



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

0653/22

Paper 2 Multiple Choice (Extended)

May/June 2018

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

* 3 0 5 4 0 1 4 7 8 9 *

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE IN ANY BARCODES.

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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 20.

Electronic calculators may be used.

This document consists of **17** printed pages and **3** blank pages.

1 Which pair of structures is found in a typical plant cell but **not** in a typical animal cell?

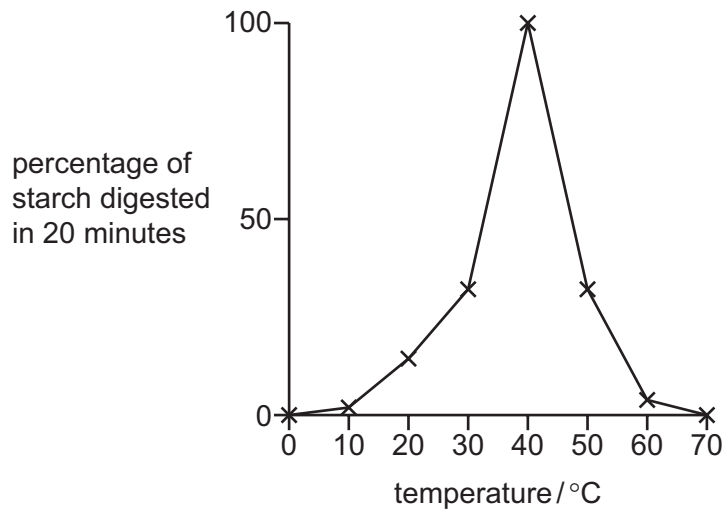
- A cell membrane and chloroplasts
- B cell membrane and cytoplasm
- C cell wall and chloroplasts
- D cell wall and cytoplasm

2 Amylase is an enzyme that digests starch.

Identical mixtures of starch and amylase are kept at different temperatures.

The percentage of starch digested in 20 minutes is recorded.

The results are shown in the graph.



The mixtures that were kept at 0 °C and 70 °C are then kept at a temperature of 40 °C for one hour.

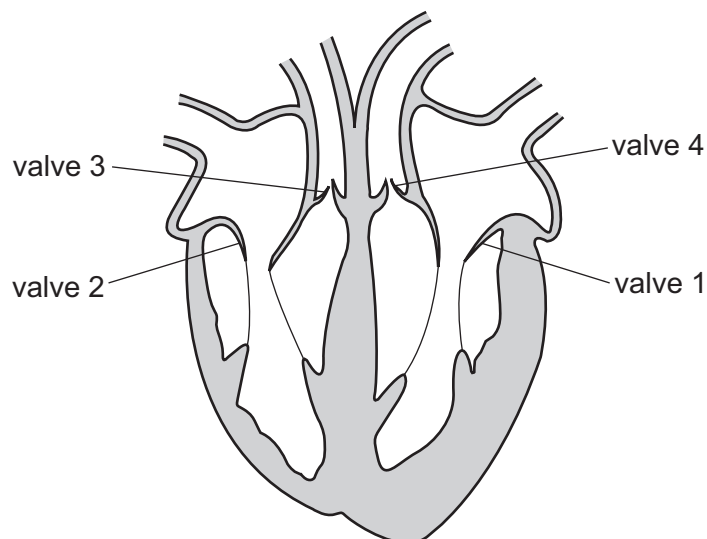
What are the results after this hour?

	percentage of starch digested	
	sample originally kept at 0 °C	sample originally kept at 70 °C
A	0	0
B	0	100
C	100	0
D	100	100

3 Which two chemical substances are required for photosynthesis?

- A carbon dioxide and glucose
- B glucose and oxygen
- C oxygen and water
- D water and carbon dioxide

4 The diagram shows a section through the human heart.



What happens to the valves as blood is being pumped to the lungs?

	valve 1	valve 2	valve 3	valve 4
A	closed	closed	open	closed
B	closed	closed	open	open
C	open	open	closed	closed
D	open	open	closed	open

5 Two students exercised for five minutes. Immediately afterwards, each student measured her own pulse rate.

The pulse rate for one student was lower than the pulse rate for the other student.

Why might her pulse rate be lower?

- A Her exercise was harder.
- B Her heart rate was higher.
- C She had secreted more adrenaline.
- D She takes regular exercise.

6 What is **not** a feature of a gas exchange surface in animals?

- A moist
- B permeable
- C small surface area
- D thin

7 What is the maximum number of carbon dioxide molecules produced when four glucose molecules are used in aerobic respiration?

