



# Cambridge IGCSE™

## COMBINED SCIENCE

0653/23

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)

### 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.



**2**

- 1** Which row correctly identifies the function of a ciliated cell in the bronchus of a healthy human?

|          | substance being moved | direction of movement |
|----------|-----------------------|-----------------------|
| <b>A</b> | air                   | towards bronchioles   |
| <b>B</b> | air                   | towards trachea       |
| <b>C</b> | mucus                 | towards bronchioles   |
| <b>D</b> | mucus                 | towards trachea       |

- 2** Water enters a plant cell.

In which order does the water pass through the cell structures before reaching the vacuole?

- A** cell membrane → cell wall → cytoplasm  
**B** cell wall → cell membrane → cytoplasm  
**C** cell wall → cytoplasm → cell membrane  
**D** cytoplasm → cell wall → cell membrane

- 3** Which row describes an enzyme?

|          | molecule     | function            |
|----------|--------------|---------------------|
| <b>A</b> | carbohydrate | biological catalyst |
| <b>B</b> | carbohydrate | hormone             |
| <b>C</b> | protein      | biological catalyst |
| <b>D</b> | protein      | hormone             |

- 4** What is a symptom of iron deficiency?

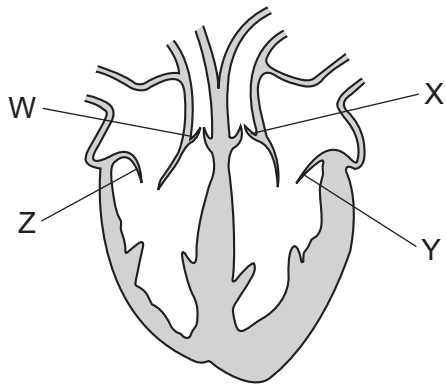
- A** constipation  
**B** feeling tired  
**C** coronary heart disease  
**D** scurvy

5 Chemical digestion produces small, soluble molecules.

For which process is chemical digestion necessary?

- A absorption
- B egestion
- C excretion
- D ingestion

6 The diagram shows a section through the human heart. The four valves are labelled W, X, Y and Z.



When the left ventricle contracts, valve Y closes.

Which row shows the position of the other valves when valve Y is closed?

|   | valve W | valve X | valve Z |
|---|---------|---------|---------|
| A | closed  | closed  | closed  |
| B | open    | closed  | open    |
| C | open    | open    | closed  |
| D | open    | open    | open    |

7 Which row describes how the oxygen concentration and carbon dioxide concentration in blood changes as the blood passes through the lungs?

|   | oxygen concentration | carbon dioxide concentration |
|---|----------------------|------------------------------|
| A | decreases            | decreases                    |
| B | decreases            | increases                    |
| C | increases            | decreases                    |
| D | increases            | increases                    |

**4**

- 8** The incomplete equation for aerobic respiration is shown.



What is the formula of X?

- A**  $\text{C}_6\text{H}_6\text{O}_{12}$       **B**  $\text{C}_6\text{H}_{12}\text{O}_6$       **C**  $\text{C}_{12}\text{H}_{12}\text{O}_6$       **D**  $6\text{CH}_{12}\text{O}_6$

- 9** Which row is correct for auxin in a shoot?

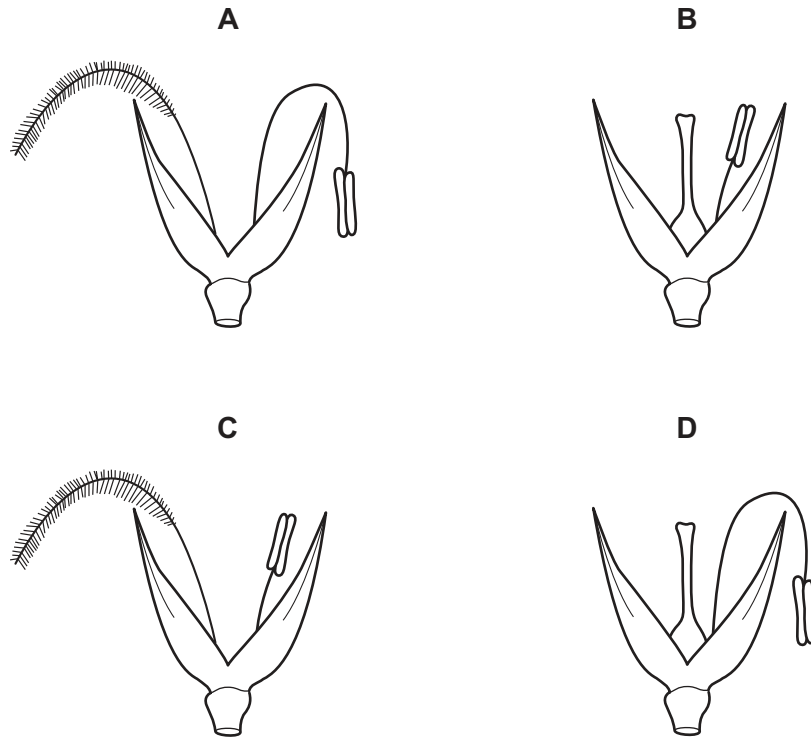
|          | effect of auxin | side of shoot where more auxin is found |
|----------|-----------------|-----------------------------------------|
| <b>A</b> | cell division   | closer to the light                     |
| <b>B</b> | cell division   | further away from the light             |
| <b>C</b> | cell elongation | closer to the light                     |
| <b>D</b> | cell elongation | further away from the light             |

