Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/22**

Paper 2 Multiple Choice (Extended) **February/March 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)

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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.

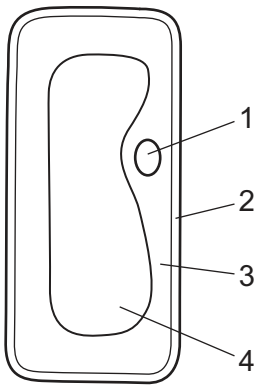
This document has **20** pages. Any blank pages are indicated.

[Turn over

1 What are the characteristics of living organisms?

	excretion	growth	movement	nutrition	reproduction	respiration	sensitivity / response
A	✓	✓	✓	✓	✓	✓	✓
B	✓	✓	✗	✓	✓	✓	✓
C	✓	✗	✗	✓	✗	✓	✓
D	✗	✓	✓	✓	✓	✓	✗

2 The diagram shows a plant cell.



Which structures are also found in an animal cell?

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

3 An animal cell is placed in a solution with a water potential lower than its cytoplasm.

Which statement correctly describes the movement of water across the cell membrane?

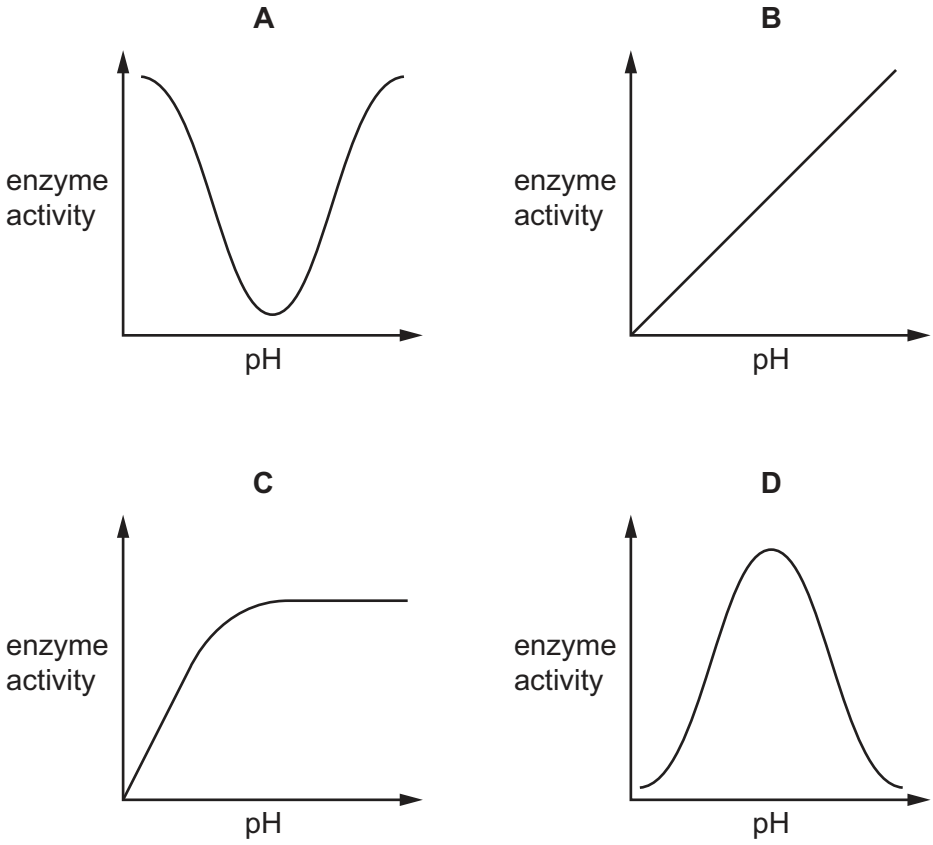
A equal movement in and out of the cell

B net movement into the cell

C net movement out of the cell

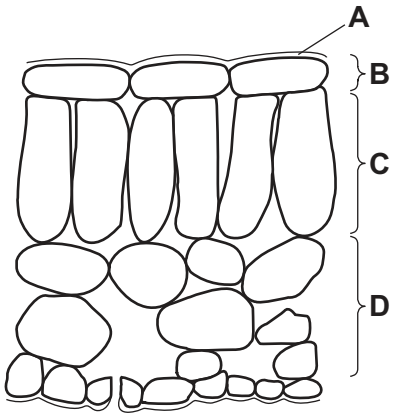
D no movement in or out of the cell

4 Which graph shows the effects of pH on the activity of an enzyme?



5 The diagram shows a section of a leaf.

Which letter is the epidermis?



