

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

**Pearson Edexcel Level 1/Level 2 GCSE (9–1)**

**Monday 22 May 2023**

Morning (Time: 1 hour 10 minutes)

Paper  
reference

**1SC0/1CF**

**Combined Science**

**PAPER 2**

**Foundation Tier**

**You must have:**

Calculator, ruler

Total Marks

## Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

## Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk** (\*), marks will be awarded for your ability to structure your answer logically, showing how the points that you make are related or follow on from each other where appropriate.
- There is a periodic table on the back cover of the paper.

## Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

P72556A

©2023 Pearson Education Ltd.  
N:1/1/1/1/



  
Pearson

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**



Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box . If you change your mind about an answer, put a line through the box  and then mark your new answer with a cross .

- 1 In an experiment, paper chromatography was used to separate the coloured dyes in four different inks, **W**, **X**, **Y** and **Z**.

(a) Figure 1 shows the chromatogram at the end of the experiment.

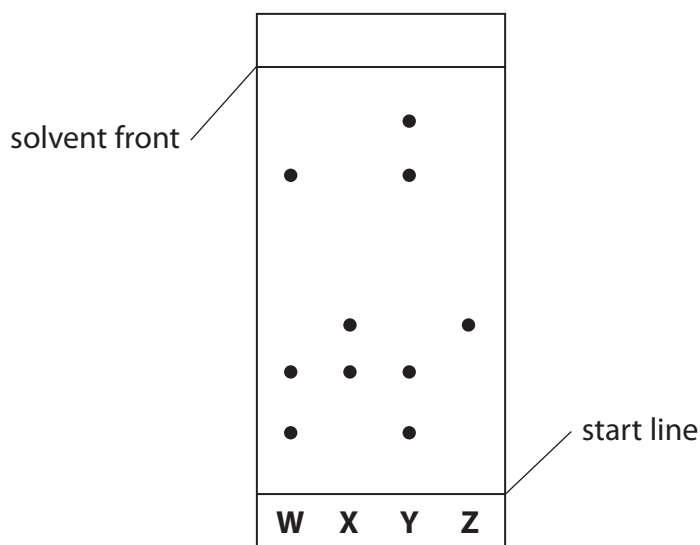


Figure 1

- (i) The chromatogram shows that only one of the inks contains a single dye.

Which ink contains a single dye?

(1)

- A W  
 B X  
 C Y  
 D Z

- (ii) Which ink contains the greatest number of dyes?

(1)

- A W  
 B X  
 C Y  
 D Z

(iii) The  $R_f$  value of a dye can be calculated using the equation

$$R_f = \frac{\text{distance moved by the dye}}{\text{distance moved by solvent front}}$$

At the end of the chromatography one dye had moved 3.60 cm and the solvent front had moved 9.20 cm.

Calculate the  $R_f$  value for this dye.

Give your answer to 2 decimal places.

(2)

.....

.....

.....

$R_f =$  .....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(b) The substance used as the solvent in the chromatography was heated for 8 minutes.

Figure 2 shows how the temperature of the substance changed with time.

