



COMBINED SCIENCE

5129/12

Paper 1 Multiple Choice

October/November 2016

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)



READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE IN ANY BARCODES.

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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

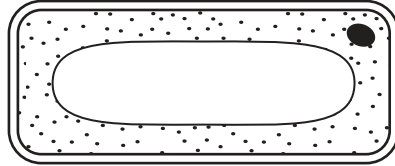
Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

Electronic calculators may be used.

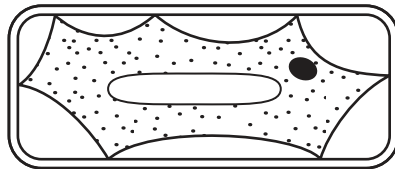
This document consists of **16** printed pages.

- 1 Which sentence about red blood cells is correct?
- A They transport carbon dioxide and contain chlorophyll.
 - B They transport carbon dioxide and contain haemoglobin.
 - C They transport oxygen and contain chlorophyll.
 - D They transport oxygen and contain haemoglobin.
- 2 The first diagram shows an onion cell in pure water.



onion cell in pure water

The cell is now placed in a concentrated sugar solution. The second diagram shows it after one hour.

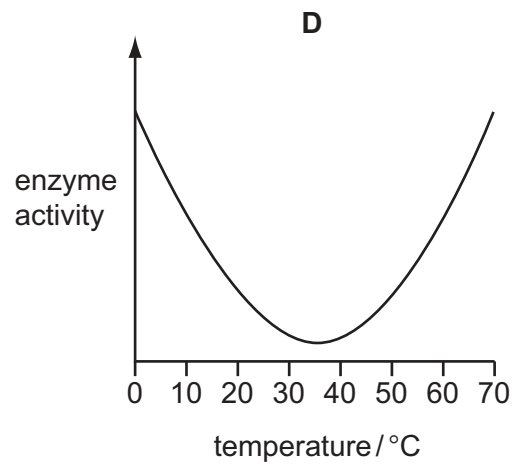
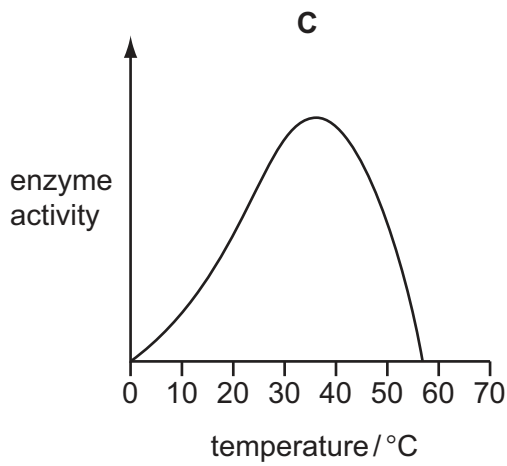
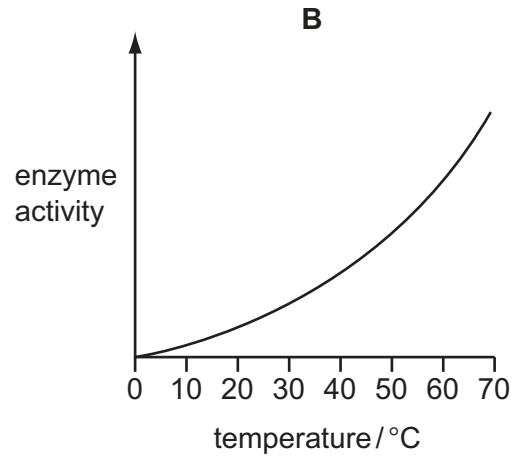
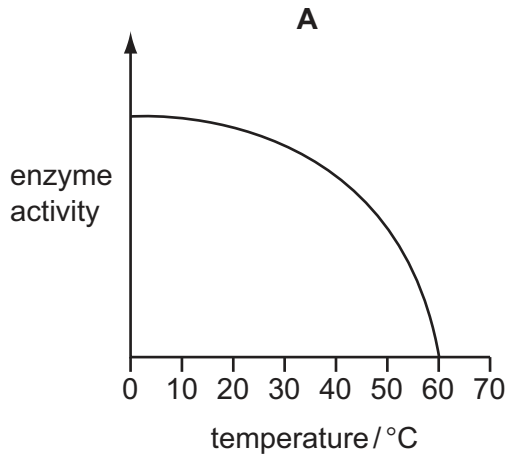


onion cell after one hour in concentrated sugar solution

Which statement explains the change?

