



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

**CO-ORDINATED SCIENCES**

**0654/13**

Paper 1 Multiple Choice

**May/June 2015**

**45 minutes**

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



**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 16.

Electronic calculators may be used.

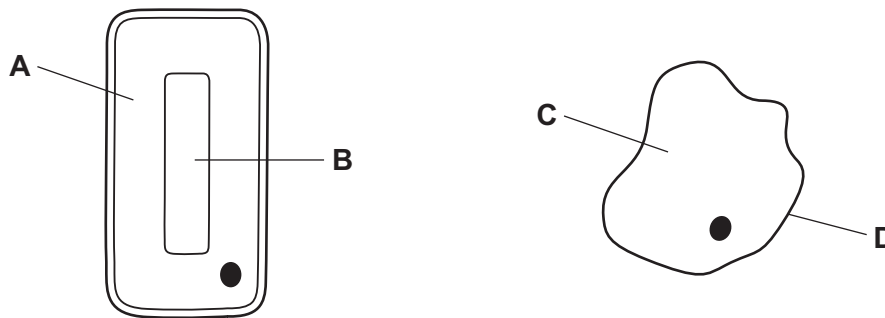
This document consists of **16** printed pages.

1 What are all living things capable of?

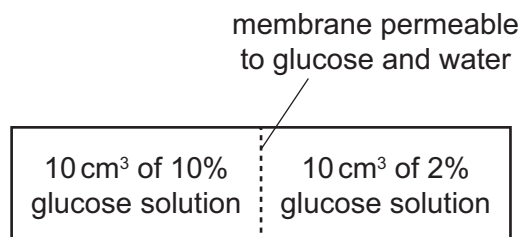
- A excretion
- B digestion
- C photosynthesis
- D sexual reproduction

2 The diagram shows two cells.

Which labelled part might contain chloroplasts?



3 Diffusion occurs between the two solutions shown.

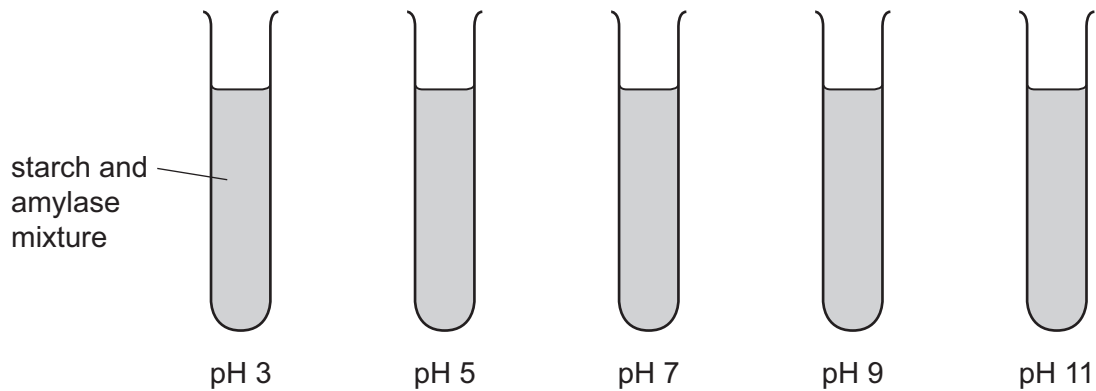


What is the final concentration of glucose solution in each region?

- A 2%
- B 6%
- C 8%
- D 12%

- 4 A student carried out an experiment to investigate the effect of pH on the activity of human amylase.

She set up five test-tubes of starch and amylase mixture, each at a different pH.