6 What does a lack of iron in the diet cause?

A bleeding from the gums

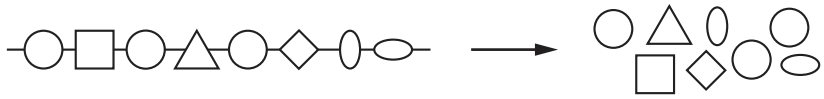
B constipation

C less oxygen transported to cells

D weakening of bones

7 Which diagram represents the digestion of food molecules in the alimentary canal?

A



B

C

D

8 Which statement explains why the rate of transpiration changes on a hot dry day?

A a decrease in diffusion of water vapour through the stomata

B a decrease in evaporation of water vapour through the stomata

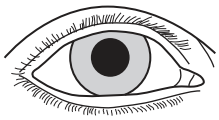
C an increase in evaporation of water from the mesophyll cells

D a decrease in diffusion of water from the mesophyll cells

9 What are the functions of the cilia and mucus in the gas exchange system of mammals?

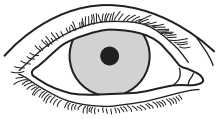
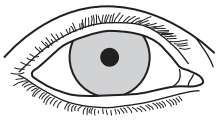
	cilia	mucus
A	make mucus	trap pathogens
B	make mucus	move cilia
C	move mucus	trap pathogens
D	move mucus	move cilia

10 The table shows some data recorded by a scientist about a student.

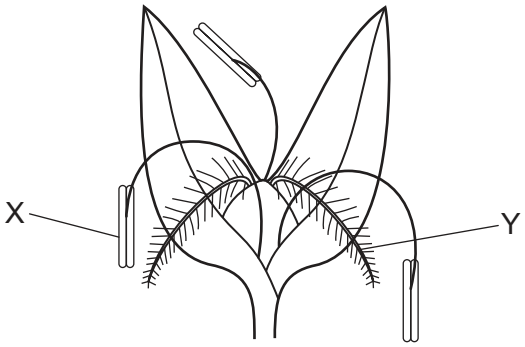
pupil size in eye	pulse rate / beats per minute
	68

The scientist then frightens the student with a sudden loud noise.

Which row shows the results immediately after the loud noise?

	pupil size in eye	pulse rate / beats per minute
A		60
B		80
C		60
D		80

11 The diagram shows a flower.



Which row is correct for the flower illustrated?

	X	Y
A	captures insect-carried pollen	produces rough pollen grains
B	captures wind-carried pollen	produces smooth pollen grains
C	produces rough pollen grains	captures insect-carried pollen
D	produces smooth pollen grains	captures wind-carried pollen

12 Materials are exchanged between a mother and her fetus across the placenta.

Which row shows the overall direction of movement of these materials?

	mother to fetus	fetus to mother
A	amino acids	glucose
B	amino acids	urea
C	carbon dioxide	glucose
D	carbon dioxide	urea

13 What is the name given to the position of an organism in a food chain?

A ecosystem

B energy content

C trophic level

D tropism

14 Which methods of separation depend on the substances in a mixture having different boiling points?

A crystallisation and distillation

B evaporation and filtration

C fractional distillation and chromatography

D fractional distillation and distillation

15 Which row describes an element and a compound?

	element	compound
A	contains more than one type of atom	contains elements chemically combined
B	contains more than one type of atom	contains elements mixed together
C	contains only one type of atom	contains elements chemically combined
D	contains only one type of atom	contains elements mixed together

16 Potassium chloride is a solid.

Hydrogen chloride is a gas.

Which statement explains why potassium chloride has a much higher boiling point than hydrogen chloride?

A Covalent bonding is stronger than ionic bonding.

B Covalent bonds are stronger than the attractive forces between molecules.

C Ionic bonding is stronger than covalent bonding.

D Ionic bonds are stronger than the attractive forces between molecules.

17 Ammonium phosphate has the formula $(NH_4)_3PO_4$.

Which row shows the formulae of ammonium ions and phosphate ions?

	ammonium	phosphate
A	NH_4^+	PO_4^-
B	NH_4^{3+}	PO_4^{3-}
C	NH_4^+	PO_4^{3-}
D	NH_4^{3+}	PO_4^-

[Turn over

18 Which process occurs during electrolysis?

A Anions gain electrons at the anode.

