Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

CO-ORDINATED SCIENCES **0973/21**

Paper 2 Multiple Choice (Extended) **October/November 2023**

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.

1 Which characteristic of a living organism releases energy for growth?

A excretion

B reproduction

C respiration

D sensitivity

2 When a plant cell is put into a solution that has a lower water potential than the cell, the cytoplasm can pull away from the cell wall.

What is the term for this?

A flaccid

B plasmolysis

C turgid

D turgor pressure

3 Which colour does Benedict's solution change to when heated with a reducing sugar?

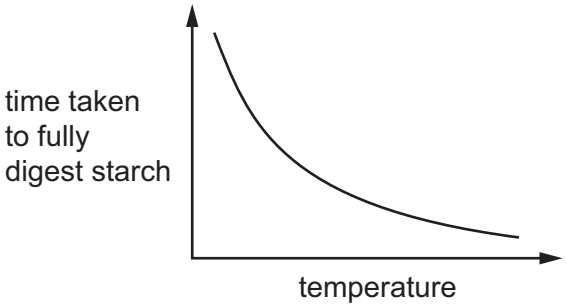
A blue

B blue-black

C orange

D purple

4 The graph shows the effect of increasing temperature on the time taken for amylase to fully digest a sample of starch.



Which statements are correct?

1 As the temperature increases, the kinetic energy of the amylase and starch molecules increases.

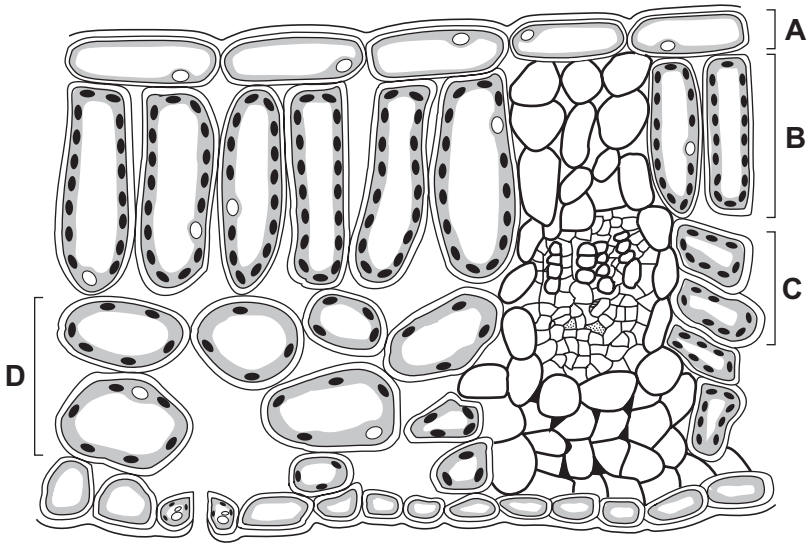
2 The time taken to fully digest the starch decreases as temperature increases because there are more frequent collisions between starch and amylase molecules.

3 The time taken to fully digest the starch decreases as temperature increases because the shape of the amylase changes as it denatures.

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

5 The diagram shows a cross-section through a leaf.

Which tissue is adapted for gas exchange?



6 Pancreatic insufficiency is a condition that occurs when the pancreas is unable to produce enough enzymes.

Which secretions are reduced due to this condition?

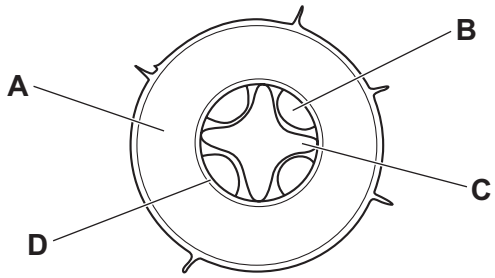
A amylase, lipase and protease

B amylase, lipase and bile

C amylase, insulin and protease

D glucagon, insulin and protease

7 Which label shows the position of the xylem in the cross-section of the root of a dicotyledonous plant?



8 Aerobic respiration releases energy from nutrient molecules.

One molecule of glucose requires .....1..... molecules of oxygen. The reaction releases .....2..... molecules of carbon dioxide and .....3..... molecules of water.

Which row completes gaps 1, 2 and 3?

	1	2	3
A	six	two	two
B	two	six	six
C	two	two	two
D	six	six	six

9 During an experiment, auxin is applied to one side of a shoot just behind the tip.

What will this stimulate?