- 10** Which row is correct for sexual reproduction?

|          | requires gametes | offspring produced    |
|----------|------------------|-----------------------|
| <b>A</b> | yes              | genetically different |
| <b>B</b> | yes              | genetically identical |
| <b>C</b> | no               | genetically different |
| <b>D</b> | no               | genetically identical |

5

11 Which diagram shows the stigma and stamen of a wind-pollinated flower?



12 What is the function of the placenta?

- A to allow the mixing of the mother's blood with the blood of the fetus
- B to exchange nutrients and waste
- C to keep the fetus warm
- D to stop the fetus from moving

13 What are the effects of deforestation and the combustion of fossil fuels on the concentrations of carbon dioxide and oxygen in the atmosphere?

|   | concentration of carbon dioxide | concentration of oxygen |
|---|---------------------------------|-------------------------|
| A | decreases                       | decreases               |
| B | decreases                       | increases               |
| C | increases                       | decreases               |
| D | increases                       | increases               |

14 Solid mixtures X and Y are made from the salts as shown in the table.

| mixture X                                                             | mixture Y                                                                            |
|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| barium sulfate: white, insoluble<br>iron(III) sulfate: brown, soluble | potassium chromate(VI): yellow, soluble<br>potassium manganate(VII): purple, soluble |

Each mixture is shaken with water.

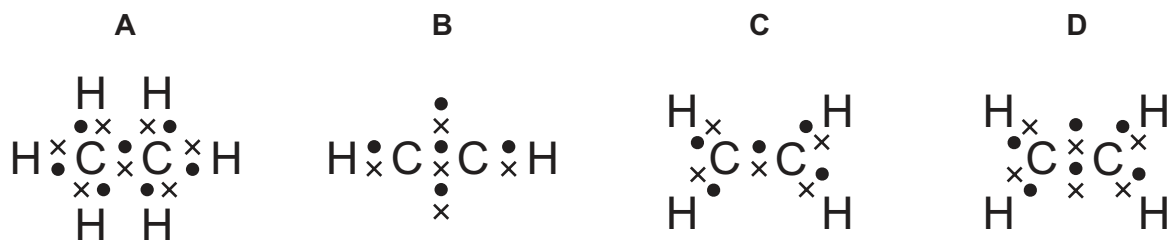
How can the salts in each mixture be separated?

|          | mixture X      | mixture Y      |
|----------|----------------|----------------|
| <b>A</b> | chromatography | chromatography |
| <b>B</b> | chromatography | filtration     |
| <b>C</b> | filtration     | chromatography |
| <b>D</b> | filtration     | filtration     |

15 Which particle has the smallest mass?

- A** atom
- B** electron
- C** neutron
- D** proton

16 Which dot-and-cross diagram represents the bonding in a molecule of ethene?



17 What are the correct numbers of atoms in one molecule of nitric acid?

|          | hydrogen | nitrogen | oxygen |
|----------|----------|----------|--------|
| <b>A</b> | 1        | 1        | 3      |
| <b>B</b> | 1        | 3        | 1      |
| <b>C</b> | 2        | 1        | 3      |
| <b>D</b> | 2        | 3        | 1      |

**18** Molten silver chloride is electrolysed using inert electrodes.

Which statement about this electrolysis is correct?

