Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/22**

Paper 2 Multiple Choice (Extended) **October/November 2024**

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)

0058083261

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. Any blank pages are indicated.

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1 Auxin is a chemical that is produced in shoot tips.

With which characteristics of living things is auxin involved?

	growth	movement	sensitivity
A	✓	✗	✓
B	✓	✗	✗
C	✗	✓	✓
D	✗	✓	✗

2 Which statement about the named cells is correct?

A Palisade mesophyll cells have many chloroplasts.

B Red blood cells have a haploid nucleus.

C Root hair cells have many chloroplasts.

D Sperm cells have a diploid nucleus.

3 Which large molecule is made from many smaller glucose molecules?

A amino acid

B glycerol

C glycogen

D protein

4 Some bacteria live in acidic, hot springs.

What are the optimum conditions for the enzymes of these bacteria?

A 20 °C and pH 4

B 20 °C and pH 9

C 80 °C and pH 4

D 80 °C and pH 9

5 Which statement about the process of photosynthesis is correct?

A Chlorophyll produces chemical energy for the synthesis of carbohydrates.

B Chlorophyll produces light energy for the synthesis of carbohydrates.

C Chlorophyll transfers chemical energy to light energy for the synthesis of carbohydrates.

D Chlorophyll transfers light energy to chemical energy for the synthesis of carbohydrates.

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6 Protein shakes are used by athletes to supplement their diet. They are a drink made by dissolving protein powders in water or milk.

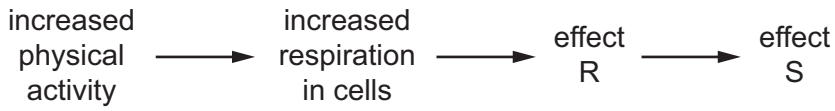
Which types of digestion will be required before they can be absorbed?

	chemical digestion	mechanical digestion
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

7 Which component of blood is matched to its function?

	component	function
A	plasma	clot blood
B	platelets	transport oxygen
C	red blood cells	transport hormones
D	white blood cells	phagocytosis

8 Changes in the body occur as a result of increased physical activity.

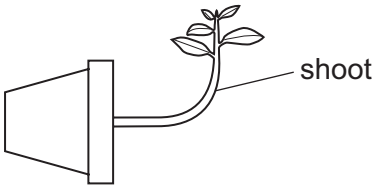


What are effects R and S?

	effect R	effect S
A	decrease in blood carbon dioxide	decrease in breathing rate
B	decrease in blood lactic acid	increase in breathing rate
C	increase in blood carbon dioxide	increase in breathing rate
D	increase in blood lactic acid	decrease in breathing rate

9 A plant was placed horizontally in complete darkness.

The diagram shows how the plant had grown after one week.



Which response has the shoot made?

A gravitropism away from gravity

B gravitropism towards gravity

C phototropism away from light

D phototropism towards light

10 What processes occur in the oviduct?

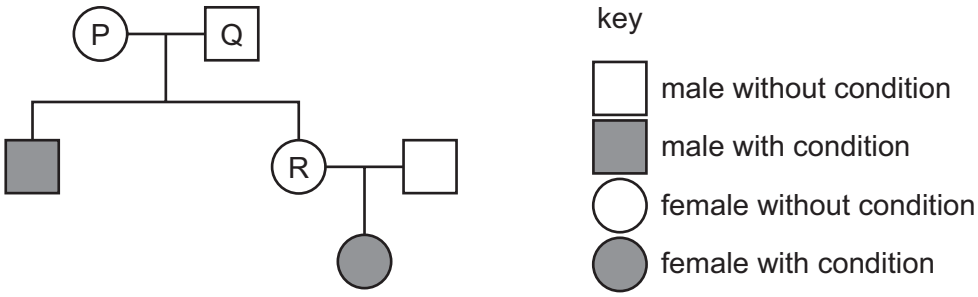
A fertilisation and then the zygote undergoes meiosis

B fertilisation and then the zygote undergoes mitosis

C zygote undergoes meiosis and then fertilisation occurs

D zygote undergoes mitosis and then fertilisation occurs

11 The pedigree diagram shows the inheritance of a recessive condition.



Which statements are correct with reference to this condition?

1 P and Q are both heterozygous for the condition.

2 Q and R have different genotypes.

3 P and R have the same genotype.

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

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12 What is a description of a trophic level?