A decreased cell elongation in all cells

B decreased cell elongation on the side with extra auxin

C increased cell elongation in all cells

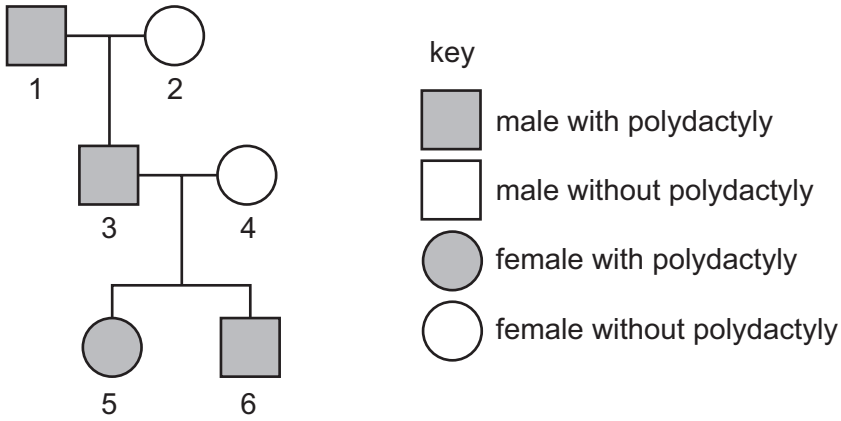
D increased cell elongation on the side with extra auxin

10 Which part of the male reproductive system is correctly matched to its function?

	part	function
A	prostate gland	transfers sperm to the urethra
B	scrotum	holds the testes outside of body
C	testes	secrete fluids for sperm to swim in
D	urethra	transfers semen to ovary

11 Cats with polydactyly have an extra digit on their paw. The allele for polydactyly, P, is dominant to the allele for having five digits, p.

The pedigree diagram shows a family of cats where polydactyly is present.



What is the probability that the next kitten from the mating of 3 and 4 has five digits?

A 0.00 **B** 0.25 **C** 0.50 **D** 0.75

12 Four processes that occur in mammals are listed.

1 muscle contraction

2 cell division

3 excretion

4 maintenance of a constant body temperature

Which processes reduce the amount of energy available to the next trophic level?

A 1, 2, 3 and 4

B 1 and 2 only

C 1, 3 and 4 only

D 4 only

13 Forests are cut down and burnt in deforestation programmes.

As a result of this, which gas in the atmosphere increases in concentration?

A carbon dioxide

B hydrogen

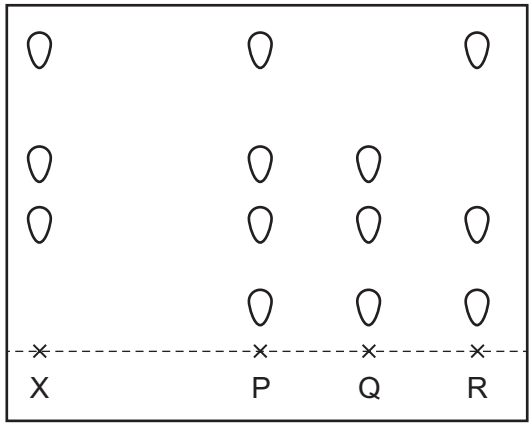
C nitrogen

D oxygen

14 Dye X is a mixture of different coloured substances.

Chromatography is used to compare X with three other mixtures, P, Q and R.

The results are shown.



Which mixtures contain dye X?

A P, Q and R **B** P and Q only **C** P only **D** R only

15 What do the chemical symbols N_2 and Ni represent?

	N_2	Ni
A	a compound	a compound
B	a compound	an element
C	an element	a compound
D	an element	an element

16 The nucleon number of a hydrogen atom is 1.

What is present inside the nucleus of this atom?

A one proton and one electron

B one proton and one neutron

C one proton only

D one neutron only

17 When magnesium carbonate reacts with dilute hydrochloric acid, carbon dioxide gas is released.

The equation for this reaction is shown.

$$MgCO_3 + 2HCl \rightarrow MgCl_2 + CO_2 + H_2O$$

Which volume of carbon dioxide, collected at room temperature and pressure, is released when 4.2 g of magnesium carbonate reacts with excess dilute hydrochloric acid?

A 1.2 dm^3 **B** 2.4 dm^3 **C** 4.8 dm^3 **D** 12 dm^3

18 The temperature of solution Q is 21 °C. The temperature of solution P is 24 °C.

The two solutions are mixed. The temperature of the mixture is 31 °C.