- A** Silver ions gain electrons at the anode.
- B** Silver ions gain electrons at the cathode.
- C** Silver ions lose electrons at the anode.
- D** Silver ions lose electrons at the cathode.

**19** The reaction of bromine with ethene is exothermic.

Which statement about this reaction is correct?

- A** The activation energy is greater than the energy released in bond formation.
- B** The activation energy must be less than the overall energy change.
- C** The energy gained in bond forming causes the temperature to fall.
- D** The energy released in bond forming is greater than the energy used in bond breaking.

**20** Which row describes what happens to the rate of reaction and the frequency of collisions between particles when the concentration of a reactant is increased?

|          | rate of reaction | frequency of collisions |
|----------|------------------|-------------------------|
| <b>A</b> | decreases        | decreases               |
| <b>B</b> | decreases        | increases               |
| <b>C</b> | increases        | decreases               |
| <b>D</b> | increases        | increases               |

**21** Which statements about an oxidising agent are correct?

- 1 It is oxidised in a redox reaction.
- 2 It is reduced in a redox reaction.
- 3 It oxidises another substance in a redox reaction.
- 4 It reduces the reducing agent in a redox reaction.

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

- 22** Magnesium chloride crystals can be made by reacting solid magnesium carbonate with dilute hydrochloric acid.

What is **not** used in this process?

- A** excess solid
- B** crystallisation
- C** distillation
- D** filtration

- 23** Which statement about the halogens is correct?

- A** Aqueous sodium bromide reacts with chlorine to produce aqueous sodium chloride.
- B** Aqueous sodium chloride reacts with iodine to produce aqueous sodium iodide.
- C** Bromine reacts with aqueous sodium chloride to produce chlorine.
- D** Iodine reacts with aqueous sodium bromide to produce bromine.

- 24** Which metal is extracted from bauxite?

- A** aluminium
- B** copper
- C** iron
- D** zinc

- 25** Two different bottles each contain a colourless liquid.

One bottle contains an alkene and the other contains water.

Three different tests are listed.

- 1 addition of pink cobalt(II) chloride
- 2 addition of brown aqueous bromine
- 3 addition of white copper(II) sulfate

Which tests can be used to positively identify the bottle that contains water?

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



**26** Which statement about greenhouse gases is correct?

- A** Increased concentrations of greenhouse gases cause a reduced greenhouse effect, which may contribute to climate change.
- B** Increased concentrations of greenhouse gases cause an enhanced greenhouse effect, which may contribute to climate change.
- C** Increased concentrations of greenhouse gases cause an enhanced greenhouse effect, which does **not** contribute to climate change.
- D** Decreased concentrations of greenhouse gases cause an enhanced greenhouse effect, which may contribute to climate change.

**27** Q, R and S are fossil fuels.

The main constituent of Q is methane.

R is a source of diesel oil and bitumen.

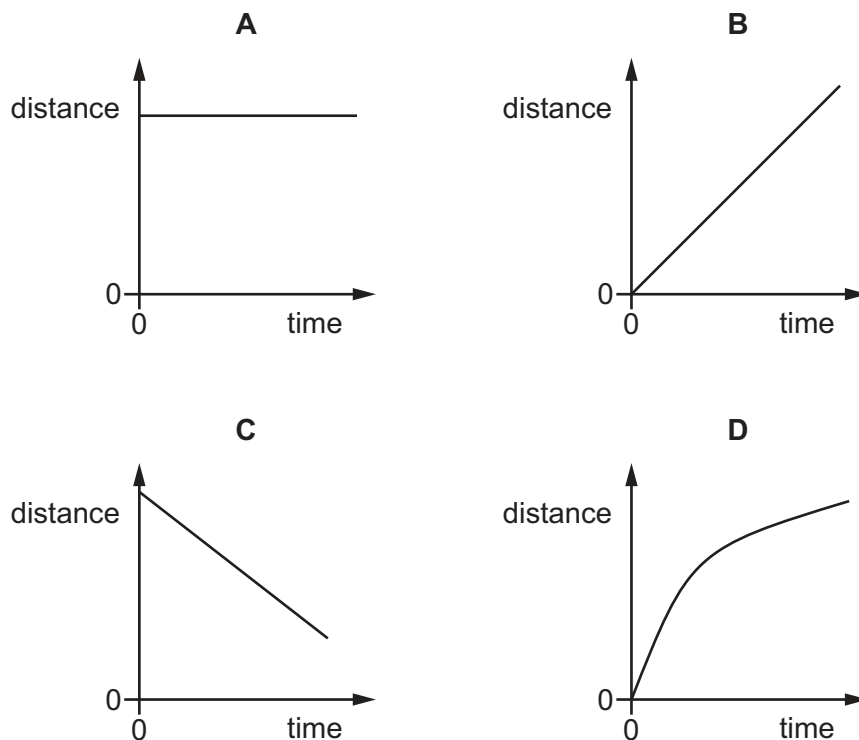
S is burned in car engines.