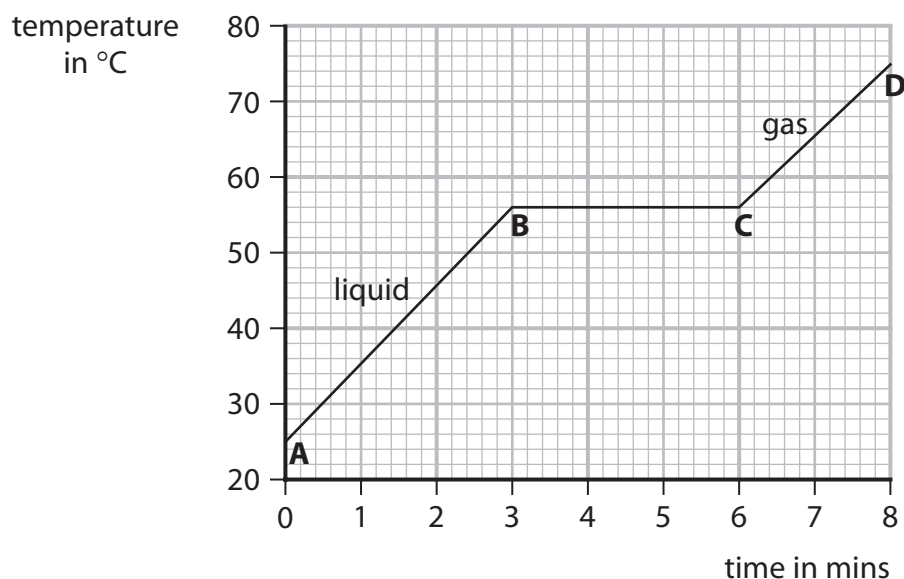


Figure 2

From **A** to **B** the substance was a liquid.

From **C** to **D** the substance was a gas.

(i) Give the name of the change when a liquid becomes a gas. (1)

(ii) Use Figure 2 to give the temperature of the substance at 4 minutes. (1)  
..... °C

(iii) Use Figure 2 to give the time when the substance has completely changed into a gas. (1)  
..... minutes

(iv) The temperature of the substance at **A** was 25 °C.  
Calculate the temperature rise of the substance from **A** to **D**. (1)  
..... °C

(Total for Question 1 = 8 marks)



2 This question is about electrolysis.

(a) Which statement describes what happens during electrolysis?

(1)

- A atoms are decomposed
- B ionic compounds are decomposed
- C mixtures are separated
- D molecules are separated

(b) Figure 3 shows the electrolysis of copper chloride solution.

(i) Use the words from the box to complete the labelling of the diagram in Figure 3.

(2)

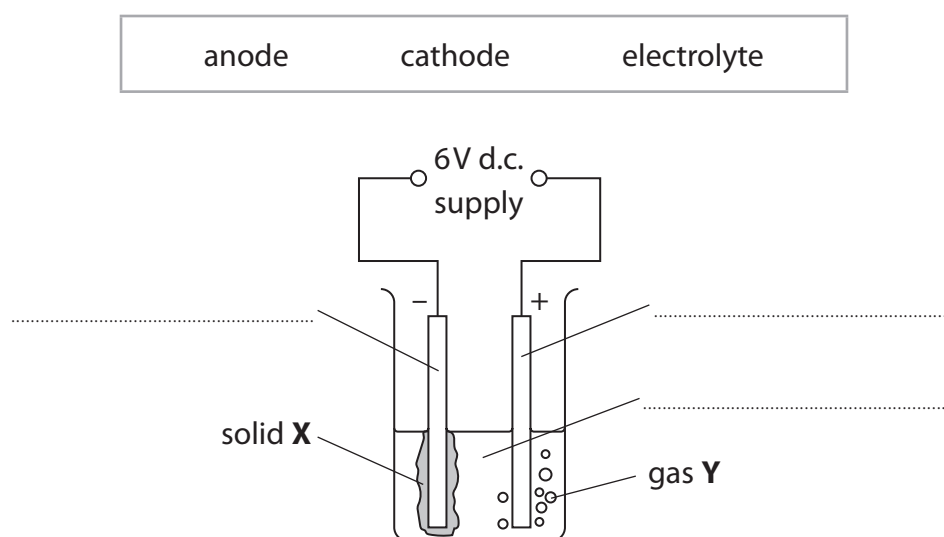


Figure 3



(ii) The products of the electrolysis shown in Figure 3 are solid **X** and gas **Y**.

Draw **one** straight line from each product to its name.

(2)

**product**

**name**

solid **X**

carbon

chlorine

copper

gas **Y**

hydrogen

(iii) The experiment is repeated using powdered solid copper chloride instead of copper chloride solution.

Nothing happens and no products are formed.

Explain why nothing happens and no products are formed.

(2)

(Total for Question 2 = 7 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**





3 (a) When lead nitrate solution and potassium chloride solution are mixed, potassium nitrate and a precipitate of lead chloride are formed.