- A 6 B 12 C 24 D 48

8 Adrenaline is sometimes called the 'fight or flight' hormone.

Which is an effect of adrenaline that helps prepare the body to fight or to take flight when frightened?

- A It increases blood glucose concentration.
- B It increases the rate of digestion.
- C It maintains a constant body temperature.
- D It slows down the heart rate.

9 Which row describes sexual reproduction?

	number of parents	offspring genetically identical to parents	involves zygote production
A	1	✓	✓
B	1	x	x
C	2	✓	x
D	2	x	✓

10 Which features are correct for a wind-pollinated flower?

	nectar	petals
A	absent	small
B	absent	large
C	present	small
D	present	large

- 11 In a food chain, the energy transferred from the first trophic level to the second trophic level is greater than the energy transferred from the second trophic level to the third trophic level.

Which process is **not** a reason for this difference?

- A egestion
- B excretion
- C movement
- D photosynthesis

- 12 Fertilisers help crop plants grow.

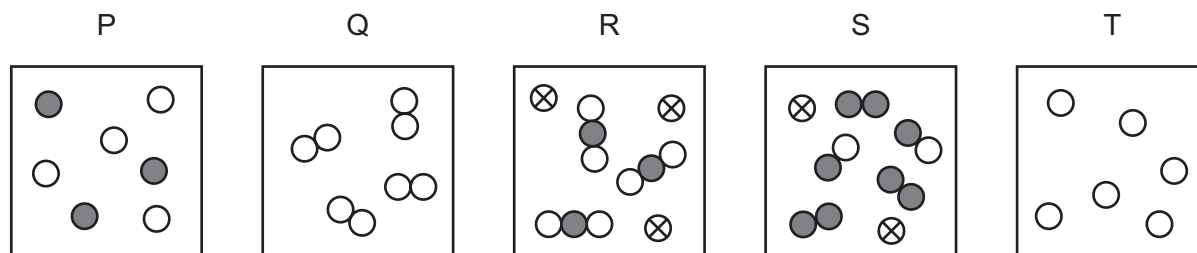
How might the overuse of fertilisers damage the ecosystem?

- A Animals feeding on the crop plants will die.
- B It will lead to flooding
- C Nutrients will not be available to plants.
- D Waterways will be polluted.

- 13 What are the effects of acid rain?

	damage to limestone buildings	damage to trees
A	✓	x
B	✓	✓
C	x	x
D	x	✓

14 The diagrams represent different substances.



Which row describes the substances?

	only separate atoms	only molecules	mixture of atoms and molecules
A	P	Q	S
B	Q	T	R
C	T	P	R
D	T	Q	P

15 Which method is used to separate a mixture of two liquids?

- A** chromatography
- B** crystallisation
- C** filtration
- D** fractional distillation

16 Which process involves a physical change?

- A** adding magnesium to nitric acid
- B** burning methane
- C** evaporating petroleum
- D** rusting iron

17 An ion of element X has 8 protons, 8 neutrons and 10 electrons.

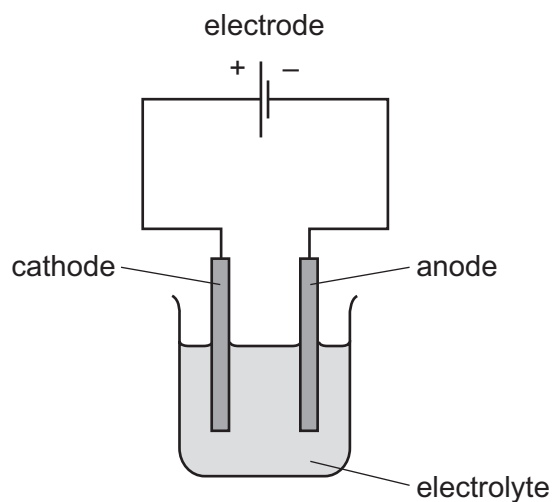
An ion of element Y has 11 protons, 12 neutrons and 10 electrons.

What is the formula of the ionic compound formed between X and Y?

- A** XY
- B** XY₂
- C** X₂Y
- D** X₂Y₂

18 The diagram shows apparatus for electrolysis.

Only one label is correct.



Which label on the diagram is correct?