Which statement is correct?

A An endothermic reaction occurs and the reacting chemicals gain energy.

B An endothermic reaction occurs and the reacting chemicals lose energy.

C An exothermic reaction occurs and the reacting chemicals gain energy.

D An exothermic reaction occurs and the reacting chemicals lose energy.

19 The rate of reaction between calcium carbonate and dilute hydrochloric acid is determined either by measuring the change in gas volume per unit time or by measuring the change in mass per unit time.

Which piece of apparatus must be used for **both** methods?

A a balance

B a gas syringe

C a stop-clock

D a thermometer

20 The ionic equation for the reaction between iron(II) chloride and chlorine is shown.

$$2Fe^{2+} + Cl_2 \rightarrow 2Fe^{3+} + 2Cl^-$$

Which row shows the substance that is reduced and the oxidising agent?

	substance reduced	oxidising agent
A	Cl_2	Cl_2
B	Cl_2	Fe^{2+}
C	Fe^{2+}	Cl_2
D	Fe^{2+}	Fe^{2+}

21 Substance X is mixed with aqueous sodium hydroxide.

A green precipitate is produced.

Which metal ion is present in X?

A Cu^{2+} **B** Fe^{2+} **C** Fe^{3+} **D** Zn^{2+}

22 Potassium is in Group I of the Periodic Table.

Which statement about potassium is correct?

A It is a relatively hard metal.

B It is less dense than lithium.

C It has a higher melting point than sodium.

D It reacts more vigorously with water than sodium.

23 What is a use for argon?

A as a catalyst

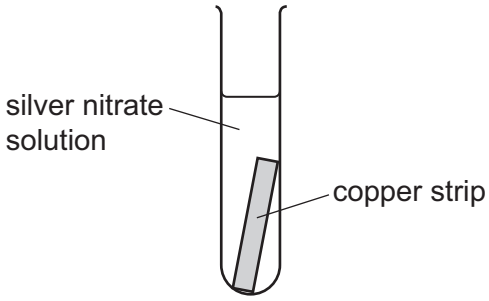
B in alloys

C in lamps

D neutralising chemical waste

24 Silver oxide is reduced by heating with carbon more easily than copper oxide is reduced by heating with carbon.

A copper strip is placed into a solution of silver nitrate as shown.



Which row describes the reaction?

	the colourless solution slowly turns blue	the copper strip slowly dissolves	a silver-grey metal is formed
A	✗	✗	✗
B	✓	✓	✓
C	✓	✗	✓
D	✗	✓	✗

25 Catalytic converters are fitted to cars to remove some gases from exhaust emissions.

Which gases are released by catalytic converters?

A carbon dioxide and nitrogen

B carbon dioxide and nitrogen monoxide

C carbon monoxide and nitrogen

D carbon monoxide and nitrogen monoxide

26 Sulfuric acid is manufactured by the Contact process.

One of the reactions in this process converts sulfur dioxide to sulfur trioxide.

Which statements about the conditions for this reaction are correct?

1 A nickel catalyst is used.

2 A pressure of about 1–2 atmospheres is used.

3 A temperature of about 450 °C is used.

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

27 Which statements about monomers and polymers are correct?

1 Different polymers can have different linkages between monomers.

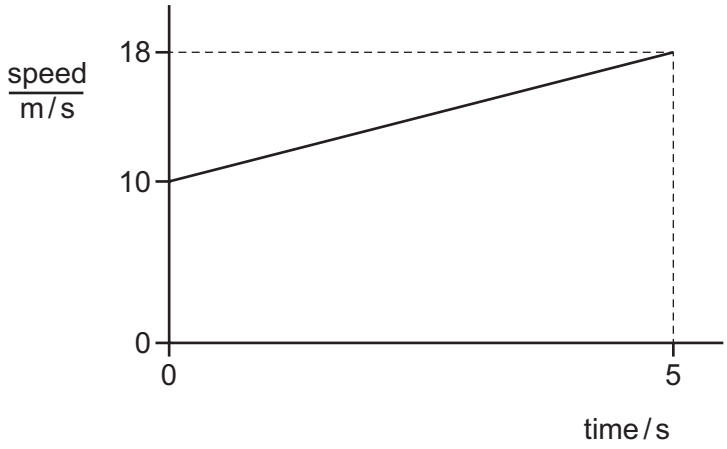
2 An addition polymerisation reaction produces more than one type of polymer.

