Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/23**

Paper 2 Multiple Choice (Extended) **May/June 2020**

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. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Blank pages are indicated.

1 A scientist is studying a living organism. She observes that it has the ability to remove the waste products of metabolism.

What characteristic of living organisms is being observed?

A excretion

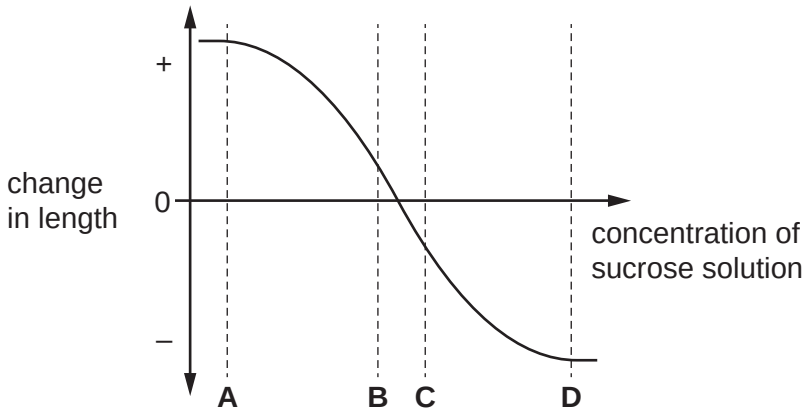
B nutrition

C respiration

D reproduction

2 Pieces of potato (a plant) of the same size were placed in sucrose solutions of different concentrations. Their length was measured after two hours.

At which sucrose concentration were the pieces most flaccid?



3 A food contains reducing sugar, but no starch.

What colours will be obtained if samples of the food are tested with Benedict's solution and with iodine solution?

	Benedict's test	iodine test
A	blue	blue-black
B	blue	brown
C	red-orange	blue-black
D	red-orange	brown

4 Which type of molecule is an enzyme?

A carbohydrate

B fat

C protein

D vitamin

5 Which part of a leaf is involved in opening and closing the stomata during gas exchange?

A chloroplast

B guard cell

C palisade mesophyll

D phloem

6 Why is calcium needed in the diet?

A to make carbohydrates

B to make teeth

C to make enzymes

D to make protein

7 Which blood vessel carries deoxygenated blood and has a thick muscular wall?

A aorta

B pulmonary artery

C pulmonary vein

D vena cava

8 Which row shows the products of anaerobic respiration in yeast cells?

	lactic acid	CO_2	alcohol
A	✓	✗	✗
B	✗	✓	✓
C	✗	✗	✓
D	✓	✓	✗

9 What happens when the body temperature falls below normal?

A Arterioles supplying the skin constrict.

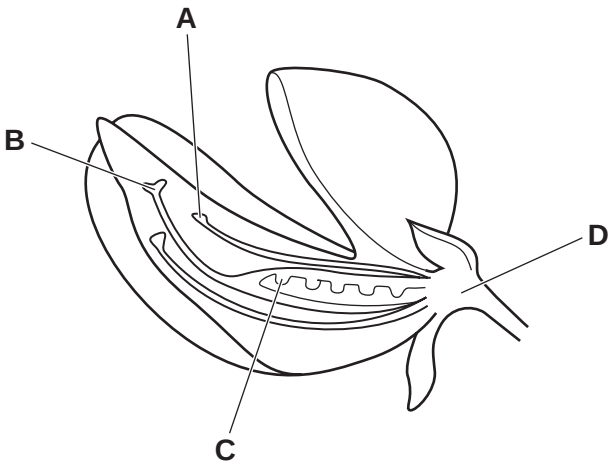
B Arterioles supplying the skin dilate.

C Capillaries move towards the skin surface.

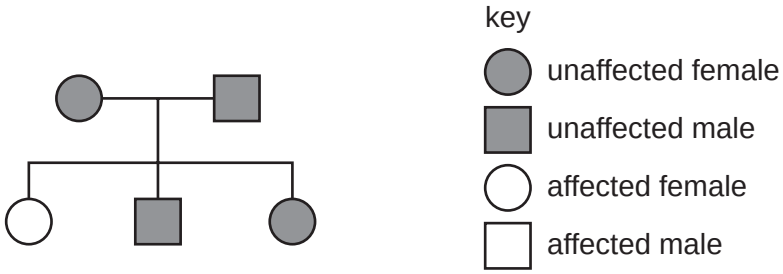
D Capillaries move away from the skin surface.