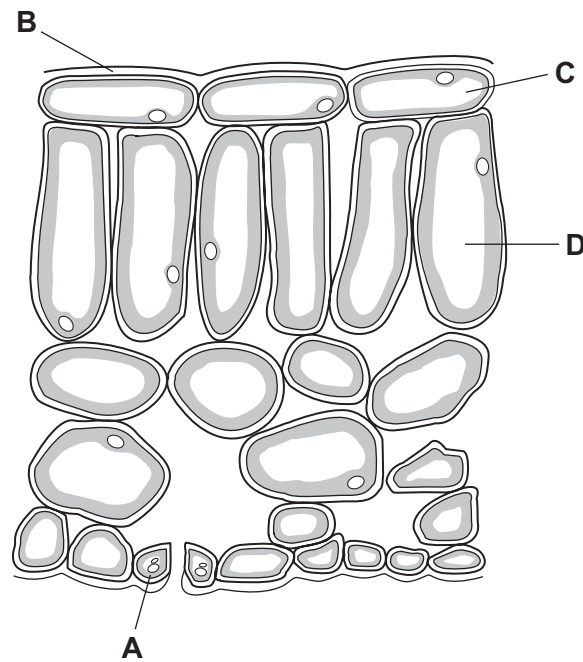


At which temperature(s) should the test-tubes be kept during this experiment?

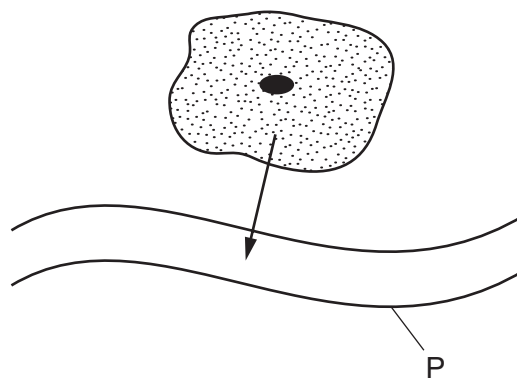
- A all at 37 °C
  - B all at 100 °C
  - C at a range of temperatures between 0 °C and 50 °C
  - D at a range of temperatures between 20 °C and 70 °C
- 5 In a balanced diet, which constituents provide most energy?
- A carbohydrate and protein
  - B fat and carbohydrate
  - C fat and fibre
  - D vitamins and protein

6 The diagram shows a section through a leaf.

Which is a cell with **no** chloroplasts?



7 The arrow shows urea leaving a cell and passing into structure P.



What is P?

- A a capillary
- B an artery
- C a vein
- D the small intestine

- 8 What describes respiration?
- A absorption of oxygen in the alveoli
  - B carbohydrate production in plant cells
  - C the break down of nutrient molecules to release energy
  - D the inspiration of gases in an animal
- 9 A person touches a hot object which triggers a reflex action.  
In which order does the signal travel in the reflex arc?
- A relay neurone → spinal cord → sensory neurone
  - B sensory neurone → spinal cord → motor neurone
  - C spinal cord → sensory neurone → stimulus
  - D stimulus → motor neurone → spinal cord

- 10 Which are target organs for adrenaline?

