Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/23**

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.

[Turn over

1 Ten woodlice were placed in a dish. Half of the dish was dark and the other half of the dish was light.

At the end of one hour, all of the woodlice had moved to the dark side of the dish.

Which characteristic of living organisms does this experiment demonstrate in woodlice?

A respiration

B excretion

C nutrition

D sensitivity

2 What is an example of osmosis?

A a dried out piece of leaf stalk swelling up when placed in a bowl of water

B carbon dioxide entering a leaf when it is photosynthesising

C red blood cells travelling to the lungs to collect oxygen

D the passage of digested food molecules through the wall of the small intestine

3 Which molecule contains carbon?

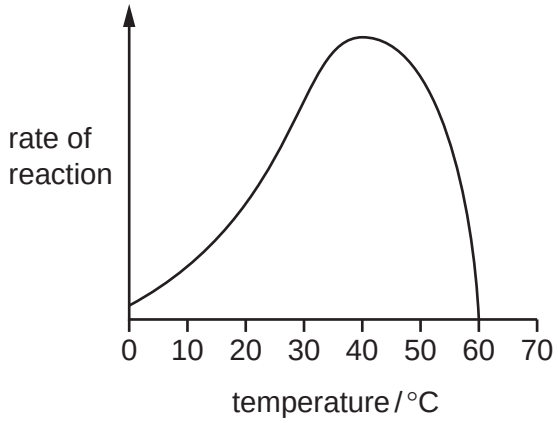
A ammonia

B fat

C sulfuric acid

D water

4 The graph shows the effect of temperature on the rate of an enzyme-controlled reaction.



Which statements are correct?

1 Enzyme molecules denature above 60 °C and below 20 °C.

2 Increasing the temperature between 10 °C and 40 °C increases kinetic energy of enzyme molecules.

3 The shape of the active site changes between 40 °C and 60 °C.

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

5 What will cause plant leaves to turn yellow?

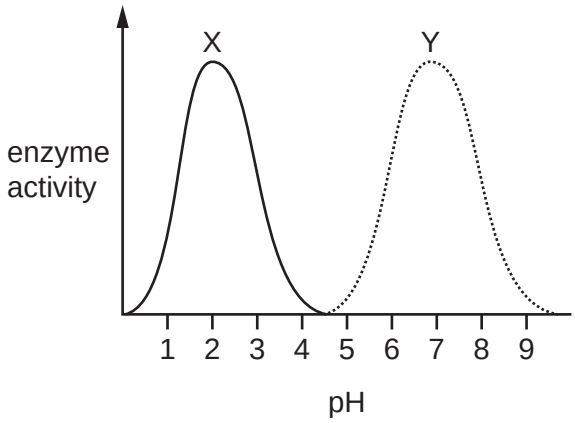
A a lack of magnesium in the soil

B a lack of starch in the leaves

C a reduction in the rate of photosynthesis

D a reduction in the rate of respiration

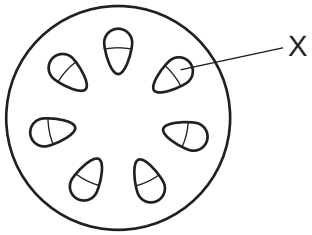
6 The diagram shows the optimum pH for two different enzymes X and Y.



Which enzyme, X or Y, could be amylase and from which organ could this amylase be secreted?

	enzyme	site of secretion
A	X	pancreas
B	X	stomach
C	Y	pancreas
D	Y	stomach

7 The diagram shows a transverse section through a plant stem.



Which tissue is X?

A mesophyll

B phloem

C epidermis

D xylem

8 A person ran up as many stairs as they could in one minute.

What would be the effect on their breathing?

	depth of breathing	rate of breathing
A	decreased	decreased
B	decreased	increased
C	increased	decreased
D	increased	increased

9 The drug atropine is used to stop the pupil narrowing when a bright light is shone into the eye.

Which statement explains how atropine stops the pupil narrowing?

A Atropine prevents circular muscles contracting.

B Atropine prevents radial muscles contracting.

C Atropine causes circular muscles to contract.

D Atropine causes radial muscles to relax.