- A anode
 - B cathode
 - C electrode
 - D electrolyte
- 19 When aqueous copper chloride is electrolysed, ions move to the electrodes.
- Which ions move to the positive electrode?
- A chloride
 - B copper
 - C hydrogen
 - D oxide
- 20 Which change **must** take place in an endothermic reaction?
- A Bubbles of gas are released.
 - B The mass decreases.
 - C The temperature decreases.
 - D The temperature increases.

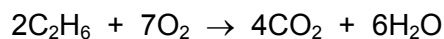
21 Magnesium reacts with dilute hydrochloric acid in four experiments.

The same mass of magnesium and the same volume and concentration of the acid are used.

Which conditions produce the greatest rate of reaction?

	magnesium	temperature / °C
A	powder	10
B	powder	20
C	ribbon	10
D	ribbon	20

22 The equation for the combustion of ethane is shown.



Which statement about this reaction is correct?

- A** Ethane is oxidised because it gains oxygen.
- B** Ethane is reduced because carbon to hydrogen bonds are broken.
- C** It is endothermic because chemical energy is transformed to heat.
- D** It is exothermic because heat is transformed to chemical energy.

23 Zinc sulfate is a soluble salt.

It is made by reacting excess zinc with dilute sulfuric acid.

Which row describes how zinc sulfate is obtained from the mixture after the reaction has finished?

	step 1	step 2	step 3
A	evaporate all of the water	wash the solid that is left	dry the solid
B	filter the mixture	collect the residue from the filter paper	wash and dry the residue
C	filter the mixture	saturate the solution and crystallise	filter, wash and dry the crystals
D	saturate the solution	allow the solution to crystallise	filter, wash and dry the crystals

24 Part of the Periodic Table is shown.

	I	II														III	IV	V	VI	VII	VIII	
	V																			W	X	

Which element forms an anion and which element forms a cation?

	forms an anion	forms a cation
A	V	W
B	V	X
C	W	V
D	X	W

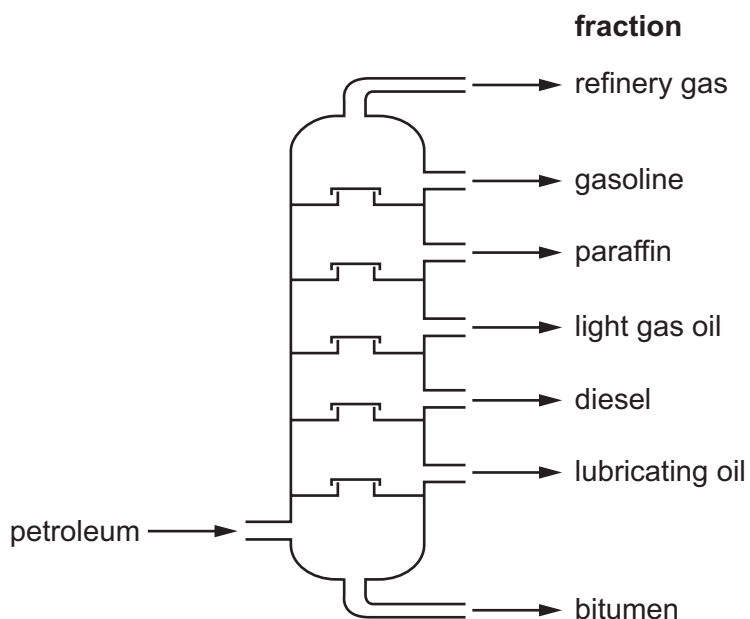
25 Which statement about metals is **not** correct?

- A** Calcium is extracted from its ore by electrolysis.
- B** Compounds containing metals are ionic and the metal is always the positive ion.
- C** Magnesium is more reactive than iron because it forms positive ions less easily than iron.
- D** Some metals react with dilute hydrochloric acid to give hydrogen.

26 Which process produces a gas that contributes to climate change?

- A** the electrolysis of molten lead(II) bromide
- B** the reaction of calcium with water
- C** the reaction of copper oxide with dilute sulfuric acid
- D** the thermal decomposition of calcium carbonate

27 The fractional distillation of petroleum is shown.

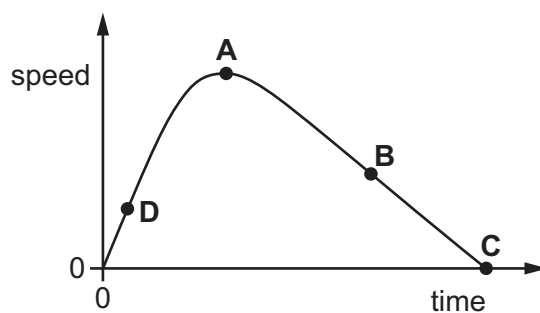


Which fraction contains molecules with the largest intermolecular attractive forces?