Which row identifies Q, R and S?

|          | Q           | R         | S         |
|----------|-------------|-----------|-----------|
| <b>A</b> | natural gas | gasoline  | petroleum |
| <b>B</b> | natural gas | petroleum | gasoline  |
| <b>C</b> | coal        | gasoline  | petroleum |
| <b>D</b> | coal        | petroleum | gasoline  |

10

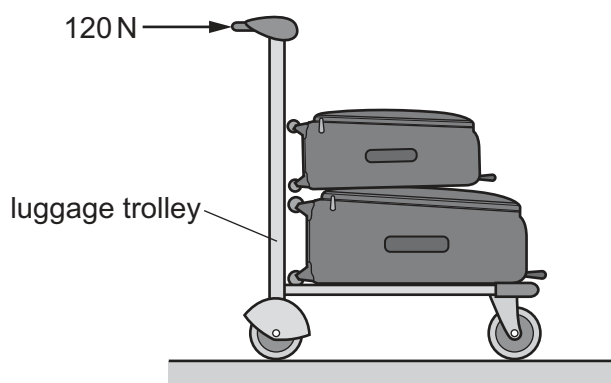
28 Which distance–time graph represents an object that is moving with changing speed?



29 Which statement about mass and weight is correct?

- A** Mass is the gravitational field that acts on a weight.
- B** Mass is the gravitational force that acts on a weight.
- C** Weight is the gravitational field that acts on a mass.
- D** Weight is the gravitational force that acts on a mass.

30 A luggage trolley is pushed with a horizontal force of 120 N.



The trolley travels a distance of 500 cm in the direction of the force.

How much work is done?

- A** 24 J
- B** 60 J
- C** 600 J
- D** 60 000 J

31 A brick of mass 3.0 kg rests on a shelf. The brick falls from the shelf. The brick hits the ground at a speed of 8.0 m/s.

Ignore air resistance.

How much kinetic energy does the brick have just before hitting the ground, and how much gravitational potential energy does the brick have when on the shelf?

|   | kinetic energy<br>before hitting<br>ground / J | gravitational<br>potential energy<br>on shelf / J |
|---|------------------------------------------------|---------------------------------------------------|
| A | 24                                             | 24                                                |
| B | 24                                             | 96                                                |
| C | 96                                             | 0                                                 |
| D | 96                                             | 96                                                |

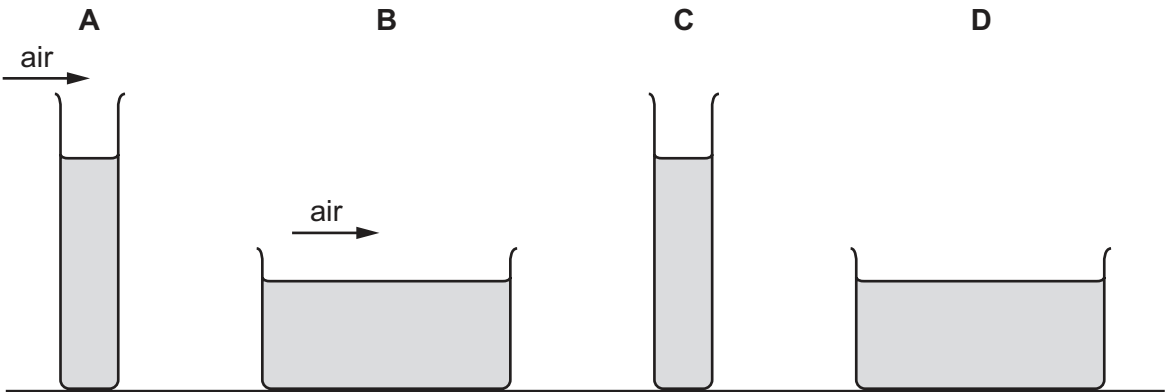
32 Which row states an advantage and a disadvantage of the energy resource given?

|   | energy resource | advantage                       | disadvantage                       |
|---|-----------------|---------------------------------|------------------------------------|
| A | natural gas     | renewable                       | produces carbon dioxide            |
| B | nuclear fission | no hazardous waste              | expensive to build a power station |
| C | solar energy    | does not produce carbon dioxide | not always available               |
| D | wind energy     | cheap to run                    | non-renewable                      |

33 The water in four containers is at the same temperature.

There is a movement of air over the surface of containers **A** and **B** but **not** over **C** and **D**.