10 The diagram shows a section through a pea flower.

Where does fertilisation occur?



11 The diagram shows the inheritance of a disease.



Which row is correct for the parents and the allele for the disease?

	parents	allele for the disease
A	heterozygous	dominant
B	heterozygous	recessive
C	homozygous	dominant
D	homozygous	recessive

12 Where does the principle source of energy for an ecosystem come from?

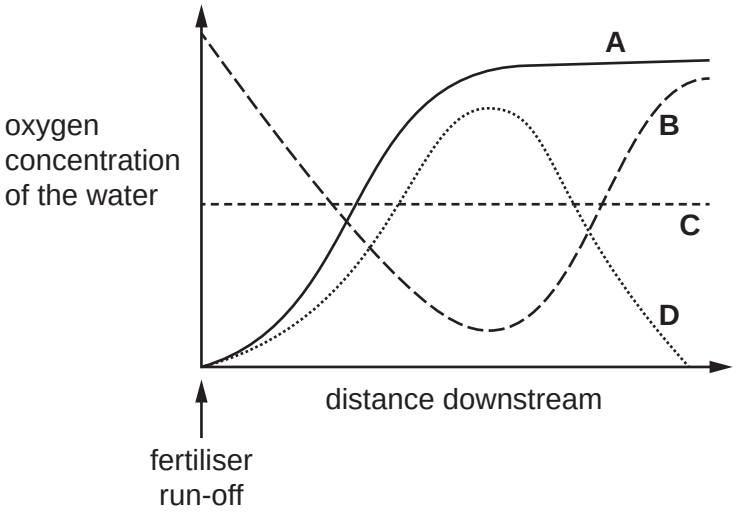
A decay

B the soil

C the Sun

D water

13 Which line shows how the oxygen concentration of the water changes after excess fertiliser has entered a stream?



14 Which statement about atoms and molecules is correct?

A All molecules are gases at room temperature and pressure.

B An atom is the smallest part of an element.

C Atoms of the same element all have the same mass.

D Molecules always contain atoms of more than one element.

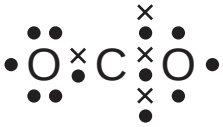
15 Which dot-and-cross diagram shows the outer shell electrons in a molecule of carbon dioxide?

A

B

C

D



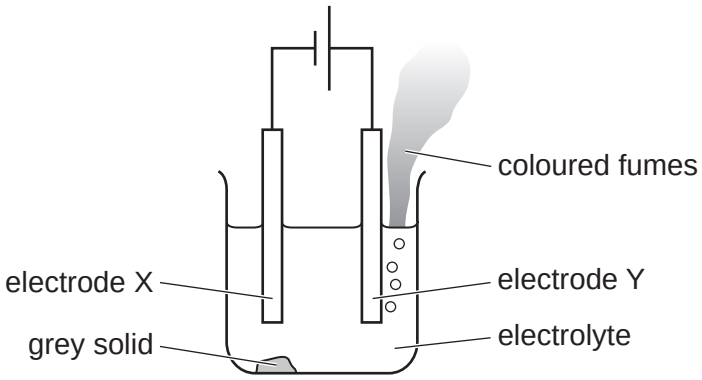
16 The equation for the combustion of magnesium is shown.

$$2Mg + O_2 \rightarrow 2MgO$$

What is the mass of magnesium oxide formed from 12 g of magnesium?

A 20 g **B** 24 g **C** 40 g **D** 80 g

17 The diagram shows the electrolysis of lead(II) bromide using inert electrodes.



Which statement about this experiment is correct?

A Electrode X is positively charged.

B The coloured fumes are produced at the negative electrode.

C The electrolyte is lead(II) bromide.

D The grey solid is lead(II) bromide.

18 The ionic equation for the formation of chromium(III) ions is shown.

$$Cr \rightarrow Cr^{3+} + 3e^{-}$$

Which statement about chromium atoms is correct?

A They are oxidised by gaining electrons.

B They are oxidised by losing electrons.

C They are reduced by gaining electrons.

D They are reduced by losing electrons.

19 Which oxide is a neutral oxide?

A CuO, because it reacts with sulfuric acid.

B NO, because it is insoluble in acids and alkalis.

C SiO_2, because it reacts with sodium hydroxide.

D SO_2, because it dissolves in water.

20 Element X is in the third period and in Group II of the Periodic Table.

Element Y has the electronic structure 2,8,7.

Element Z forms an ionic compound with the formula $Z_2(SO_4)_3$.