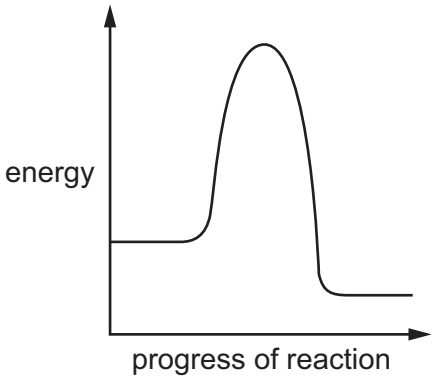
B Anions lose electrons at the anode.

C Cations gain electrons at the anode.

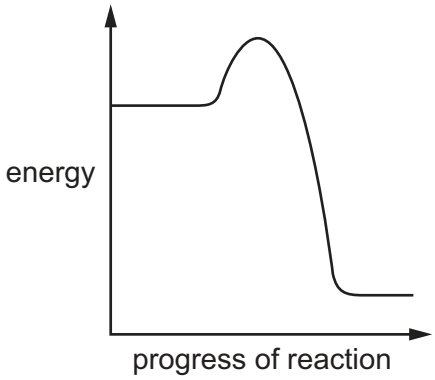
D Cations lose electrons at the cathode.

19 Which energy level diagram represents an exothermic reaction with the greatest activation energy?

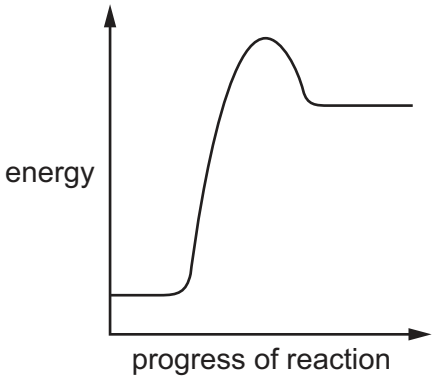
A



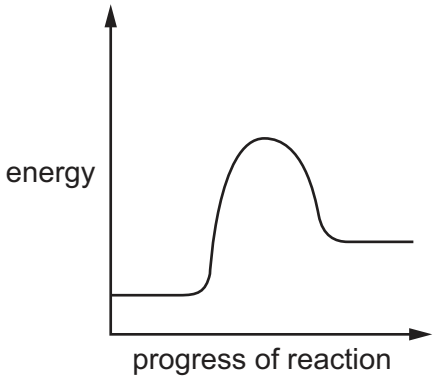
B



C



D



20 Zinc reacts with dilute hydrochloric acid.

Which row explains the effect of increasing the temperature on this reaction?

	frequency of collisions between reacting particles	number of particles possessing the minimum energy for the reaction
A	decreases	increases
B	decreases	stays the same
C	increases	increases
D	increases	stays the same

21 Copper is extracted from its ore by heating with carbon.

What is the role of the carbon in this process?

A fuel

B electrolyte

C oxidising agent

D reducing agent

22 A mixture of ammonium carbonate and ammonium chloride is heated with aqueous sodium hydroxide.

Which gas is produced?

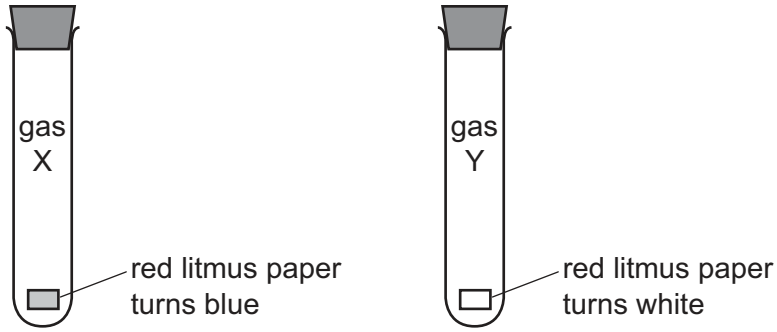
A ammonia

B carbon dioxide

C chlorine

D hydrogen chloride

23 The diagram shows what happens when damp red litmus paper is placed into two different gases, X and Y.



What are gases X and Y?

	X	Y
A	ammonia	carbon dioxide
B	ammonia	chlorine
C	chlorine	ammonia
D	chlorine	carbon dioxide

24 Different aqueous solutions of halogens and halides are mixed in four beakers.

Which mixture produces a colourless solution?