10 In which structure is pollen made?

A anther

B ovary

C sepal

D stigma

11 Four processes which require the production of new cells are listed.

1 asexual reproduction

2 gamete production

3 growth

4 replacement of worn out cells

Which processes are brought about by mitosis?

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

12 What is an ecosystem?

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

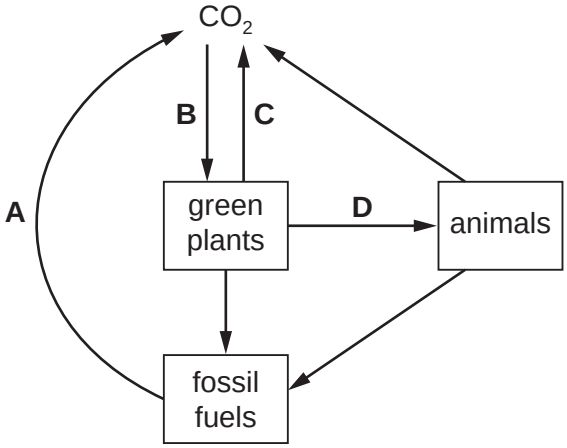
B a diagram giving the energy level of an organism in its environment

C a network of interconnected organisms

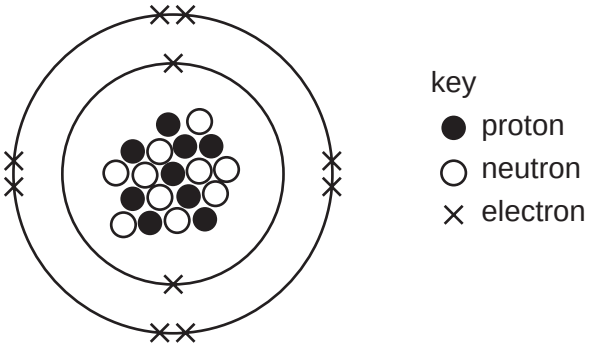
D a unit containing all of the organisms and their environment

13 The diagram shows a simplified carbon cycle.

Which labelled arrow represents respiration?



14 The protons, neutrons and electrons in a particle are shown.



Which symbol represents this particle?

A F **B** F^- **C** Ne **D** Ne^+

15 Which statements explain why graphite conducts electricity and acts as a lubricant?

1 It has many strong covalent bonds.

2 It has mobile electrons.

3 It has weak forces between sheets of carbon atoms.

4 It is a macromolecule.

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

16 Which compounds have different relative molecular masses?

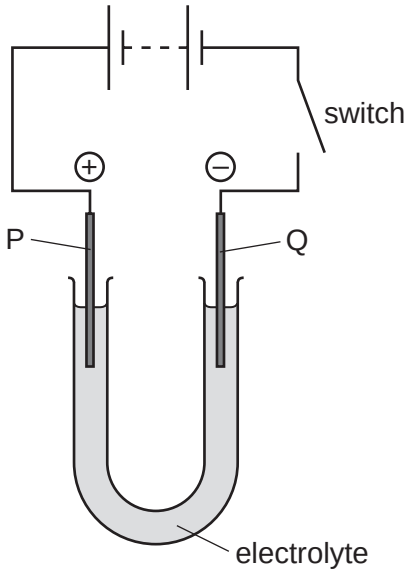
A C_2H_6 and NO

B CO_2 and N_2O

C H_2O_2 and H_2S

D NH_3 and C_2H_4

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 In experiment 1, dilute hydrochloric acid is added to an excess of solid calcium carbonate.

In experiment 2, the concentration of the acid is halved and the volume of acid used is doubled.

The same mass and size of solid calcium carbonate is used in both experiments.

Which row about the two experiments is correct?

	number of particles possessing the activation energy	frequency of reactant particle collisions
A	equal in both experiments	equal in both experiments
B	equal in both experiments	greater in experiment 1
C	greater in experiment 1	greater in experiment 1
D	greater in experiment 1	equal in both experiments

19 The ionic equation for the reaction between chlorine and potassium bromide is shown.

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

What is the oxidising agent?