Which row shows the order of metallic character?

	least ⟶		most
A	X	Y	Z
B	X	Z	Y
C	Y	X	Z
D	Y	Z	X

21 Three methods for investigating rates of reaction are listed.

1 Observe a colour change.

2 Use a gas syringe.

3 Use a balance.

The equation for the reaction of magnesium and dilute hydrochloric acid is shown.

$$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$$

Which of the methods can be used to investigate the rate of this reaction?

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

22 Which statement is **not** a reason why aluminium is used in aircraft manufacture?

A It forms low density alloys.

B It is malleable.

C It is more reactive than iron.

D It is resistant to corrosion.

23 Which reactions occur in a car's catalytic converter?

1 $2CO + O_2 \rightarrow 2CO_2$

2 $2NO + 2CO \rightarrow N_2 + 2CO_2$

3 $N_2 + O_2 \rightarrow 2NO$

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

24 The reaction equation for the production of ethanol by an addition reaction is shown.

$$C_2H_4 + H_2O \rightarrow C_2H_5OH$$

Which row describes the physical state of water and of ethanol in the reaction vessel?

	water	ethanol
A	gas	gas
B	gas	liquid
C	liquid	gas
D	liquid	liquid

25 When limestone is heated it thermally decomposes into lime.

What is the word equation for this reaction?

A calcium carbonate → calcium + carbon dioxide

B calcium carbonate → calcium oxide + carbon dioxide

C calcium hydrogencarbonate → calcium + carbon dioxide + water

D calcium hydrogencarbonate → calcium oxide + carbon dioxide + water

26 What are the uses of the fractions obtained from petroleum?

	gas oil	gasoline	refinery gas
A	cooking	petrol fuel	diesel fuel
B	diesel fuel	heating	petrol fuel
C	diesel fuel	petrol fuel	cooking
D	petrol fuel	diesel fuel	heating

27 Ethene is produced when decane, a large hydrocarbon, is heated with a catalyst.

What is the name of this process?

A combustion

B cracking

C displacement

D neutralisation

28 A man carries a suitcase of mass of 30 kg. The area of contact with the man's hand is $1.5 \times 10^{-3}\,m^2$.

The gravitational field strength g is 10 N / kg.

What pressure is exerted on the man's hand by the suitcase?

A 0.045 Pa **B** 0.45 Pa **C** 20 000 Pa **D** 200 000 Pa

29 An object of mass m moving with speed v has kinetic energy E.

A second object, also of mass m, moves with speed $\frac{v}{2}$.

What is the kinetic energy of the second object?

A $\frac{E}{4}$ **B** $\frac{E}{2}$ **C** E **D** $2E$

30 Which equation relates power P to energy change ΔE and time t?

A $P = \frac{\Delta E^2}{2 \times t}$

B $P = \frac{1}{2} \times \Delta E^2 \times t$

C $P = \frac{\Delta E}{t}$

D $P = \Delta E \times t$

31 In which pair do both energy resources have the Sun as the source of their energy?

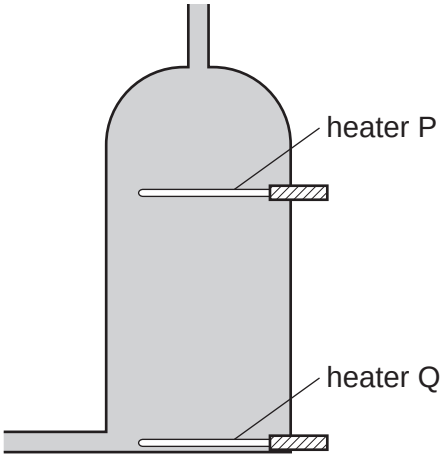
A geothermal energy and tidal energy

B hydroelectric energy and wind energy

C nuclear energy and chemical energy stored in fuel

D solar energy and nuclear energy

32 A hot water tank is fitted with two identical heaters P and Q. Heater P is fitted above heater Q as shown. The tank is full of cold water.



When only heater Q is switched on, it takes a long time to heat the tank of water to 60 °C.

What happens to the cold water when only heater P is switched on?

A All the water reaches 60 °C in less time.

B All the water reaches 60 °C in the same time.

C The water below heater P reaches 60 °C in less time.

D The water above heater P reaches 60 °C in less time.

33 'The number of crests on the surface of water that pass a particular point each second.'

Which property of a wave does this describe?