(i) Complete the word equation for this reaction.

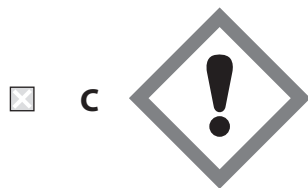
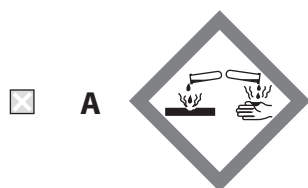
(1)

lead nitrate + ..... → ..... + lead chloride

(ii) Lead nitrate is toxic.

Which hazard symbol should be on a container of lead nitrate?

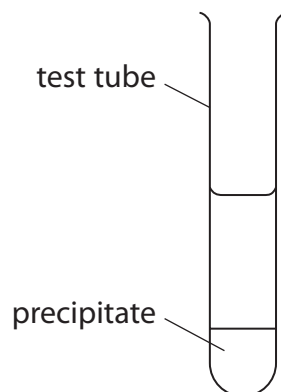
(1)



- (b) A student put  $5\text{ cm}^3$  of potassium carbonate solution into a test tube and added  $2\text{ cm}^3$  of calcium nitrate solution.

A precipitate formed and was allowed to settle as shown in Figure 4.

The height of the precipitate was measured.



**Figure 4**

- (i) Give the name of the piece of apparatus the student should use to find the volume of the potassium carbonate solution.

(1)

- (ii) The student repeated the experiment.

The results are shown in Figure 5.

| experiment | height of precipitate in cm |
|------------|-----------------------------|
| 1          | 2.4                         |
| 2          | 2.7                         |
| 3          | 2.4                         |

**Figure 5**

Use the data in Figure 5 to calculate the mean height of the precipitate.

(2)

mean height of precipitate = ..... cm



(iii) Describe how a pure, dry sample of the precipitate could be obtained from the mixture in the test tube.

(3)

.....

.....

.....

.....

.....

.....

(iv) The student investigated whether increasing the volume of calcium nitrate solution increased the height of the precipitate formed.

They repeated the experiment using different volumes of calcium nitrate.

State **one** variable that should be controlled in this investigation.

(1)

.....

**(Total for Question 3 = 9 marks)**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



4 (a) Magnesium is a metal.

(i) State **one** physical property of magnesium.

(1)

(ii) Which element is in the same group of the periodic table as magnesium?  
Use the periodic table to help you answer this question.

(1)

- A** carbon
- B** chromium
- C** sodium
- D** strontium

(b) (i) Magnesium atoms have 12 electrons.

Complete the electronic configuration of a magnesium atom.

(1)

2.8.....

(ii) The electronic configuration of a chlorine atom is 2.8.7

Explain how the electronic configuration of chlorine is linked to its period in the periodic table.

(2)

.....

.....

.....

.....



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(c) 1.20 g of magnesium reacts completely with 3.55 g of chlorine to form magnesium chloride.

Calculate the empirical formula of the magnesium chloride.

(relative atomic masses: Mg = 24.0, Cl = 35.5)

You must show your working.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

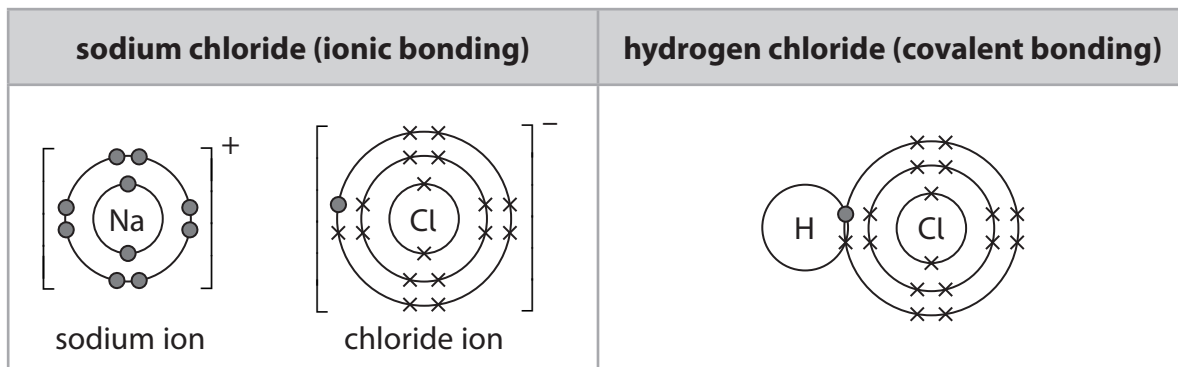
empirical formula = .....