	heart	liver
A	x	x
B	x	✓
C	✓	x
D	✓	✓

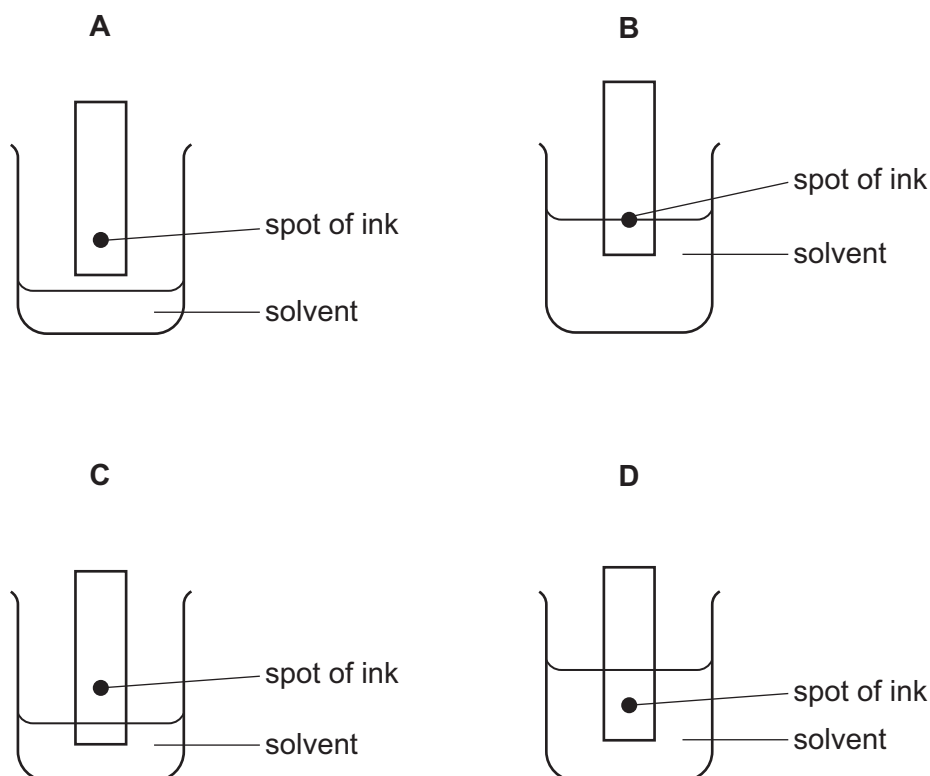
- 11 What is fertilisation?
- A a pollen tube nucleus reaching an ovule
  - B a sperm reaching an ovum
  - C a zygote being formed
  - D pollen grains reaching a stigma
- 12 Which process is responsible for the flow of energy along a food chain?
- A excretion
  - B feeding
  - C respiration
  - D seed dispersal

13 Which two gases are considered to be air-polluting gases and contribute to global warming?

- A carbon dioxide and methane
- B carbon dioxide and nitrogen
- C oxygen and methane
- D oxygen and nitrogen

14 The colours in an ink can be separated by chromatography.

Which diagram shows the correct way to set up the apparatus?

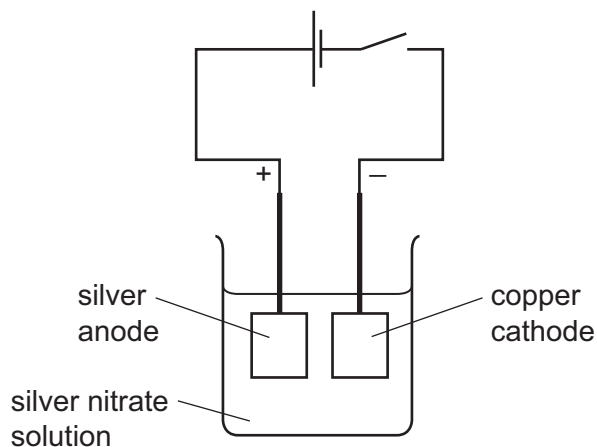


15 The positions of four elements are shown on the outline of part of the Periodic Table.

Which element forms an ion with a charge of 2+?

A	B													C	D		

16 The diagram shows an electroplating experiment.



Which row shows the change in mass of each electrode?

	anode	cathode
<b>A</b>	decrease	decrease
<b>B</b>	decrease	increase
<b>C</b>	increase	decrease
<b>D</b>	increase	increase

17 Which statement about the energetics of a reaction is correct?

- A** In an endothermic reaction heat is given out and the temperature decreases.
- B** In an endothermic reaction heat is taken in and the temperature increases.
- C** In an exothermic reaction heat is given out and the temperature increases.
- D** In an exothermic reaction heat is taken in and the temperature decreases.

18 Dilute sulfuric acid reacts with a piece of zinc.

Which change does **not** speed up the reaction?

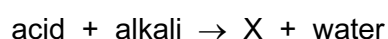
- A** Use a catalyst.
- B** Use a larger volume of dilute sulfuric acid.
- C** Use an equal volume of more concentrated sulfuric acid.
- D** Use the same mass of powdered zinc.