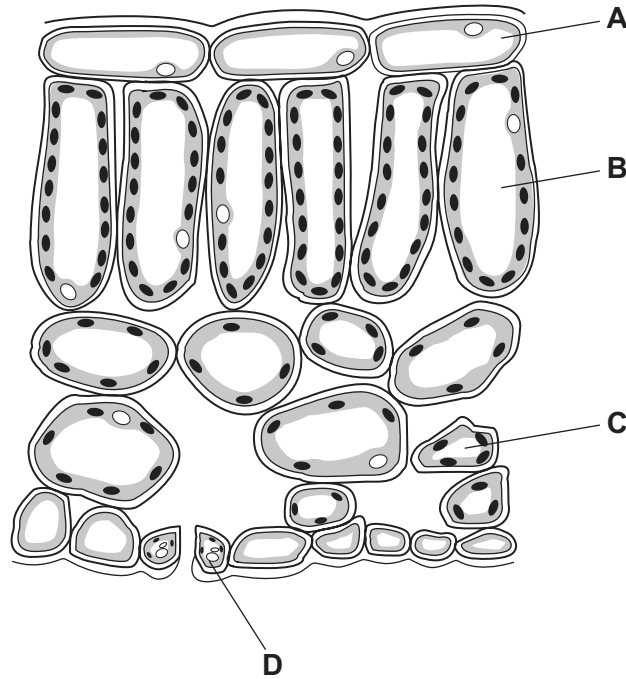
- A Sugar has moved into the cell.
- B Sugar has moved out of the cell.
- C Water has moved into the cell.
- D Water has moved out of the cell.

- 3 Which graph shows how the activity of an enzyme in the human alimentary canal varies with temperature?



4 The diagram shows a cross-section of part of a leaf.

In which cell does most photosynthesis take place?



5 The table shows information about the average daily energy demand of three age groups of males and females who have different levels of activity.

| sex | age | average daily energy requirement in kJ | | |
|--------|-------|--|-------------------|-------------|
| | | at rest | moderately active | very active |
| female | 14–18 | 7500 | 8400 | 10 000 |
| | 19–30 | 8400 | 8800 | 10 000 |
| | 31–50 | 7500 | 8400 | 9200 |
| male | 14–18 | 9200 | 10 000 | 12 600 |
| | 19–30 | 10 000 | 11 300 | 12 600 |
| | 31–50 | 9200 | 9700 | 10 900 |

What can be concluded from the table?

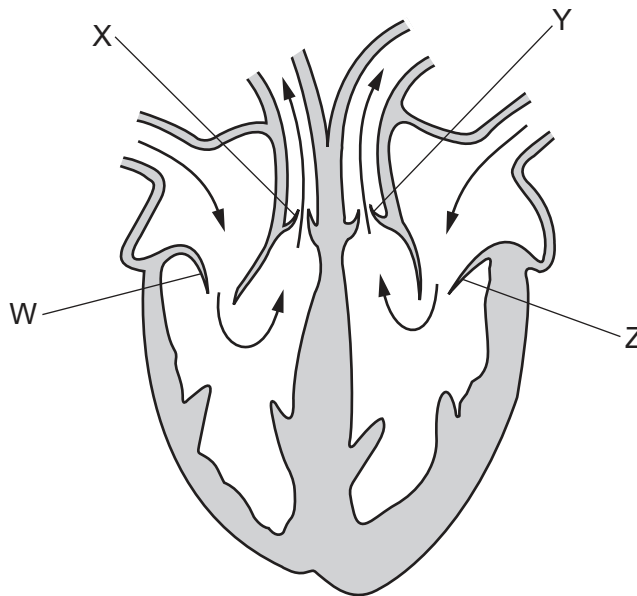
- A Activity has a greater effect than age on energy demand.
- B Females always require more energy than males.
- C Increasing age always increases energy demand.
- D The lowest energy demand is in the 14–18 age group.

6 What causes wilting to occur in a plant?

| | water loss | water uptake |
|----------|------------|--------------|
| A | high | high |
| B | high | low |
| C | low | high |
| D | low | low |

7 The diagram shows a human heart.

The four valves in the heart are labelled W, X, Y and Z.



Which valves would be open and which valves would be closed as blood leaves the heart?

| | open | closed |
|----------|---------|---------|
| A | X and Z | W and Y |
| B | X and Y | W and Z |
| C | W and Z | X and Y |
| D | W and Y | X and Z |

8 Respiration occurs in living cells.

What is released during respiration?

- A energy
- B glucose
- C nutrients
- D oxygen

9 Which substances are excreted from the body by the kidneys?

- A carbon dioxide and nitrogen
- B carbon dioxide and urea
- C nitrogen and water
- D urea and water

10 Which structure in the eye responds to changes in the brightness of light?

- A ciliary muscle
- B iris
- C lens
- D suspensory ligaments

11 Using the drug heroin can lead to someone becoming a heroin addict.

What does 'being an addict' mean?