A Br_2 **B** Br^- **C** Cl_2 **D** Cl^-

20 Aqueous ammonium chloride reacts with aqueous potassium hydroxide.

The equation is shown.

$$NH_4Cl + KOH \rightarrow KCl + NH_3 + H_2O$$

What is the role of the ammonium ion in this reaction?

A an acid

B a base

C an electron acceptor

D an electron donor

21 Which statement about the elements in Group I and in Group VII of the Periodic Table is correct?

A Chlorine has a darker colour than iodine.

B Each molecule of a halogen contains one atom.

C Potassium reacts with cold water more vigorously than lithium.

D The melting point of lithium is lower than the melting point of sodium.

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

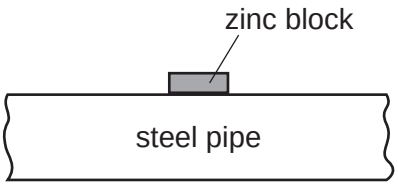
A to increase the density of the steel

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 Some cars have catalytic converters in their exhaust systems.

Some of the gases produced when petrol burns are listed.

1 carbon dioxide

2 carbon monoxide

3 oxides of nitrogen

Which gases are removed in catalytic converters?

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

25 Which equation does **not** represent a reaction in the Contact process?

A $H_2O + SO_3 \rightarrow H_2SO_4$

B $H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$

C $S + O_2 \rightarrow SO_2$

D $2SO_2 + O_2 \rightleftharpoons 2SO_3$

26 Which statements about limestone are correct?

1 Limestone is used to neutralise industrial waste products.

2 Limestone is used to treat acidic soil.

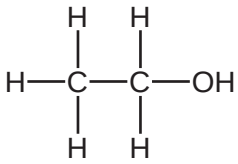
3 Thermal decomposition of limestone produces calcium oxide.

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

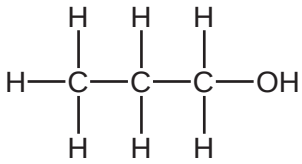
27 Four molecules are shown.

Which structure represents ethanol?

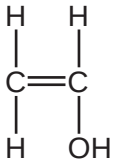
A



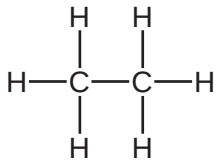
B



C



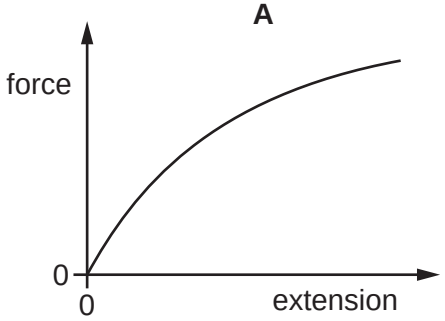
D



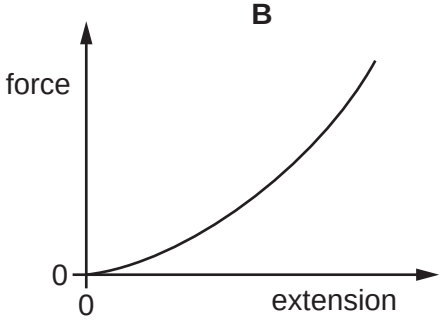
28 Four force–extension graphs are shown.

Which graph represents a spring that obeys Hooke's Law?

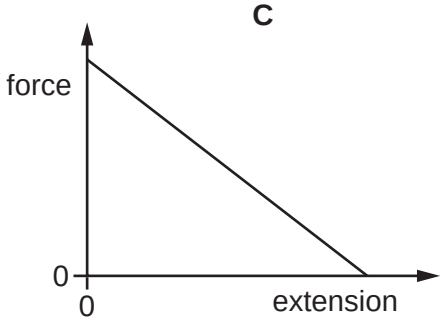
A



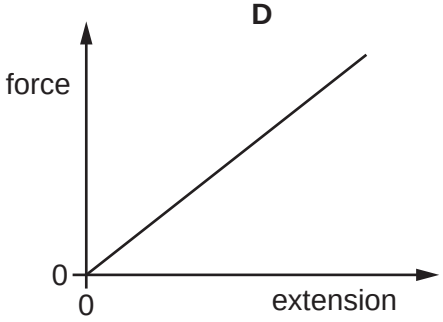
B



C



D



29 When driving cars on soft sand, drivers are advised to reduce the pressure of the air in the tyres.

Why does this cause the cars to sink less into the sand?