19 Hydrogen and oxygen react explosively to form water.

Which words describe this reaction?

	combustion	oxidation	
<b>A</b>	✓	✓	key
<b>B</b>	✓	x	✓ = yes
<b>C</b>	x	✓	x = no
<b>D</b>	x	x	

20 The equation shown is incomplete.



What is X?

- A** base
- B** carbon dioxide
- C** hydrogen
- D** salt

21 Sodium hydroxide solution and aluminium powder are added to a salt solution and warmed.

A gas is produced that turns moist red litmus paper blue.

Which anion is present in the salt?

- A** carbonate
- B** chloride
- C** nitrate
- D** sulfate

22 A gas is used in welding metals together at high temperatures.

The gas is used to provide an inert atmosphere.

What is the gas?

- A** argon
- B** carbon dioxide
- C** fluorine
- D** oxygen



23 The table shows information about some minerals.

mineral	chemical formula
bauxite	$Al_2O_3$
galena	$PbS$
hematite	$Fe_2O_3$
rutile	$TiO_2$

Which minerals contain a transition element?

- A bauxite and galena
- B bauxite and hematite
- C galena and rutile
- D hematite and rutile

24 Similar sized pieces of five different metals P, Q, R, S and T are reacted with equal volumes of dilute hydrochloric acid of the same concentration.

The results are shown below.

key  
 ○ bubble of gas  
 ● metal

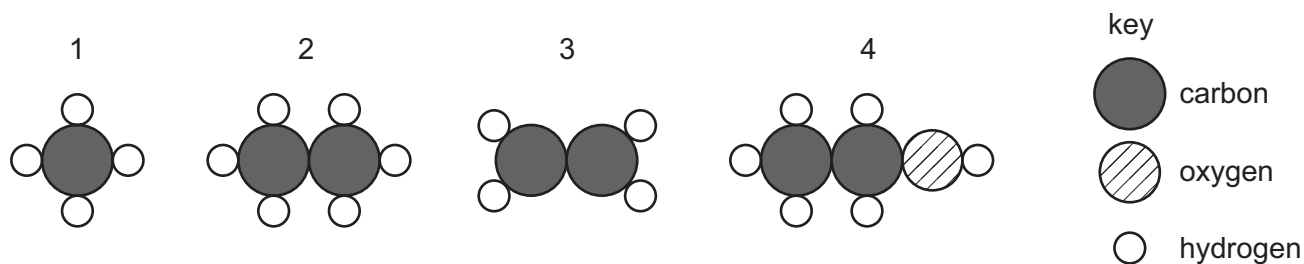
What is the order of reactivity?

	least reactive $\longrightarrow$ most reactive				
A	P	S	T	Q	R
B	R	Q	T	S	P
C	R	T	Q	P	S
D	Q	R	S	T	P

25 Which gas forms 78% of the air?

- A argon
- B carbon dioxide
- C nitrogen
- D water vapour

26 The structures of four organic molecules are shown.



Which row correctly identifies these compounds?

	1	2	3	4
<b>A</b>	ethane	ethanol	methane	ethene
<b>B</b>	ethanol	ethene	ethane	methane
<b>C</b>	ethene	methane	ethanol	ethane
<b>D</b>	methane	ethane	ethene	ethanol

27 A fuel used for cooking food is the hydrocarbon ...1... that burns in an ...2... reaction.

Which words correctly complete gaps 1 and 2?

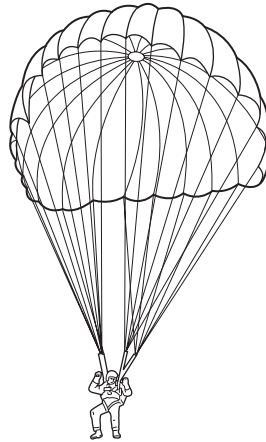
	1	2
<b>A</b>	coke	endothermic
<b>B</b>	coke	exothermic
<b>C</b>	methane	endothermic
<b>D</b>	methane	exothermic

28 The circuit of a motor racing track is 3.0 km in length. In a race, a car goes 25 times round the circuit in 30 minutes.

