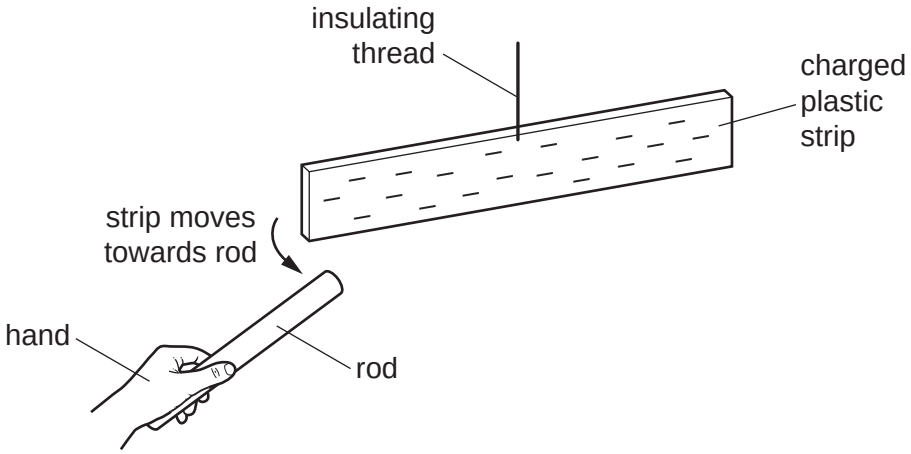


Which type of wave is represented, and in which direction do the molecules vibrate?

	type of wave	direction of vibration
A	longitudinal	↔
B	longitudinal	↕
C	transverse	↔
D	transverse	↕

38 A rod is rubbed with a dry piece of cloth. A scientist holds the rod in her hand and brings it close to a negatively charged plastic strip. The strip is suspended by an insulating thread.

As the rod approaches the plastic strip, the strip moves towards the rod.



Which statement is correct?

A The rod is a negatively charged electrical conductor.

B The rod is a negatively charged electrical insulator.

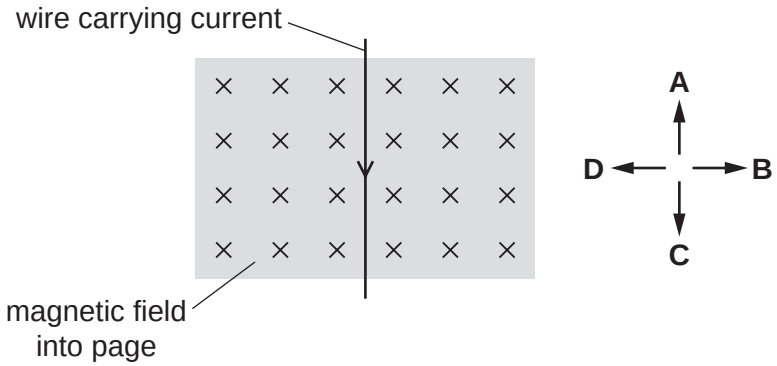
C The rod is a positively charged electrical conductor.

D The rod is a positively charged electrical insulator.

39 The diagram shows a wire carrying an electric current in the direction shown. The wire is at right angles to a magnetic field that is directed into the page.

A force acts on the wire because of the current and the magnetic field.

In which labelled direction does this force act?



40 The nuclide $^{14}_{6}C$ decays into the nuclide $^{14}_{7}N$ by emitting a β-particle.

Which equation shows this decay?

A $^{14}_{6}C \rightarrow {}^{14}_{7}N + {}^{0}_{-1}\beta$

B $^{14}_{6}C \rightarrow {}^{14}_{7}N + {}^{0}_{1}\beta$

C $^{14}_{6}C \rightarrow {}^{14}_{7}N + {}^{4}_{2}\beta$

D $^{14}_{6}C \rightarrow {}^{14}_{7}N + {}^{4}_{-2}\beta$

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The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											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											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
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 –		114 Fl flerovium –		116 Lv livermorium –		

Key

atomic number
atomic symbol
name
relative atomic mass

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 dm^3 at room temperature and pressure (r.t.p.).