- A bitumen
- B diesel
- C gasoline
- D refinery gas

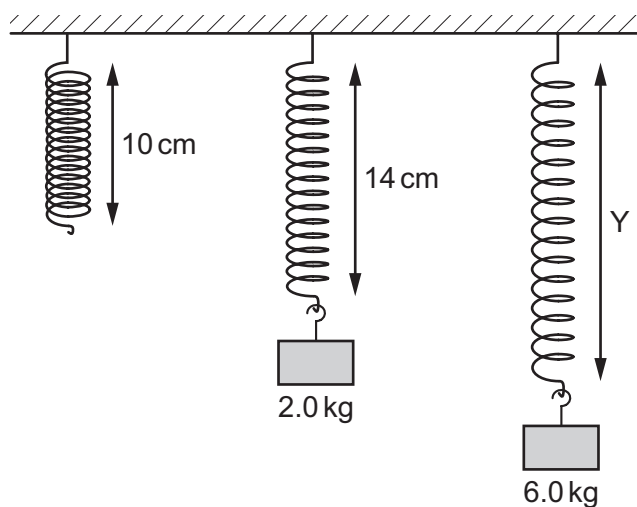
28 The graph shows how the speed of a bicycle varies with time.

At which labelled point is the acceleration of the bicycle the greatest?



- 29 An unstretched spring obeys Hooke's law and has a length of 10 cm. A load with a mass of 2.0 kg is hung from it, and its length becomes 14 cm.

The load is now increased to 6.0 kg, and the new length of the spring is Y. The limit of proportionality is not reached.



What is Y?

- A** 22 cm **B** 26 cm **C** 30 cm **D** 42 cm
- 30 A train is travelling along a straight, horizontal track at constant speed. The work done by the train is recorded as it travels through a measured distance. Which quantity can be calculated using only these two pieces of information?
- A** force exerted by the train
B speed of the train
C time taken to travel this distance
D weight of the train
- 31 The molecules of a substance are close together. They are vibrating and constantly changing places within the substance. The substance now loses energy and this causes it to change state. Which change of state has occurred?
- A** gas to liquid
B liquid to gas
C liquid to solid
D solid to liquid

32 On a summer's day, hot air rises above hot roofs.

What is the name of this process?

- A concentration
- B condensation
- C conduction
- D convection

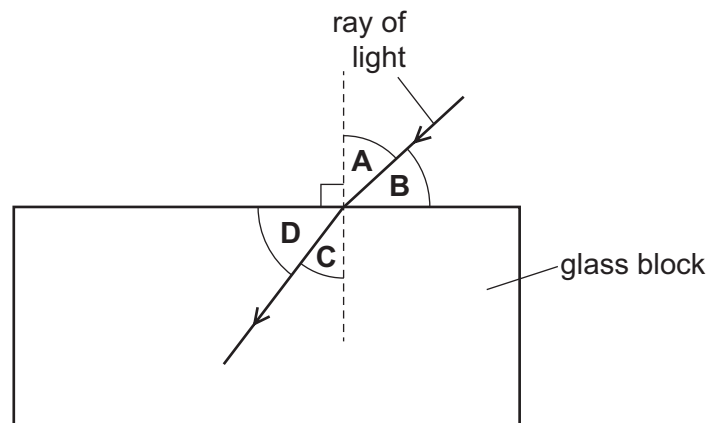
33 A wave has a frequency of 120 Hz and a wavelength of 50 cm.

What is the speed of the wave?