What is the average speed of the car?

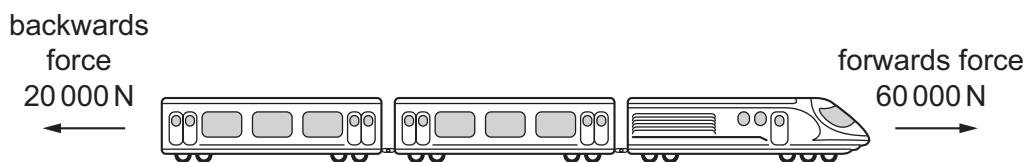
- A** 75 km/hour
- B** 90 km/hour
- C** 150 km/hour
- D** 750 km/hour

- 29 Inside an aeroplane, a parachutist has a mass of 70 kg.



What is his mass after he has jumped from the aeroplane?

- A 0 kg
  - B between 0 kg and 70 kg
  - C 70 kg
  - D greater than 70 kg
- 30 A train travels along a horizontal track at constant speed. Two of the forces acting on the train are shown in the diagram.



A force of air resistance is also acting on the train to give it a resultant force of zero.

What is this air resistance force?

- A 40 000 N backwards
  - B 80 000 N backwards
  - C 40 000 N forwards
  - D 80 000 N forwards
- 31 Which energy sources are both renewable?
- A oil and coal
  - B oil and tidal
  - C tidal and geothermal
  - D tidal and nuclear fission

32 Which row describes the molecules of a solid at 0 °C, a liquid at 0 °C and a gas at 0 °C?

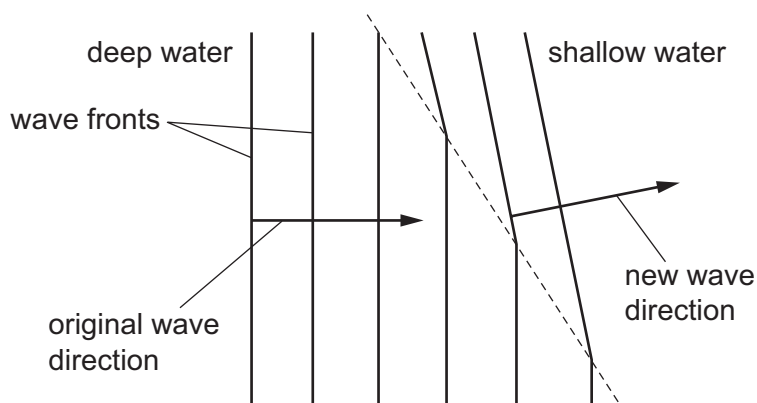
	solid	liquid	gas
<b>A</b>	stationary	stationary	stationary
<b>B</b>	stationary	stationary	moving
<b>C</b>	stationary	moving	moving
<b>D</b>	moving	moving	moving

33 There is a vacuum between the double walls of a vacuum flask.

Which types of heat transfer are reduced by the vacuum?

- A** conduction, convection and radiation
- B** conduction and convection only
- C** conduction and radiation only
- D** convection and radiation only

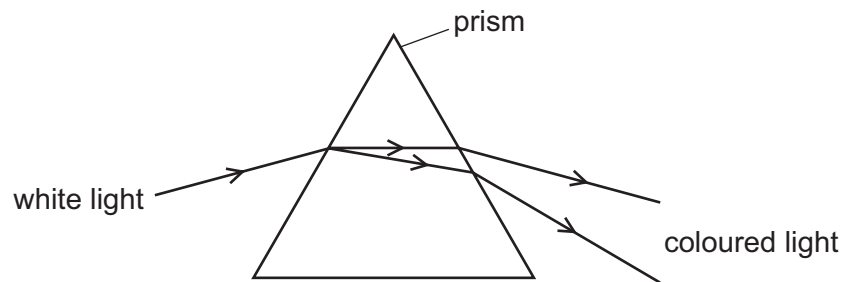
34 The diagram represents a water wave changing direction as it moves into a shallower region.