A amplitude

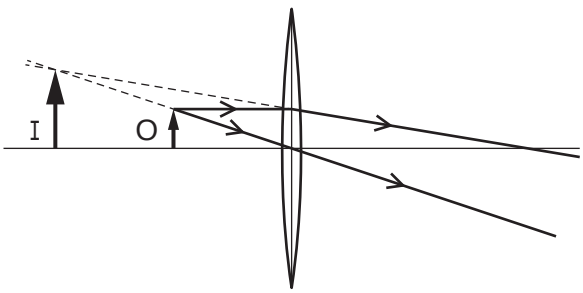
B frequency

C speed

D wavelength

34 Which ray diagram represents the formation of a virtual image I of an object O?

A



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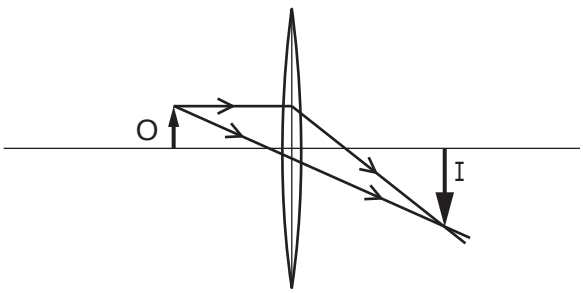

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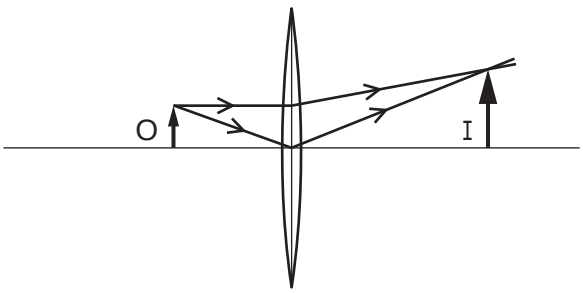

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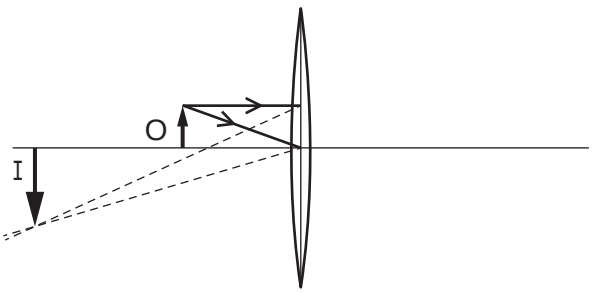
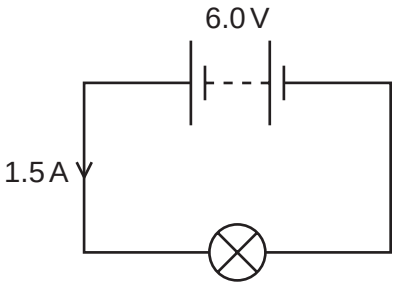


35 The current in a motor is 5.0 A.

How much charge passes through the motor in 1.0 minute?

A 0.20 C **B** 5.0 C **C** 12 C **D** 300 C

36 A lamp is connected to a 6.0 V battery. The current in the lamp is 1.5 A.



How much energy is used by the lamp in 10 minutes?

A 0.90 J **B** 40 J **C** 2400 J **D** 5400 J

37 A fuse is a safety device for use in an electrical circuit.

The current in the circuit becomes greater than the rated value for the fuse.

What happens?

A The current decreases to zero.

B The current decreases to the rated value for the fuse.

C The thickness of the insulation around the wires increases.

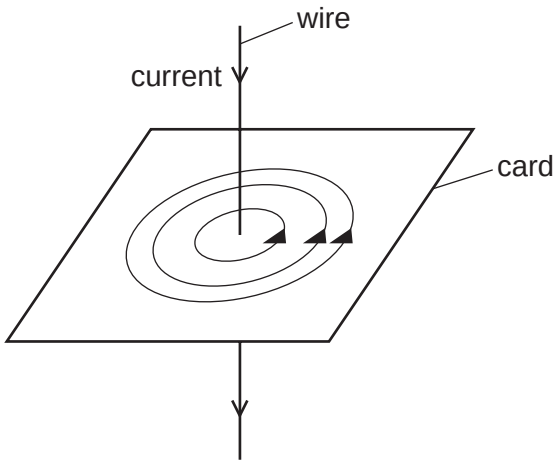
D The current is sent to the outer case of the appliance.

38 A current-carrying wire passes through a flat card.

The arrow on each wire shows the direction of the current.