- A An addict has an increased reaction time.
- B An addict has to keep decreasing the amount of drug taken.
- C An addict is depressed.
- D An addict is physically dependent on the drug.

12 Orangutans live in tropical rainforests and are herbivores.

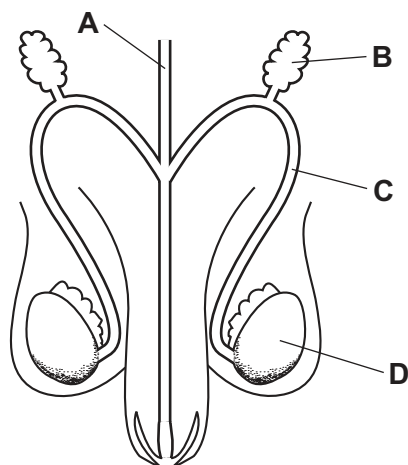
Tigers eat orangutans.

What happens to these animals if some of the rainforest is destroyed?

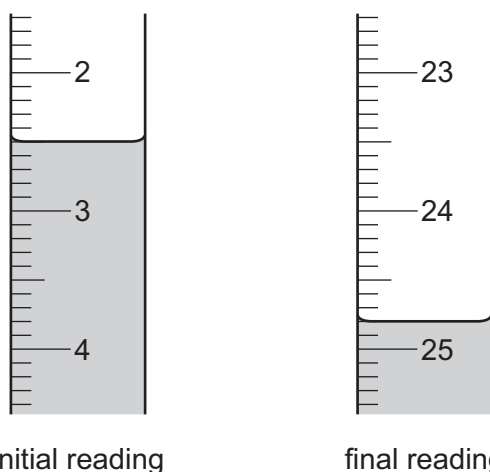
- A The number of orangutans decreases and the number of tigers remains the same.
- B The number of tigers decreases and the number of orangutans remains the same.
- C The numbers of both orangutans and tigers decrease.
- D The numbers of both orangutans and tigers remain the same.

13 The diagram shows the male reproductive system.

Which is the prostate gland?



14 Hydrochloric acid is titrated with sodium hydroxide. A hydrochloric acid solution is added to the sodium hydroxide solution from a burette. The initial and final burette readings are shown.



Which volume of hydrochloric acid is used in the titration?

- A** 21.70 cm³ **B** 22.30 cm³ **C** 22.80 cm³ **D** 22.90 cm³

15 How many protons, neutrons and electrons are in an atom of ${}_{92}^{238}\text{U}$?

| | protons | neutrons | electrons |
|----------|---------|----------|-----------|
| A | 92 | 238 | 92 |
| B | 92 | 146 | 92 |
| C | 146 | 92 | 238 |
| D | 238 | 92 | 146 |

16 Element X has an electronic structure 2,8,8,1.

Element Y has an electronic structure 2,8,6.

What is made when X and Y react?

| | type of compound | formula |
|----------|-------------------|---------|
| A | covalent compound | X_2Y |
| B | covalent compound | XY_2 |
| C | ionic compound | X_2Y |
| D | ionic compound | XY_2 |

17 QR_2 is a covalently bonded compound.

Which statement is **not** correct?

- A** Element Q is a metal.
- B** Element R is a non-metal.
- C** The atoms share electrons.
- D** The compound has a low boiling point.

18 The ion of a newly discovered metal X has the symbol X^{3+} .

What is the formula of its chloride?

- A** XCl_3 **B** X_2Cl_3 **C** X_3Cl **D** X_3Cl_2

19 What is the colour of Universal Indicator when in a neutral solution?

- A** blue
- B** green
- C** purple
- D** red

20 Element X is in Group I of the Periodic Table.

The proton number of element Z is one more than the proton number of X.

Which statement is **not** correct?

- A Atoms of X have one electron in their outer shell.
- B Element Z is a metal.
- C X^+ ions have the same electron arrangement as a noble gas.
- D Z^{2+} ions have two electrons in their outer shell.

21 Which statement explains why aluminium is used to make aircraft parts?

- A It conducts electricity.
- B It conducts heat.
- C It has a low density.
- D It is reactive.