What happens to the speed and what happens to the wavelength of the wave as it changes direction?

	speed	wavelength
<b>A</b>	changes	changes
<b>B</b>	changes	stays the same
<b>C</b>	stays the same	changes
<b>D</b>	stays the same	stays the same

- 35 One of the effects of passing a ray of white light through a prism is to split the light into colours.



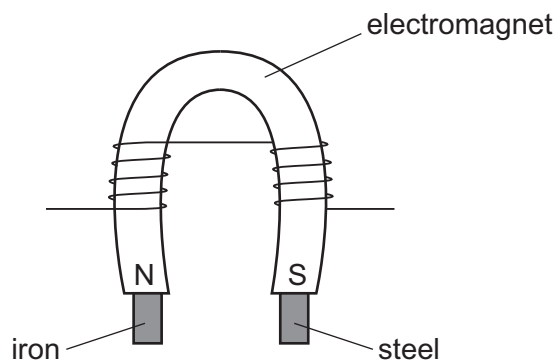
What is the name given to this splitting effect?

- A dispersion
  - B radiation
  - C reflection
  - D refraction
- 36 Sound waves may cause an echo.

What happens to sound waves to cause an echo and what is the nature of sound waves?

	what an echo is caused by	nature of sound waves
<b>A</b>	reflection	longitudinal
<b>B</b>	reflection	transverse
<b>C</b>	refraction	longitudinal
<b>D</b>	refraction	transverse

37 A piece of iron and a piece of steel are attracted to an electromagnet as shown.



The electromagnet is now switched off.

What happens?

- A Both the iron and the steel remain magnetised.
  - B Neither the iron nor the steel remains magnetised.
  - C Only the iron remains magnetised.
  - D Only the steel remains magnetised.
- 38 The diagrams show two possible ways in which a fuse and a lamp can be connected in a circuit. The current in the lamp is 2.0 A.

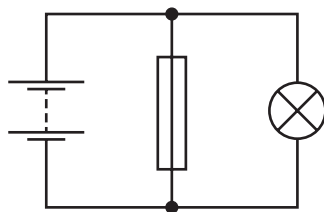


diagram 1

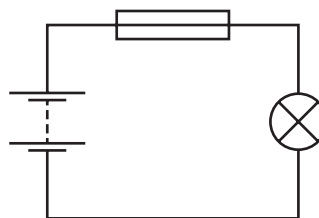


diagram 2

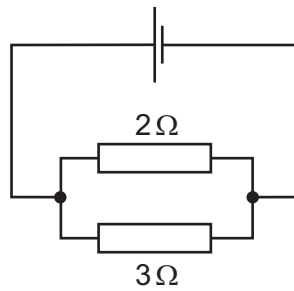
A fault develops. The current in the lamp increases, and the fuse blows.

Which row gives the correct position of the fuse, and the effect of the fuse when it blows?

	correct position	effect
<b>A</b>	as in diagram 1	reduces current to 0
<b>B</b>	as in diagram 1	reduces current to 2.0 A
<b>C</b>	as in diagram 2	reduces current to 0
<b>D</b>	as in diagram 2	reduces current to 2.0 A

15

39 A  $2\ \Omega$  and a  $3\ \Omega$  resistor are connected as shown.



What is the total resistance of the two resistors?