- A 2.4 m/s B 60 m/s C 240 m/s D 6000 m/s

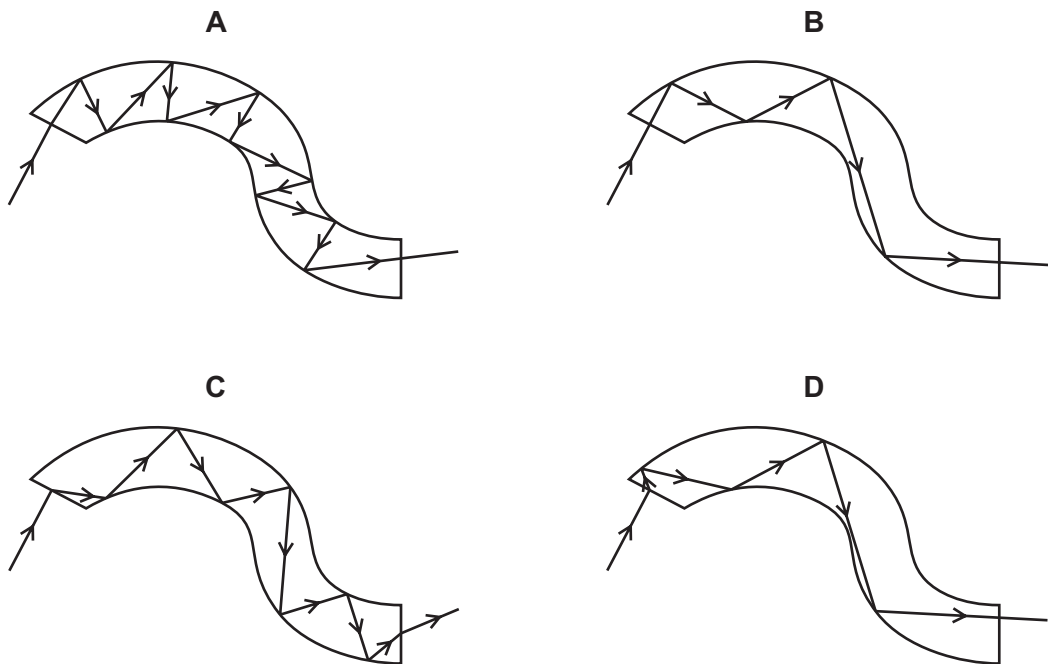
34 The diagram shows a ray of light as it enters a glass block.

Which labelled angle is the angle of refraction?



- 35 Light travels along a glass optical fibre by total internal reflection. The light enters the fibre at right angles to the end.

Which diagram shows the path of the light in the fibre?



- 36 Gamma rays, radio waves and visible light all travel in a vacuum.

How do the speeds of these waves compare?

- A Gamma rays have the highest speed.
- B Radio waves have the highest speed.
- C The waves all have the same speed.
- D Visible light waves have the highest speed.

37 A student writes two sentences about sound waves.

'A sound wave travels through the air as compressions andX..... .'

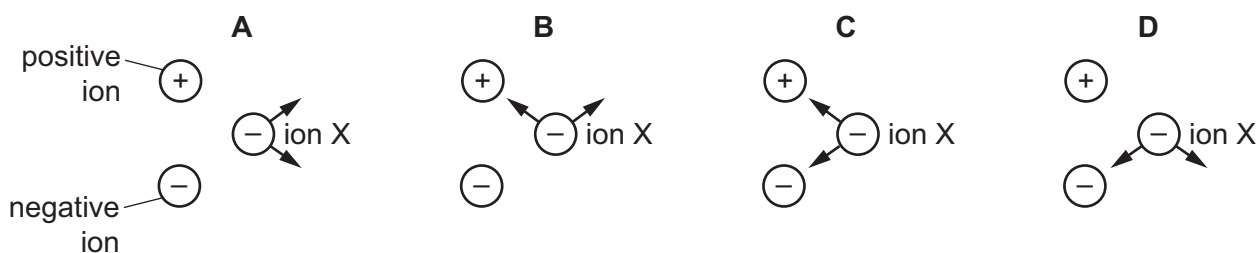
'The air at the compressions has a differentY..... from the air atX..... .'

What are the missing words, X and Y?

	X	Y
A	rarefactions	density
B	rarefactions	state
C	refractions	density
D	refractions	state