22 Which gas makes up 21% by volume of clean air?

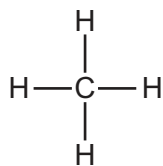
- A argon
- B carbon dioxide
- C nitrogen
- D oxygen

23 Hydrogen has many uses and is formed in different reactions.

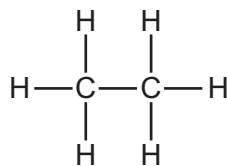
Which row correctly describes hydrogen?

| | reaction to form hydrogen | use of hydrogen | test for hydrogen |
|---|---------------------------|--------------------------|-------------------------------------|
| A | iron + acid | manufacture of margarine | relights a glowing splint |
| B | sodium + water | rocket fuel | pops when a lighted splint is added |
| C | zinc oxide + acid | manufacture of ammonia | pops when a lighted splint is added |
| D | zinc + water | manufacture of ammonia | relights a glowing splint |

24 The names and molecular structures of two alkanes are shown.



methane



ethane

What is the next alkane in the homologous series?

| | name | formula |
|----------|---------|------------------------|
| A | butane | C_3H_6 |
| B | butane | C_3H_8 |
| C | propane | C_3H_6 |
| D | propane | C_3H_8 |

25 Petroleum is separated using a fractionating column. The boiling temperature of each fraction is different.

Which statement is **not** correct?

- A** Fractions with larger molecules condense at the bottom.
- B** Fractions which condense at the top are used as fuels.
- C** Fractions with lower boiling points condense nearer the top.
- D** The column is hotter at the top than the bottom.

26 An alkene can be made by heating an alkane in the presence of a catalyst.

What is the name of this process?

- A** cracking
- B** crystallisation
- C** distillation
- D** polymerisation

27 Ethanol is a clear colourless liquid that mixes with water. It has a boiling point of 78°C .

What is **not** a use for ethanol?

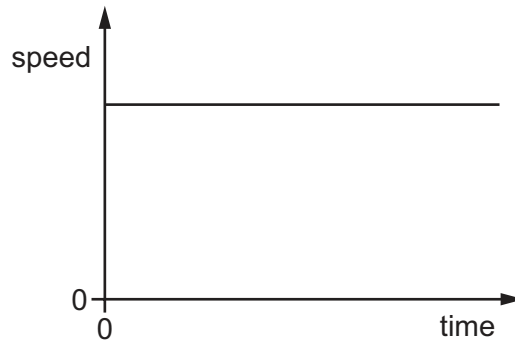
- A fertiliser
- B fuel
- C solvent
- D wine

28 A scientist needs to measure the internal diameter of a test-tube as accurately as possible.

Which instrument should be used?

- A measuring tape
- B metre rule
- C micrometer
- D vernier calipers

29 The motion of an object is represented by a speed-time graph.



Which statement about this object is correct?

- A It is at rest.
- B It is moving at uniform speed.
- C It is moving with increasing speed.
- D It is moving with uniform non-zero acceleration.

30 The table shows the masses and volumes of four objects.

Which object has the largest density?

| | mass / g | volume / cm ³ |
|----------|----------|--------------------------|
| A | 2.0 | 12 |
| B | 4.0 | 16 |
| C | 6.0 | 10 |
| D | 8.0 | 14 |

31 Which energy source is used in a nuclear power station?

- A** coal
- B** hydrogen
- C** natural gas
- D** uranium

32 What is power?

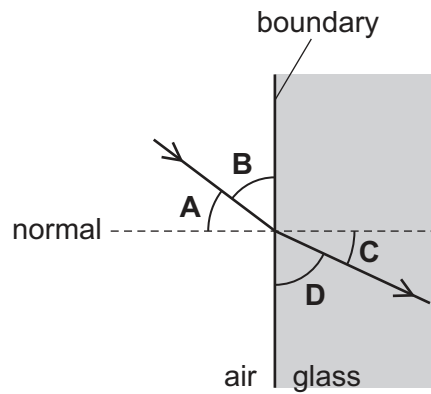
- A** $\frac{\text{energy transferred}}{\text{time taken}}$
- B** energy transferred \times time taken
- C** $\frac{\text{force}}{\text{time taken}}$
- D** force \times distance moved

33 A wave has a speed of 1.4 km/s and a wavelength of 7.0×10^{-4} m.

What is the frequency of the wave?