From which container does the water evaporate at the lowest rate?



12

**34** An aluminium cap is screwed onto the top of an aluminium bottle.

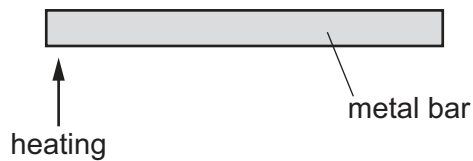


The cap is difficult to unscrew.

Which action makes removing the cap easier?

- A** cooling only the cap in cold water
- B** heating only the bottle in hot water
- C** placing both the bottle and the cap in a freezer
- D** placing both the bottle and the cap in a hot oven

**35** 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** Electrons at the heated end gain kinetic energy and move along the bar.
- B** 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.

**36** Three types of wave are listed.

- 1 microwaves
- 2 sound waves
- 3 radio waves

Which waves are longitudinal waves?

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

- 37 A wave is refracted when it moves from one medium to another.

What **must** remain constant?

- A direction of motion
- B frequency
- C speed
- D wavelength

- 38 The current in a resistor is 4.0 A.

What is the time taken for 1200 C of charge to flow through the resistor?

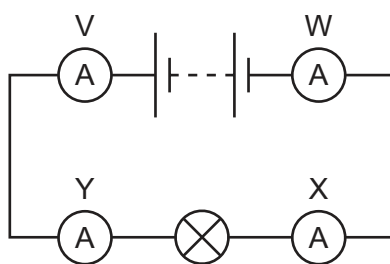
- A 0.20 min      B 5.0 min      C 80 min      D 300 min

- 39 A student connects a lamp to a cell.

Which change to the circuit can increase the current in the circuit?

- A connecting a second cell in series
- B connecting a second lamp in series
- C connecting a variable resistor in series
- D connecting an ammeter in series

- 40 Four ammeters, V, W, X and Y, are connected in the circuit shown.



Which ammeters have the same reading as each other?

- A V, W, X and Y
- B V and W only
- C V and Y only
- D X and Y only

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The Periodic Table of Elements