Which diagram shows the pattern of the magnetic field on the card and the direction of the magnetic field lines?

A



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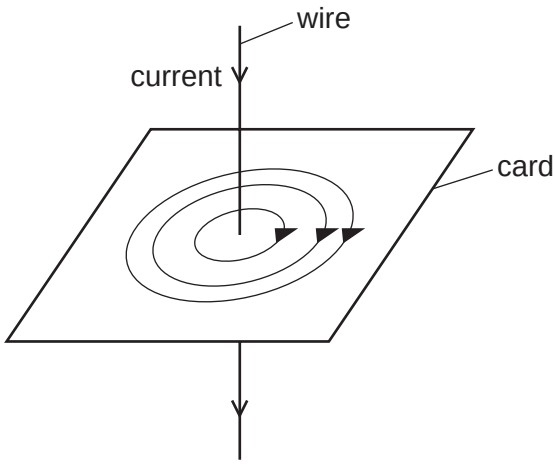

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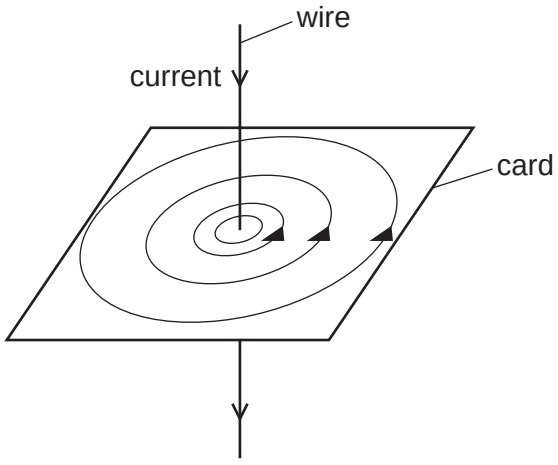

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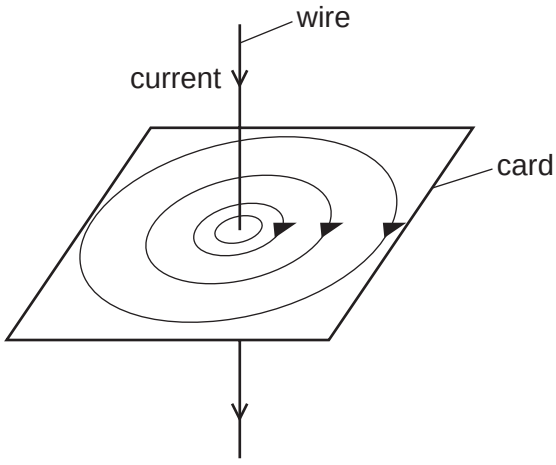


39 A power station produces electricity at a voltage of 25 kV. Transformer 1 steps up the voltage to 400 kV for the transmission line.

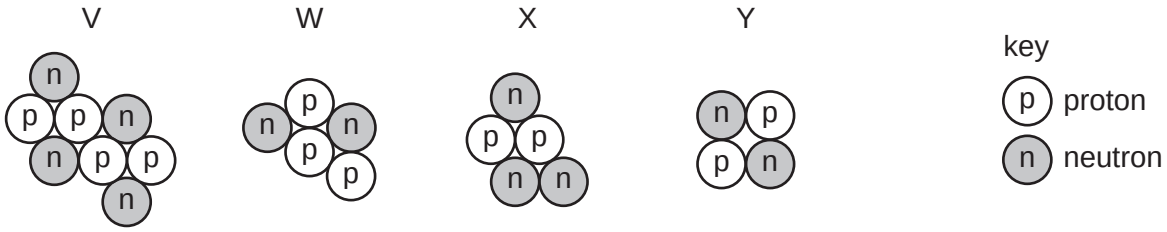
At the other end of the transmission line, transformer 2 steps down 400 kV to 160 kV.

The turns ratio of a transformer is $N_p : N_s$ (or $\frac{N_p}{N_s}$).

What is the turns ratio of transformer 1, and what is the turns ratio of transformer 2?

	turns ratio of transformer 1	turns ratio of transformer 2
A	1 : 16	2 : 5
B	1 : 16	5 : 2
C	16 : 1	2 : 5
D	16 : 1	5 : 2

40 The diagrams represent the nuclei of four different atoms V, W, X and Y.



Which two diagrams represent isotopes of the same element?

A V and Y **B** W and X **C** X and Y **D** Y and W

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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.).