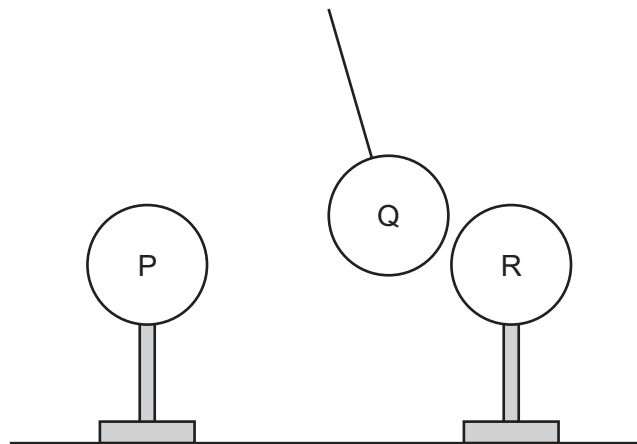
- A** 9.8×10^{-4} Hz
- B** 9.8×10^{-1} Hz
- C** 2.0×10^3 Hz
- D** 2.0×10^6 Hz

34 What is the angle of refraction for this ray of light moving from air to glass?



35 A charged sphere is suspended between two fixed spheres that are also charged.

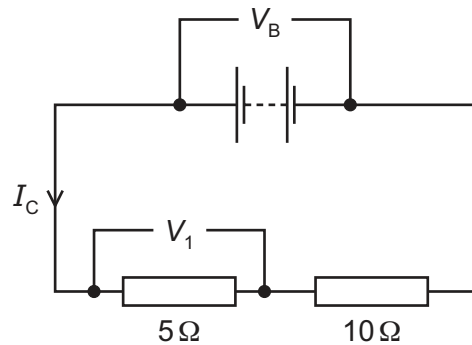
The three spheres are identical and the size of the charge on all three spheres is the same.



Which row gives the sign of the charge on each sphere?

| | P | Q | R |
|---|----------|----------|----------|
| A | negative | negative | negative |
| B | negative | negative | positive |
| C | negative | positive | negative |
| D | positive | positive | positive |

- 36 A 5Ω resistor in series with a 10Ω resistor is connected to a battery of e.m.f. V_B . There is a current I_C through the 5Ω resistor and the p.d. across it is V_1 .



What is the current through and the p.d. across the 10Ω resistor?

| | current | p.d. |
|----------|-----------------|-------------|
| A | I_C | $V_B + V_1$ |
| B | $\frac{I_C}{2}$ | $V_B - V_1$ |
| C | $\frac{I_C}{2}$ | $V_B + V_1$ |
| D | I_C | $V_B - V_1$ |

- 37 A 2 kW electric heater is connected to a 240 V supply.

What is the current in the heater?

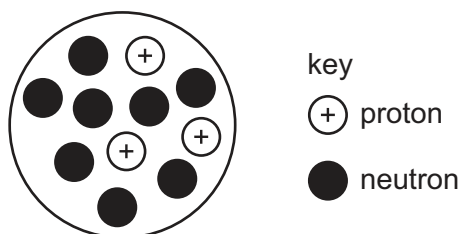
- A** 0.12 A **B** 8.3 A **C** 120 A **D** 480 A

- 38 When making a core for an electromagnet, iron is chosen in preference to steel.

Which statement gives the main reason for choosing iron?

- A** Iron easily loses its magnetism but steel does not.
B Iron is magnetic but steel is not.
C Steel easily loses its magnetism but iron does not.
D Steel is magnetic but iron is not.

39 The diagram represents the nucleus of a radioactive isotope of element X.



The nucleus decays by emitting a beta-particle to become the nucleus of an isotope of element Y.

Which notation represents the nuclide of element Y?

- A ${}_{10}^3\text{Y}$ B ${}_{7}^4\text{Y}$ C ${}_{4}^{10}\text{Y}$ D ${}_{4}^{11}\text{Y}$

40 The half-life of a radioactive material is 24 years.

The activity of a sample falls to a fraction of its initial value after 72 years.

What is the fraction?

- A $\frac{1}{3}$ B $\frac{1}{4}$ C $\frac{1}{6}$ D $\frac{1}{8}$

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The Periodic Table of Elements

| | | Group | | | | | | | | | | | | | | | |
|-----------------------------------|------------------------------------|--|--|------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|------------------------------------|--------------------------------------|------------------------------------|-------------------------------------|----------------------------------|----------------------------------|
| I | II | III | IV | V | VI | VII | VIII | | | | | | | | | | |
| 3 Li lithium 7 | 4 Be beryllium 9 | <div style="border: 1px solid black; padding: 5px; text-align: center;"> Key atomic number atomic symbol name relative atomic mass </div> | | | | | | | | | | 2 He helium 4 | | | | | |
| 11 Na sodium 23 | 12 Mg magnesium 24 | | | | | | | | | | | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 |
| 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 — | — | — | — | — |

| | | | | | | | | | | | | | | | |
|-------------|-------------------------------------|-----------------------------------|--|-------------------------------------|------------------------------------|------------------------------------|------------------------------------|--------------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|----------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|
| 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 dm³ at room temperature and pressure (r.t.p.)