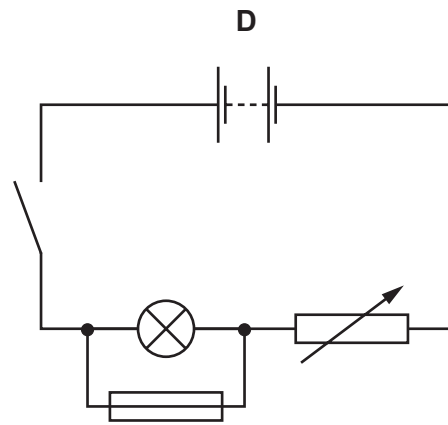
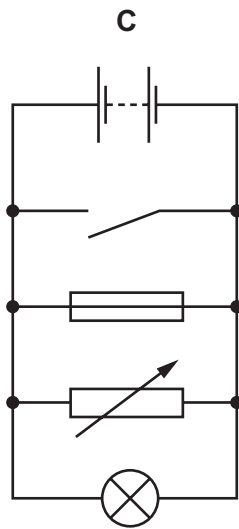
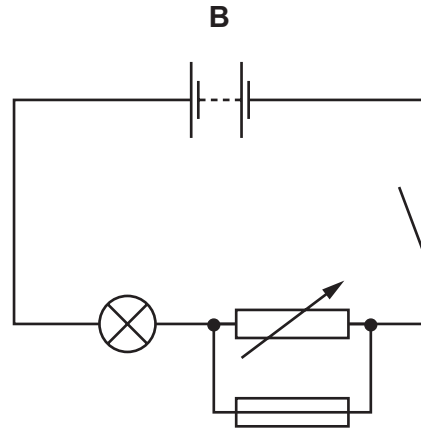
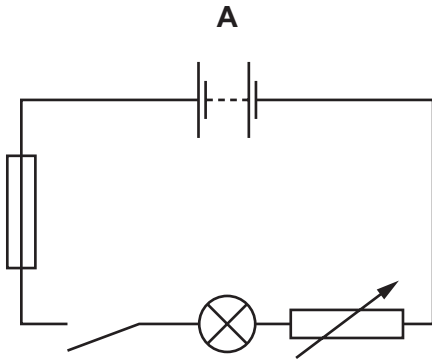
38 A negative ion X is close to a positive ion and another negative ion. Electrical forces act on ion X because of the charges in the other two ions.

Which diagram shows the directions of the two forces acting on ion X?



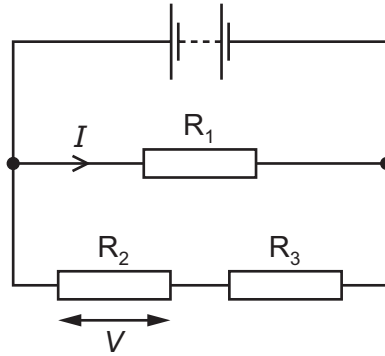
39 A lamp can be dimmed or switched off. Its circuit is protected by a fuse.

Which diagram shows this circuit?



40 The diagram shows three identical resistors R_1 , R_2 and R_3 connected to a battery.

The current in R_1 is I . The potential difference (p.d.) across R_2 is V .



Which row gives the current in R_3 and the p.d. across R_3 ?

	current in R_3	p.d. across R_3
A	$\frac{I}{2}$	$\frac{V}{2}$
B	$\frac{I}{2}$	V
C	I	$\frac{V}{2}$
D	I	V

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The Periodic Table of Elements

		Group															
I	II	III	IV	V	VI	VII	VIII										
3 Li lithium 7	4 Be beryllium 9	1 H hydrogen 1	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	Key atomic number atomic symbol name relative atomic mass						17 Cl chlorine 35.5	18 Ar argon 40								
19 K potassium 39	20 Ca calcium 40	26 Fe iron 56	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	44 Ru ruthenium 101	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	76 Os osmium 190	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 —	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 —							
89–103 actinoids	—	101 La lanthanum 139	102 Ce cerium 140	103 Pr praseodymium 141	104 Nd neodymium 144	105 Pm promethium —	106 Sm samarium 150	107 Eu europium 152	108 Gd gadolinium 157	109 Tb terbium 159	110 Dy dysprosium 163	111 Ho holmium 165	112 Er erbium 167	113 Tm thulium 169	114 Yb ytterbium 173	115 Lu lutetium 175	116 La lawrencium —
—	—	139 La lanthanum	140 Ce cerium	141 Pr praseodymium	144 Nd neodymium	— Pm promethium	150 Sm samarium	152 Eu europium	157 Gd gadolinium	159 Tb terbium	163 Dy dysprosium	165 Ho holmium	167 Er erbium	169 Tm thulium	173 Yb ytterbium	175 Lu lutetium	— La lawrencium
—	—	231 Pa protactinium	232 Th thorium	231 Pa protactinium	238 U uranium	— Np neptunium	— Pu plutonium	— Am americium	— Cm curium	— Bk berkelium	— Cf californium	— Es einsteinium	— Fm fermium	— Md mendelevium	— No nobelium	— Lr lawrencium	—
—	—	231 Pa protactinium	232 Th thorium	231 Pa protactinium	238 U uranium	— Np neptunium	— Pu plutonium	— Am americium	— Cm curium	— Bk berkelium	— Cf californium	— Es einsteinium	— Fm fermium	— Md mendelevium	— No nobelium	— Lr lawrencium	—

lanthanoids

actinoids

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