3 Addition polymers are made from saturated monomer molecules.

4 Nylon is a condensation polymer formed from two different monomers.

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

28 The speed–time graph represents part of a car journey.



How far does the car travel in the part of the journey shown?

A 20 m **B** 45 m **C** 70 m **D** 90 m

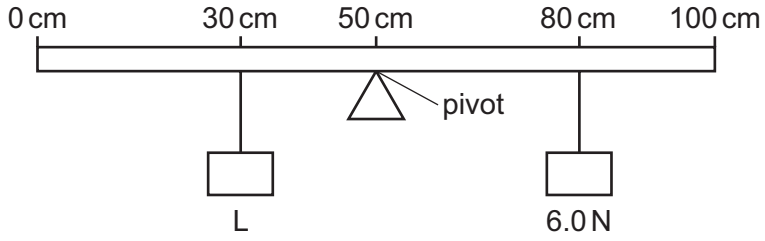
29 A rocket has a mass of 300 kg. Its motors produce a force of 12 000 N vertically upwards.

The acceleration of free fall g is 10 m/s^2.

What is the resultant force on the rocket and what is the acceleration of the rocket?

	resultant force / N	acceleration / m/s^2
A	9 000	30
B	9 000	2.7×10^6
C	15 000	50
D	15 000	4.5×10^6

30 A uniform metre rule rests on a pivot at the 50 cm mark. A load L is placed at the 30 cm mark and a load of 6.0 N is placed at the 80 cm mark. The arrangement is balanced.



What is the weight of load L?

A 6.0 N **B** 9.0 N **C** 16 N **D** 24 N

31 A hydroelectric energy storage scheme stores energy by pumping water up a mountain into a lake behind a dam.

In 1.0 s, 10 000 kg of water is pumped into the lake and gains a height of 150 m. The efficiency of this process is 60%.

Gravitational field strength = 10 N / kg.

What is the energy input in 1.0 s?

A 9.0×10^5 J **B** 2.5×10^6 J **C** 9.0×10^6 J **D** 2.5×10^7 J

32 What is a thermocouple used to measure?

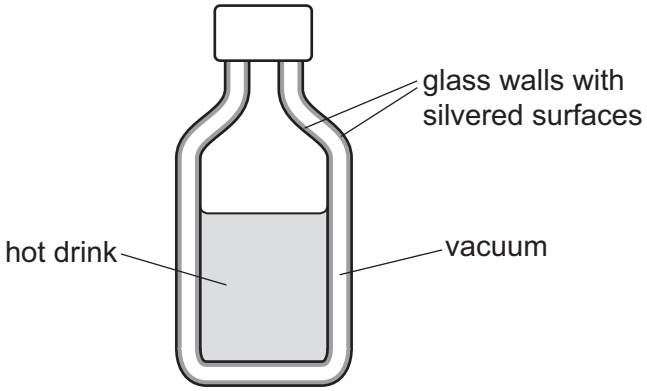
A expansion

B pressure

C resistance

D temperature

33 A vacuum flask uses a vacuum between two shiny surfaces to keep a drink hot for a long time.



How do the vacuum and the shiny surfaces help to keep the drink hot?

	vacuum	shiny surfaces
A	prevents conduction and convection	reduce conduction and radiation
B	prevents conduction and convection	reduce radiation only
C	prevents radiation	reduce conduction and convection
D	prevents radiation	reduce convection only

34 When light passes from air into glass its speed decreases but its frequency remains constant.

Light travelling in air enters a glass block at an angle of incidence that is greater than 0°.

Which row describes what happens to the direction and what happens to the wavelength of the light?

	direction	wavelength
A	moves away from the normal	decreases
B	moves away from the normal	increases
C	moves towards the normal	decreases
D	moves towards the normal	increases

35 Which change to a sound wave makes the sound louder?

A decreasing the amplitude

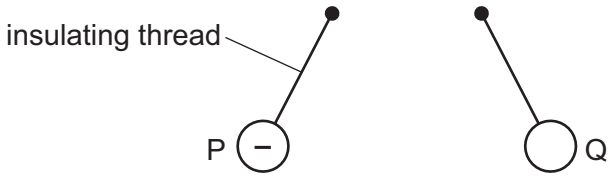
B decreasing the wavelength

C increasing the amplitude

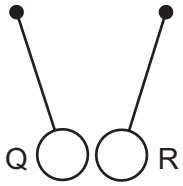
D increasing the wavelength

36 Three charged balls P, Q and R are suspended by insulating threads. Ball P is negatively charged.

Ball Q is brought close to ball P. The balls move away from each other.