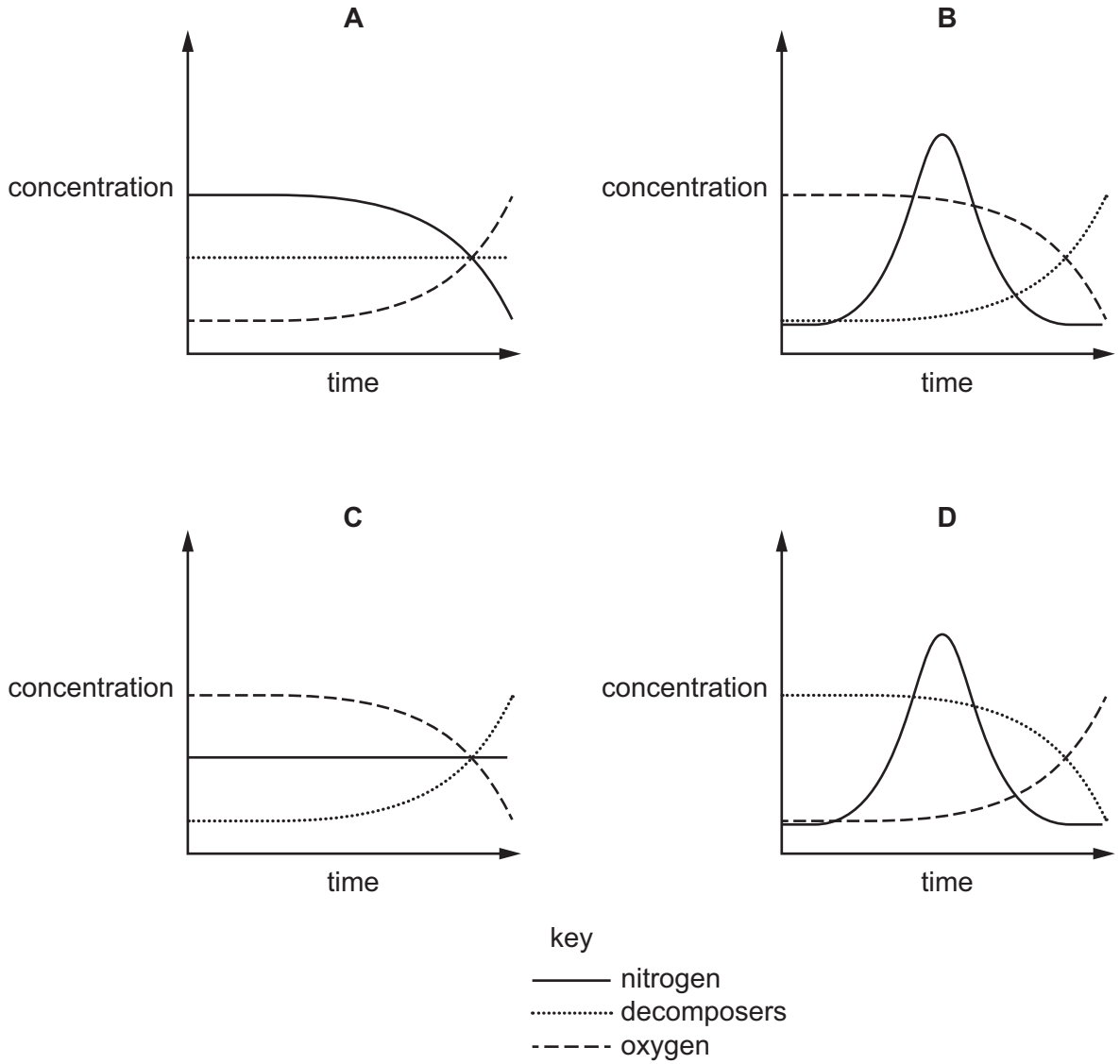
A the ability of an organism to make its own food through photosynthesis

B the death of organisms due to increased availability of nitrates

C the interaction of an organism with its environment

D the position of an organism in a food chain

13 Which graph represents a pollution incident in a lake causing eutrophication?



14 The bonding in potassium iodide is ionic.

Which row describes the potassium iodide lattice structure?