A The area of the tyres in contact with the sand is decreased.

B The area of the tyres in contact with the sand is increased.

C The downward force on the sand is decreased.

D The downward force on the sand is increased.

30 A ball of mass 0.25 kg is thrown from the ground to a height of 5.0 m.

The gravitational field strength g is 10 N / kg.

Which expression gives the increase in gravitational potential energy of the ball?

A $[(0.25 \times 10) + 5.0]$ J

B $[0.25 \times 10 \times 5.0]$ J

C $\left[\frac{5.0}{(0.25 \times 10)}\right]$ J

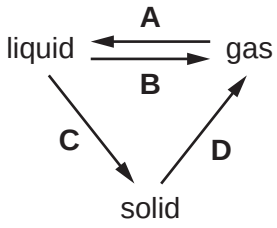
D $[(5.0 + 0.25) \times 10]$ J

31 A lamp produces 760 J of wasted energy for every 1000 J of electrical energy supplied to it.

What is the efficiency of the lamp?

A 0.24% **B** 0.76% **C** 24% **D** 76%

32 Which labelled arrow on the diagram represents condensation?

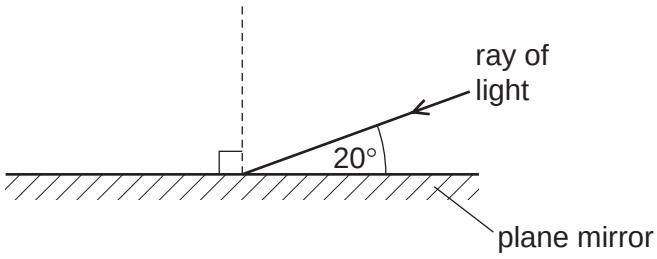


33 Thermal energy can be transferred through a solid metal by conduction.

Which row describes how the molecules and free electrons in a solid metal behave during this process?

	molecules	free electrons
A	move throughout the solid	move throughout the solid
B	move throughout the solid	vibrate about fixed positions
C	vibrate about fixed positions	move throughout the solid
D	vibrate about fixed positions	vibrate about fixed positions

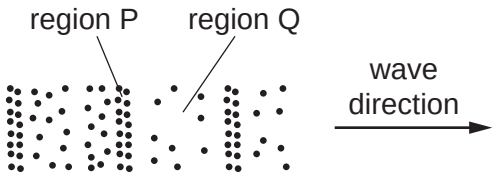
34 The diagram shows a ray of light striking a plane mirror.



What is the angle of reflection?

A 20° **B** 40° **C** 70° **D** 90°

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

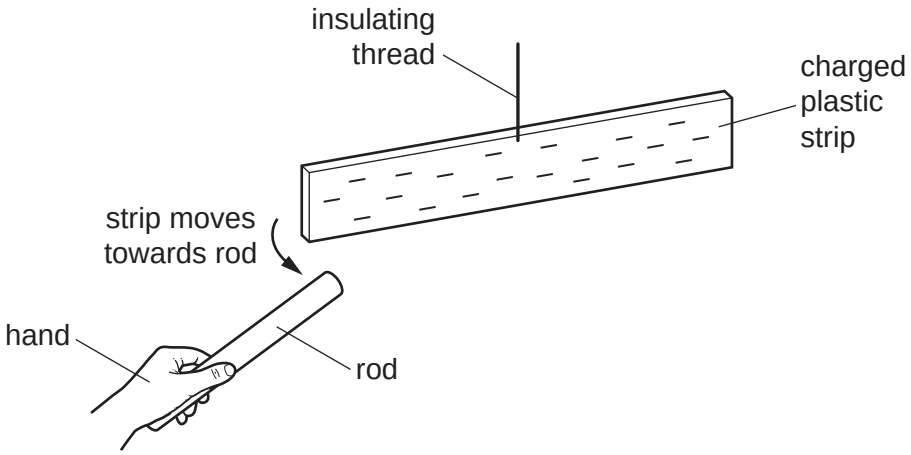


Which type of wave is represented, and in which direction do the molecules vibrate?