| Group                                |                                       |                                                                                            |                                           |                                       |                                        |                                       |                                        |                                        |                                          |                                         |                                         |                                       |                                       |                                       |                                         |                                        |                                       |
|--------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------|----------------------------------------|---------------------------------------|----------------------------------------|----------------------------------------|------------------------------------------|-----------------------------------------|-----------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|-----------------------------------------|----------------------------------------|---------------------------------------|
| I                                    | II                                    |                                                                                            |                                           |                                       |                                        |                                       |                                        |                                        |                                          |                                         |                                         | III                                   | IV                                    | V                                     | VI                                      | VII                                    | VIII                                  |
|                                      |                                       | <div>1<div>Hhydrogen1</div></div>                                                          |                                           |                                       |                                        |                                       |                                        |                                        |                                          |                                         |                                         |                                       |                                       |                                       |                                         |                                        |                                       |
|                                      |                                       | <div>Key<div>atomic number<br/>atomic symbol<br/>name<br/>relative atomic mass</div></div> |                                           |                                       |                                        |                                       |                                        |                                        |                                          |                                         |                                         |                                       |                                       |                                       |                                         |                                        |                                       |
| 3 <div>Li<br/>lithium<br/>7</div>    | 4 <div>Be<br/>beryllium<br/>9</div>   |                                                                                            |                                           |                                       |                                        |                                       |                                        |                                        |                                          |                                         |                                         |                                       |                                       |                                       |                                         |                                        |                                       |
| 11 <div>Na<br/>sodium<br/>23</div>   | 12 <div>Mg<br/>magnesium<br/>24</div> |                                                                                            |                                           |                                       |                                        |                                       |                                        |                                        |                                          |                                         |                                         |                                       |                                       |                                       |                                         |                                        |                                       |
| 19 <div>K<br/>potassium<br/>39</div> | 20 <div>Ca<br/>calcium<br/>40</div>   | 21 <div>Sc<br/>scandium<br/>45</div>                                                       | 22 <div>Ti<br/>titanium<br/>48</div>      | 23 <div>V<br/>vanadium<br/>51</div>   | 24 <div>Cr<br/>chromium<br/>52</div>   | 25 <div>Mn<br/>manganese<br/>55</div> | 26 <div>Fe<br/>iron<br/>56</div>       | 27 <div>Co<br/>cobalt<br/>59</div>     | 28 <div>Ni<br/>nickel<br/>59</div>       | 29 <div>Cu<br/>copper<br/>64</div>      | 30 <div>Zn<br/>zinc<br/>65</div>        | 31 <div>Ga<br/>gallium<br/>70</div>   | 32 <div>Ge<br/>germanium<br/>73</div> | 33 <div>As<br/>arsenic<br/>75</div>   | 34 <div>Se<br/>selenium<br/>79</div>    | 35 <div>Br<br/>bromine<br/>80</div>    | 36 <div>Kr<br/>krypton<br/>84</div>   |
| 37 <div>Rb<br/>rubidium<br/>85</div> | 38 <div>Sr<br/>strontium<br/>88</div> | 39 <div>Y<br/>yttrium<br/>89</div>                                                         | 40 <div>Zr<br/>zirconium<br/>91</div>     | 41 <div>Nb<br/>niobium<br/>93</div>   | 42 <div>Mo<br/>molybdenum<br/>96</div> | 43 <div>Tc<br/>technetium<br/>—</div> | 44 <div>Ru<br/>ruthenium<br/>101</div> | 45 <div>Rh<br/>rhodium<br/>103</div>   | 46 <div>Pd<br/>palladium<br/>106</div>   | 47 <div>Ag<br/>silver<br/>108</div>     | 48 <div>Cd<br/>cadmium<br/>112</div>    | 49 <div>In<br/>indium<br/>115</div>   | 50 <div>Sn<br/>tin<br/>119</div>      | 51 <div>Sb<br/>antimony<br/>122</div> | 52 <div>Te<br/>tellurium<br/>128</div>  | 53 <div>I<br/>iodine<br/>127</div>     | 54 <div>Xe<br/>xenon<br/>131</div>    |
| 55 <div>Cs<br/>caesium<br/>133</div> | 56 <div>Ba<br/>barium<br/>137</div>   | 57–71 <div>lanthanoids</div>                                                               | 72 <div>Hf<br/>hafnium<br/>178</div>      | 73 <div>Ta<br/>tantalum<br/>181</div> | 74 <div>W<br/>tungsten<br/>184</div>   | 75 <div>Re<br/>rhenium<br/>186</div>  | 76 <div>Os<br/>osmium<br/>190</div>    | 77 <div>Ir<br/>iridium<br/>192</div>   | 78 <div>Pt<br/>platinum<br/>195</div>    | 79 <div>Au<br/>gold<br/>197</div>       | 80 <div>Hg<br/>mercury<br/>201</div>    | 81 <div>Tl<br/>thallium<br/>204</div> | 82 <div>Pb<br/>lead<br/>207</div>     | 83 <div>Bi<br/>bismuth<br/>209</div>  | 84 <div>Po<br/>polonium<br/>—</div>     | 85 <div>At<br/>astatine<br/>—</div>    | 86 <div>Rn<br/>radon<br/>—</div>      |
| 87 <div>Fr<br/>francium<br/>—</div>  | 88 <div>Ra<br/>radium<br/>—</div>     | 89–103 <div>actinoids</div>                                                                | 104 <div>Rf<br/>rutherfordium<br/>—</div> | 105 <div>Db<br/>dubnium<br/>—</div>   | 106 <div>Sg<br/>seaborgium<br/>—</div> | 107 <div>Bh<br/>bohrium<br/>—</div>   | 108 <div>Hs<br/>hassium<br/>—</div>    | 109 <div>Mt<br/>meitnerium<br/>—</div> | 110 <div>Ds<br/>darmstadtium<br/>—</div> | 111 <div>Rg<br/>roentgenium<br/>—</div> | 112 <div>Cn<br/>copernicium<br/>—</div> | 113 <div>Nh<br/>nihonium<br/>—</div>  | 114 <div>Fl<br/>flerovium<br/>—</div> | 115 <div>Mc<br/>moscovium<br/>—</div> | 116 <div>Lv<br/>livermorium<br/>—</div> | 117 <div>Ts<br/>tennessine<br/>—</div> | 118 <div>Og<br/>oganesson<br/>—</div> |