	positive ions	negative ions	attractive force between ions
A	iodide	potassium	strong
B	iodide	potassium	weak
C	potassium	iodide	strong
D	potassium	iodide	weak

15 What is the definition of the *relative atomic mass*, A_r, of an element?

A the average mass of atoms of the element on a scale in which an atom of ^{12}C has a mass of exactly 12 units

B the average mass of atoms of the element on a scale in which an atom of ^{1}H has a mass of exactly 1 unit

C the average mass of atoms of the element on a scale in which an atom of ^{12}C has a mass of exactly 1 unit

D the mass in grams of one mole of atoms of the element

16 Which statements about the electrolysis of aqueous copper(II) sulfate are correct?

1 Oxygen is produced at the anode when carbon electrodes are used.

2 Copper is produced at the cathode when copper electrodes are used.

3 Hydrogen is produced at the cathode when carbon electrodes are used.

4 Electrolysis does not occur when inert electrodes are used.

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

17 What describes an endothermic reaction?

A a reaction in which all the bonds in all the reactants are broken

B a reaction in which energy is released to the surroundings

C a reaction which goes to completion

D a reaction in which energy is taken in from the surroundings

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18 The rate of a reaction that produces carbon dioxide gas is investigated.

Which piece of apparatus gives the **least** accurate measurement for the gas production?

A burette

B gas syringe

C measuring cylinder

D 3-decimal-place digital balance

19 What happens when an acid reacts with an alkali?

A Neutralisation takes place and the temperature falls.

B Neutralisation takes place and the temperature rises.

C Reduction takes place and the temperature falls.

D Reduction takes place and the temperature rises.

20 A student tests an aqueous solution for the presence of sulfate ions.

What is the test and observation for sulfate ions?

A Acidify the solution and add aqueous barium ions to produce a white precipitate.

B Acidify the solution and add aqueous silver ions to produce a cream precipitate.

C Add aqueous iron(III) ions to produce a brown precipitate.

D Add aqueous copper(II) ions to produce a pale blue precipitate.

21 Elements in Group VI share similar chemical and physical trends as elements in Group VII.

Which statement about the elements of Group VI is correct?

A Atoms of Group VI elements form cations when they react with sodium.

B Sulfur has a lower boiling point than tellurium.

C Selenium displaces sulfur from metal sulfides.

D The elements become lighter in colour as Group VI is descended.

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22 The reactions of four different metals W, X, Y and Z with aqueous solutions of their ions are listed.

- W reacts with aqueous ions of X and of Z but not with aqueous ions of Y.
- X does not react with aqueous ions of W, Y or Z.
- Y reacts with aqueous ions of W, X and Z.
- Z reacts with aqueous ions of X but not with aqueous ions of Y or W.

Which row shows the tendency of the metals to form positive ions?

	least tendency →			greatest tendency
A	X	W	Z	Y
B	X	Z	W	Y
C	Y	W	Z	X
D	Y	Z	W	X

23 A sample of air is analysed before and after it is used in an experiment.

The percentage composition of the air before and after the experiment is recorded.

	nitrogen	oxygen	carbon dioxide	other gases
before	78	21	0.04	small amount
after	78	17	4	small amount

Which process does **not** produce this change in the composition of the air?

A combustion of coal

B combustion of natural gas

C combustion of sulfur

D respiration

24 What is the catalyst used in the Contact process?

A yeast

B iron

C nickel

D vanadium(V) oxide

25 What is the word equation for the manufacture of lime?

A calcium carbonate → calcium hydroxide + carbon dioxide

B calcium carbonate → calcium oxide + carbon dioxide

C calcium sulfate → calcium hydroxide + sulfur dioxide

D calcium sulfate → calcium oxide + sulfur dioxide

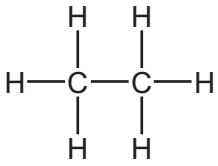
26 Petroleum is separated into useful fractions by fractional distillation.

Which row shows the uses of the named fractions?