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

36 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.

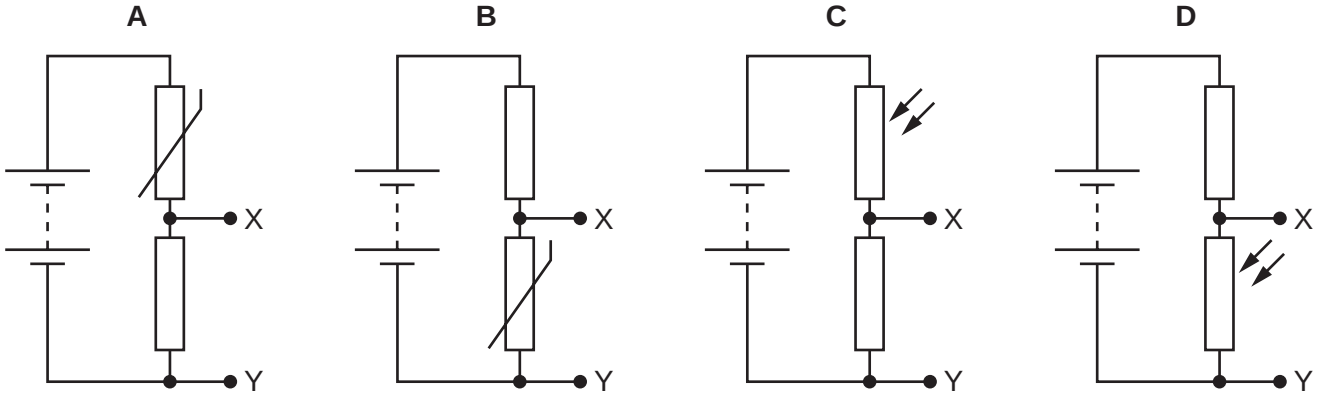
C The rod is a positively charged electrical conductor.

D The rod is a positively charged electrical insulator.

37 The diagrams show four circuits, each with two points X and Y labelled.

Two circuits include an NTC thermistor and two circuits include an LDR.

Which circuit produces a potential difference (p.d.) between points X and Y that increases as the temperature increases?



38 A hairdryer is protected by a 10 A fuse.

What is the purpose of the fuse?

A It decreases the current in the hairdryer to 10 A when the current is more than 10 A.

B It increases the current in the hairdryer to 10 A when the current is less than 10 A.

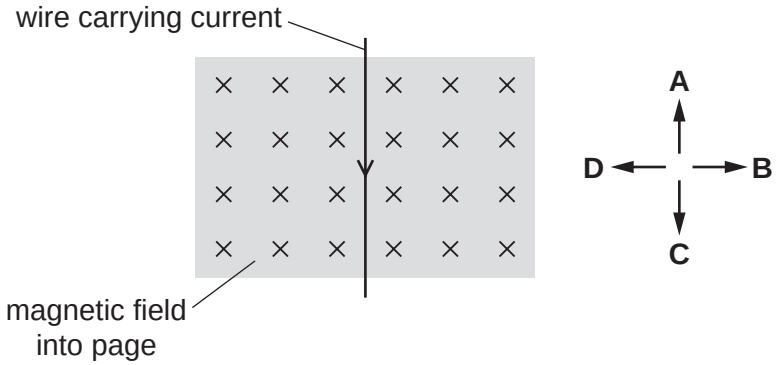
C It maintains a constant temperature in the hairdryer.

D It melts when the current in the hairdryer is greater than 10 A.

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 A uranium nucleus decays by emitting an α-particle. The nuclide equation shows this decay.

$$^{X}_{92}\text{U} \rightarrow {}^{234}_{Y}\text{Th} + \alpha\text{-particle}$$

What are the numbers *X* and *Y*?

	X	*Y*
A	234	90
B	234	92
C	238	90
D	238	92

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.).