Ball Q is now brought close to ball R. The balls move closer to each other.

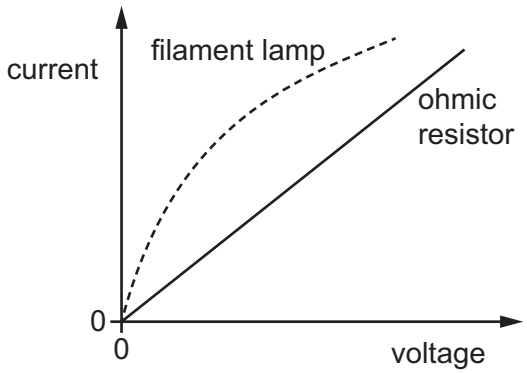


What are the signs of the charges on ball Q and ball R?

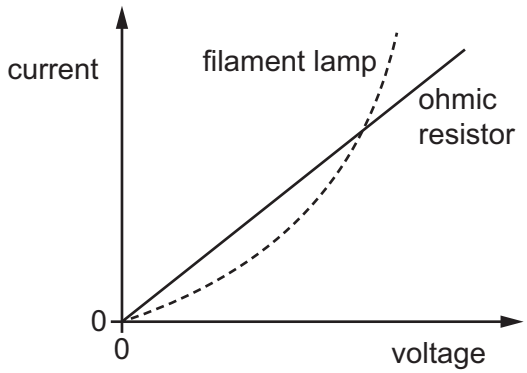
	ball Q	ball R
A	negative	negative
B	negative	positive
C	positive	negative
D	positive	positive

37 Which graph shows the current–voltage characteristics of an ohmic resistor and a filament lamp?

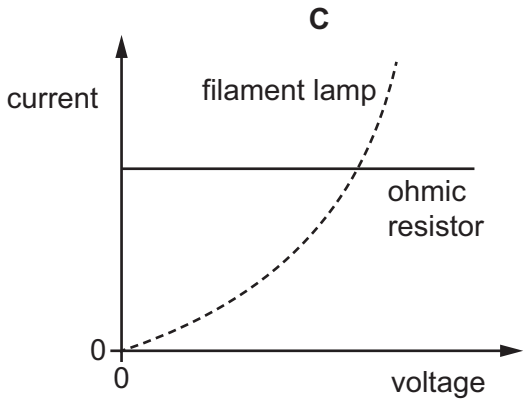
A



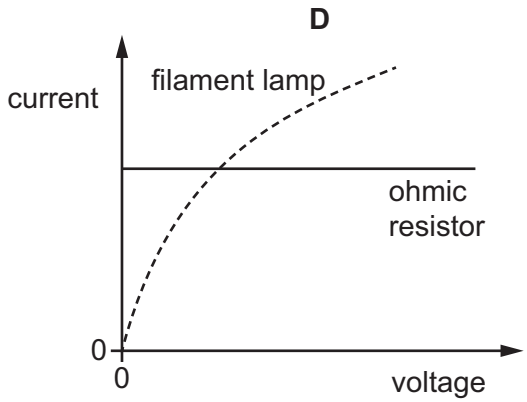
B



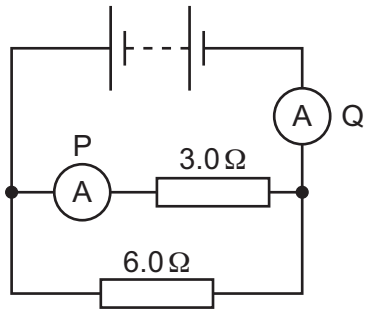
C



D



38 A battery is connected in a circuit to a 3.0 Ω resistor, a 6.0 Ω resistor and two ammeters P and Q.



What is the combined resistance of the two resistors and which ammeter has the greater reading?

	combined resistance / Ω	ammeter with greater reading
A	less than 3.0	P
B	less than 3.0	Q
C	9.0	P
D	9.0	Q

39 The current in an electric kettle used to boil water is 9.0 A.

What is the most appropriate rating of fuse to use with this kettle?

A 1 A **B** 3 A **C** 8 A **D** 13 A

40 Three types of ionising radiation enter a magnetic field at right angles to the field.

Which types of radiation are deflected?

A α and β only **B** α and γ only **C** β and γ only **D** α, β and γ

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.).