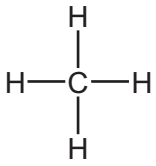
	gasoline	naphtha	bitumen
A	fuel for cars	feedstock for making chemicals	fuel for cooking
B	fuel for cooking	fuel for heating	fuel for diesel engines
C	feedstock for making chemicals	fuel for heating	road surfaces
D	fuel for cars	feedstock for making chemicals	road surfaces

27 Which substance decolourises aqueous bromine?

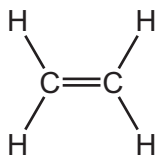
A



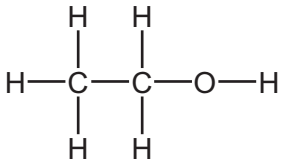
B



C



D



28 The weight of a man on the Earth is 600 N, where the gravitational field strength is 10 N / kg.

The gravitational field strength on the Moon is 1.6 N / kg.

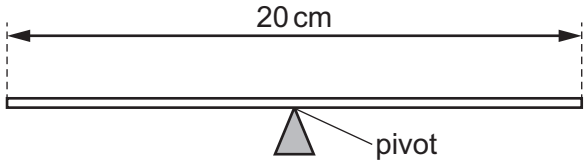
What is the weight of the man on the Moon?

A 60 N **B** 96 N **C** 600 N **D** 960 N

29 A uniform beam of length 20 cm is balanced on a pivot at its centre.

A 20 N load is placed at one end of the beam and a 30 N load is placed at the other end.

A 25 N load is also placed on the beam to balance it.



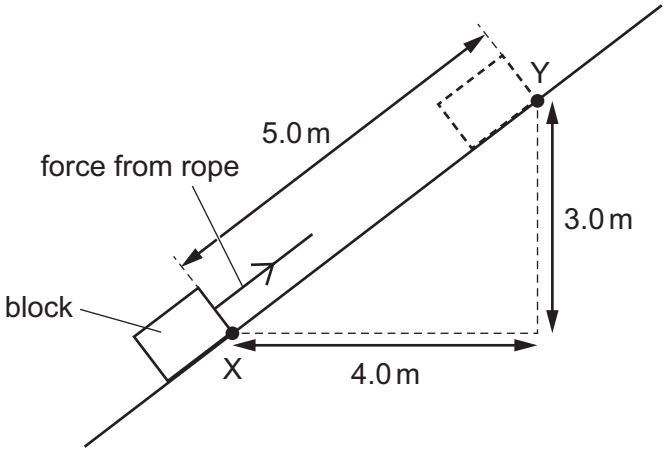
How far from the pivot is the 25 N load placed?

A 4.0 cm **B** 5.0 cm **C** 8.0 cm **D** 10 cm

30 A rope is used to pull a block of mass 25 kg up a slope from point X to point Y.

Three distances are shown on the diagram.

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



What is the increase in gravitational potential energy of the block?

A 125 J **B** 750 J **C** 1000 J **D** 1250 J

31 A liquid starts to evaporate.

Which molecules escape and what happens to the temperature of the remaining liquid?

	molecules that escape	temperature of remaining liquid
A	less-energetic	decreases
B	less-energetic	increases
C	more-energetic	decreases
D	more-energetic	increases

32 Water in a metal pan is heated on a gas burner.

What are the main methods by which heat is transferred through the metal pan to the water and throughout the water?

A conduction through the metal pan and convection in the water

B convection through the metal pan and conduction in the water

C convection through the metal pan and radiation in the water

D radiation through the metal pan and conduction in the water

33 The critical angle of water is 49°.

A ray of light from the bottom of a swimming pool has an angle of incidence of 50° at the surface of the water.

What happens to the ray of light?

A It is all refracted with an angle of refraction of 49°.

B It is partly reflected and partly refracted.

C It is totally internally reflected with an angle of reflection of 50°.

D It travels along the surface of the water.

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34 Humans can hear sounds with a range of frequencies.

Which row shows the smallest frequency and the greatest frequency that can be heard by a healthy human ear?

	smallest frequency / Hz	greatest frequency / Hz
A	20	2 000
B	20	20 000
C	200	2 000
D	200	20 000

35 A plastic rod is rubbed with a cloth.

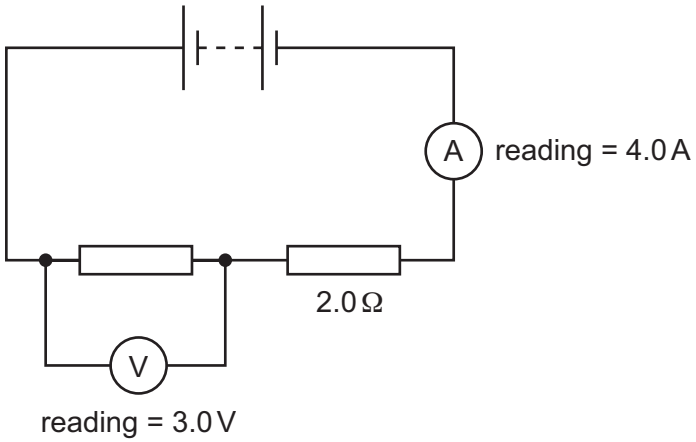
The rod becomes positively charged.