- A less than  $2\ \Omega$
  - B between  $2\ \Omega$  and  $3\ \Omega$
  - C between  $3\ \Omega$  and  $5\ \Omega$
  - D exactly  $5\ \Omega$
- 40 Which type of radiation has the greatest ionising effect?
- A infra-red rays
  - B  $\alpha$ -particles
  - C  $\beta$ -particles
  - D  $\gamma$ -rays

**DATA SHEET**  
**The Periodic Table of the Elements**

		Group																																				
		I	II	III	IV	V	VI	VII	VIII	IX	X																											
		1 <b>H</b> Hydrogen 1																																				
7	9	<b>Li</b> Lithium 3	<b>Be</b> Beryllium 4																																			
23	24	<b>Na</b> Sodium 11	<b>Mg</b> Magnesium 12																																			
39	40	<b>K</b> Potassium 19	<b>Ca</b> Calcium 20	45 <b>Sc</b> Scandium 21	48 <b>Ti</b> Titanium 22	51 <b>V</b> Vanadium 23	52 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36																			
85	88	<b>Rb</b> Rubidium 37	<b>Sr</b> Strontium 38	89 <b>Y</b> Yttrium 39	91 <b>Zr</b> Zirconium 40	93 <b>Nb</b> Niobium 41	96 <b>Mo</b> Molybdenum 42	101 <b>Ru</b> Ruthenium 44	101 <b>Ru</b> Ruthenium 44	103 <b>Rh</b> Rhodium 45	106 <b>Pd</b> Palladium 46	108 <b>Ag</b> Silver 47	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	119 <b>Sn</b> Tin 50	122 <b>Sb</b> Antimony 51	128 <b>Te</b> Tellurium 52	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54																			
133	137	<b>Cs</b> Caesium 55	<b>Ba</b> Barium 56	139 <b>La</b> Lanthanum 57	178 <b>Hf</b> Hafnium 72	181 <b>Ta</b> Tantalum 73	184 <b>W</b> Tungsten 74	190 <b>Os</b> Osmium 76	190 <b>Os</b> Osmium 76	192 <b>Ir</b> Iridium 77	195 <b>Pt</b> Platinum 78	197 <b>Au</b> Gold 79	201 <b>Hg</b> Mercury 80	204 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	210 <b>Po</b> Polonium 84	210 <b>At</b> Astatine 85	210 <b>Rn</b> Radon 86																			
87	226	<b>Fr</b> Francium 87	<b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89																																		
		*58-71 Lanthanoid series																																				
		†90-103 Actinoid series																																				
		159 <b>Tb</b> Terbium 65																																				
		157 <b>Gd</b> Gadolinium 64	152 <b>Eu</b> Europium 63	150 <b>Sm</b> Samarium 62	144 <b>Nd</b> Neodymium 60	141 <b>Pr</b> Praseodymium 59	140 <b>Ce</b> Cerium 58	162 <b>Dy</b> Dysprosium 66	165 <b>Ho</b> Holmium 67	167 <b>Er</b> Erbium 68	169 <b>Tm</b> Thulium 69	173 <b>Yb</b> Ytterbium 70	175 <b>Lu</b> Lutetium 71	183 <b>La</b> Lanthanum 57	188 <b>Ce</b> Cerium 58	192 <b>Pr</b> Praseodymium 59	197 <b>Nd</b> Neodymium 60	201 <b>Pm</b> Promethium 61	207 <b>Sm</b> Samarium 62	214 <b>Eu</b> Europium 63	227 <b>Gd</b> Gadolinium 64	232 <b>Tb</b> Terbium 65	238 <b>Dy</b> Dysprosium 66	252 <b>U</b> Uranium 92	258 <b>Pa</b> Protactinium 91	262 <b>Th</b> Thorium 90	262 <b>U</b> Uranium 92	268 <b>Np</b> Neptunium 93	271 <b>Pu</b> Plutonium 94	277 <b>Am</b> Americium 95	285 <b>Cm</b> Curium 96	289 <b>Bk</b> Berkelium 97	294 <b>Cf</b> Californium 98	297 <b>Es</b> Einsteinium 99	301 <b>Fm</b> Fermium 100	304 <b>Md</b> Mendelevium 101	307 <b>No</b> Nobelium 102	310 <b>Lr</b> Lawrencium 103

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number

Key

a	<b>X</b>
b	

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).