A Cl_2(aq) and Cl^-(aq)

B Br_2(aq) and Br^-(aq)

C Cl_2(aq) and Br^-(aq)

D Br_2(aq) and Cl^-(aq)

25 Which change shows the presence of water?

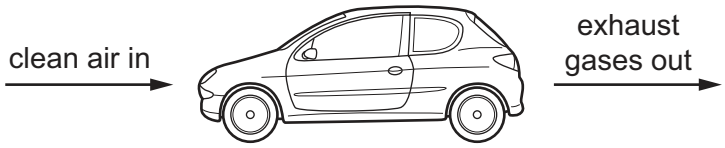
A Anhydrous copper(II) sulfate turns white.

B Anhydrous copper(II) sulfate turns pink.

C Cobalt(II) chloride paper turns pink.

D Cobalt(II) chloride paper turns blue.

26 A petrol car engine takes in clean air and lets out exhaust gases.



Which gas has a higher concentration in the exhaust gases than in clean air?

A argon

B carbon dioxide

C nitrogen

D oxygen

27 Which statement about hydrocarbons is **not** correct?

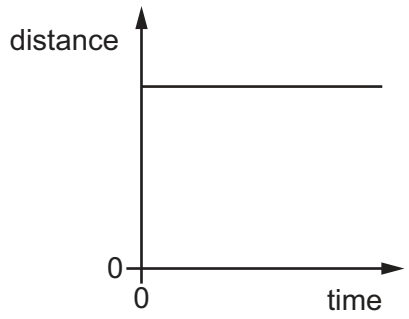
A Alkenes are made by cracking alkanes.

B Butene decolourises aqueous bromine.

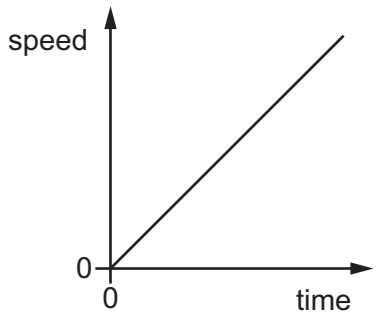
C C_2H_4 is used to make poly(ethene).

D The general formula of alkanes is C_nH_{2n}.

28 Graph 1 is a distance–time graph. Graph 2 is a speed–time graph.



graph 1



graph 2

Which of these graphs represents a car that is moving at constant speed?

A graph 1 only

B graph 2 only

C both graphs

D neither graph

29 An object has mass 1.0 kg and weight 10 N on the Earth.

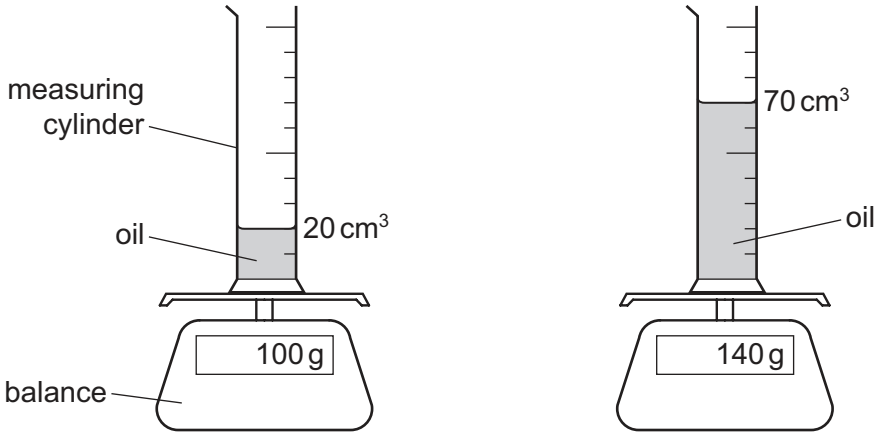
It is moved to another planet where the gravitational field strength is smaller.

What are its mass and weight now?

	mass / kg	weight / N
A	less than 1.0	less than 10
B	less than 1.0	10
C	1.0	less than 10
D	1.0	10

30 A measuring cylinder contains 20 cm^3 of oil. The measuring cylinder is placed on a balance and the reading on the balance is 100 g.

Extra oil is added to the measuring cylinder. The volume increases to 70 cm^3 and the reading on the balance increases to 140 g.



before extra oil is added after extra oil is added

What is the density of the oil?

A 0.50 g / cm^3 **B** 0.80 g / cm^3 **C** 1.25 g / cm^3 **D** 2.00 g / cm^3

31 Diagram 1 shows a load hanging on a spring.

Diagram 2 shows the load pulled down.