What happens to the rod and what happens to the cloth?

	rod	cloth
A	electrons are removed	electrons are added
B	electrons are removed	protons are removed
C	protons are added	electrons are added
D	protons are added	protons are removed

36 The circuit shown contains a battery, two resistors, a voltmeter and an ammeter.

One of the resistors has a resistance of 2.0 Ω. The reading on each meter is shown.



What is the potential difference (p.d.) across the battery?

A 3.0 V **B** 6.0 V **C** 8.0 V **D** 11 V

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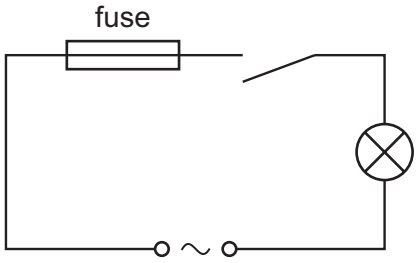
37 A heating element in an electric kettle has a resistance of 24 Ω.

When the kettle is connected to a 240 V supply, it takes 2.5 minutes to boil some water.

How much energy is used to boil the water?

A 16 J **B** 960 J **C** 6000 J **D** 360 000 J

38 A student connects the circuit shown.



When the switch is closed, the fuse blows and stops the current.

What is a possible reason for this?

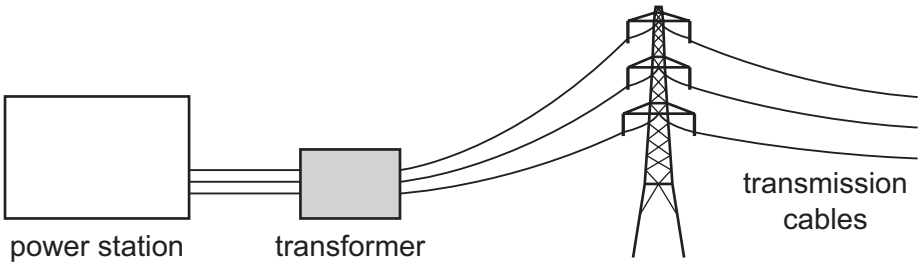
A The current rating of the fuse is too high.

B The current is too large.

C The lamp is too dim.

D The voltage is too small.

39 Electrical energy from a power station is transmitted over a large distance. A 100% efficient transformer is used near to the power station. This transformer reduces the energy that is wasted thermally in the transmission cables.



How does the transformer reduce the energy that is wasted?

A It decreases the power transmitted so the current and the voltage are both larger.

B It decreases the power transmitted so the current and the voltage are both smaller.

C It increases the current so the voltage is smaller.

D It increases the voltage so the current is smaller.

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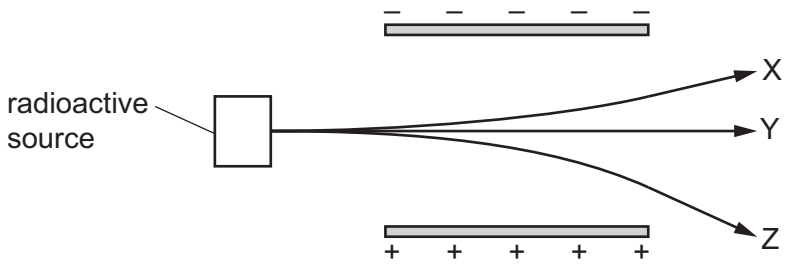
40 The diagram shows a radioactive source emitting three types of ionising radiation, X, Y and Z.

The radiation passes through an electric field between two metal plates, as shown.



Which row identifies the three types of radiation?

	X	Y	Z
A	alpha	gamma	beta
B	beta	gamma	alpha
C	gamma	alpha	beta
D	gamma	beta	alpha

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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 –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

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.).