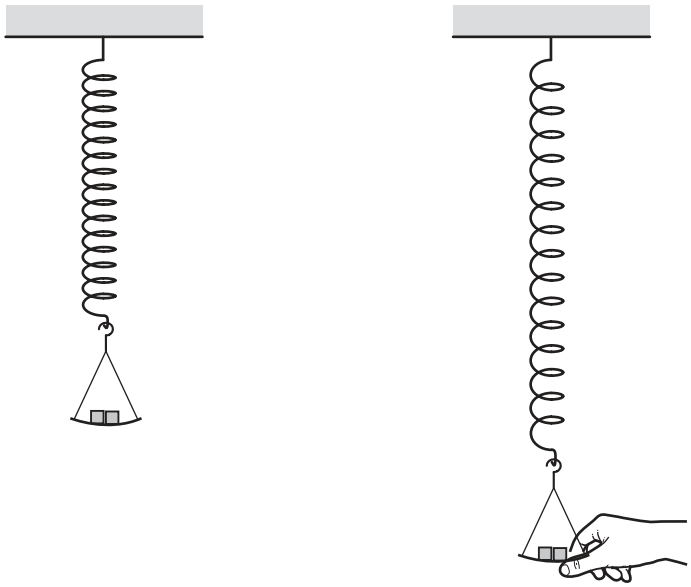


diagram 1 diagram 2

When the load is pulled down, what happens to the gravitational potential energy of the load and the elastic potential (strain) energy of the spring?

	gravitational potential energy of load	elastic potential energy of spring
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

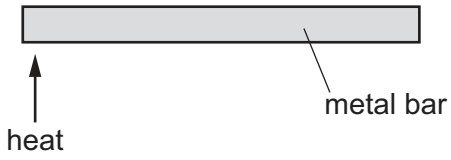
32 A load of mass 50 kg is lifted vertically by 8.0 m in 20 s.

The gravitational field strength *g* is 10 N / kg.

How much power is developed in lifting the load?

A 125 W **B** 200 W **C** 1600 W **D** 8000 W

33 A metal bar is heated at one end.



What is the main method by which thermal energy reaches the other end of the bar?

A Free electrons at the heated end gain kinetic energy and move along the bar.

B Free electrons at the heated end move apart and set up a convection current along the bar.

C Molecules at the heated end gain kinetic energy and move along the bar.

D Molecules at the heated end move apart and set up a convection current along the bar.

34 How is thermal energy transferred from the Sun to the Earth through the vacuum of space?

A by conduction, convection and radiation

B by conduction only

C by convection only

D by radiation only

35 Which waves are longitudinal?

A light waves

B microwaves

C sound waves

D X-rays

36 A thin converging lens is used as a magnifying glass.

The focal length of the lens is *f*.

Where is the object placed?

A on the opposite side of the lens to the eye and at a distance from the lens between *f* and 2*f*

B on the opposite side of the lens to the eye and at a distance from the lens less than *f*

C on the same side of the lens as the eye and at a distance from the lens between *f* and 2*f*

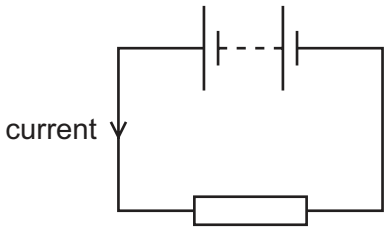
D on the same side of the lens as the eye and at a distance from the lens less than *f*

37 There is a current of 5.0 A in a resistor.

How much electric charge passes through the resistor in 30 minutes?

A 6.0 C **B** 150 C **C** 360 C **D** 9000 C

38 A battery is connected to a resistor.



Which changes to the resistance of the resistor, and to the potential difference (p.d.) across the resistor, **must** produce a smaller current?

	resistance	p.d.
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

39 A piece of wire has electrical resistance.

The wire is stretched so that it becomes longer and thinner.

What happens to its resistance?

A It could increase or decrease depending on how much it is stretched.

B It does not change because the effect of its smaller diameter cancels the effect of its greater length.

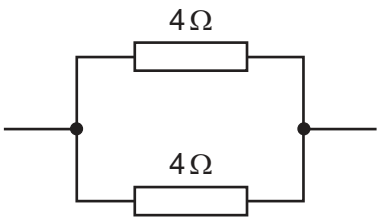
C It must decrease.

D It must increase.

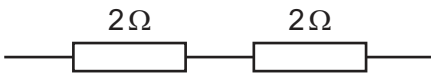
40 The diagrams show four arrangements of resistors.

Which arrangement has the **smallest** total resistance?

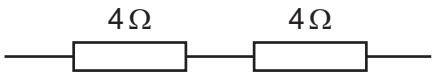
A



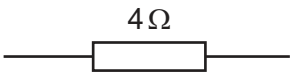
B



C



D



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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.).