(d) Sodium reacts with chlorine to form sodium chloride, which contains ionic bonds.

Hydrogen reacts with chlorine to form hydrogen chloride, which contains covalent bonds.

Figure 6 shows dot and cross diagrams of these compounds.



**Figure 6**

Describe the differences between an ionic bond and a covalent bond.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**(Total for Question 4 = 12 marks)**



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**



P 7 2 5 5 6 A 0 1 5 2 4

- 5 In an experiment, powdered calcium hydroxide was added to dilute hydrochloric acid and the pH was measured.

The method used was

**step 1** measure 200 cm<sup>3</sup> dilute hydrochloric acid into a beaker

**step 2** add 0.1 g of powdered calcium hydroxide to the beaker

**step 3** find the pH of the mixture

**step 4** repeat steps 2 and 3 until the pH stops changing.

- (a) State what should be done after **step 2** to make sure that any reaction is complete.

(1)

- (b) Complete the word equation for the reaction.

(2)

calcium hydroxide + hydrochloric acid → .....

- (c) Which row of the table shows the state symbols for powdered calcium hydroxide and dilute hydrochloric acid in the balanced chemical equation?

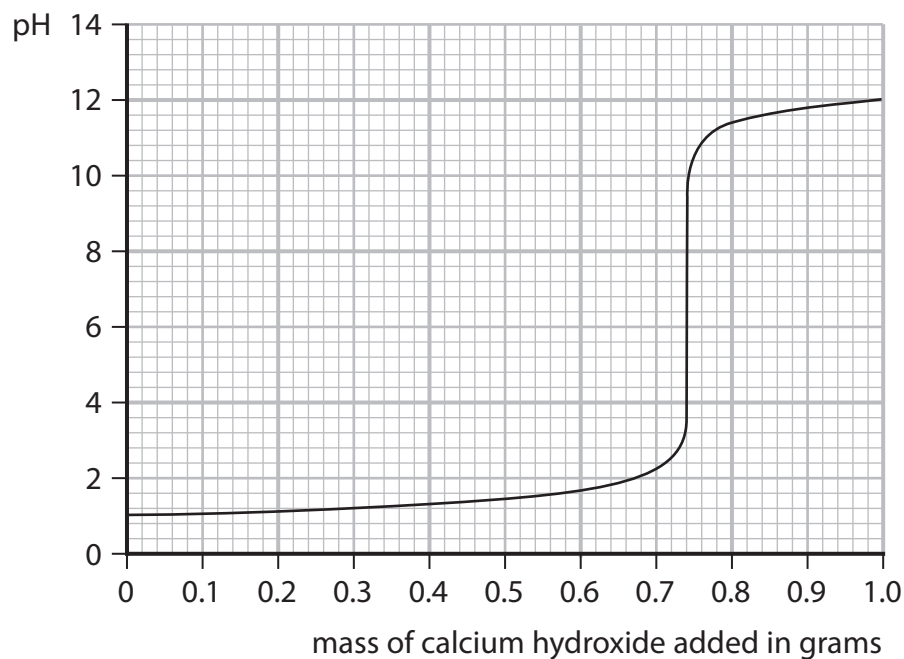
(1)

|                            | calcium hydroxide | hydrochloric acid |
|----------------------------|-------------------|-------------------|
| <input type="checkbox"/> A | aq                | l                 |
| <input type="checkbox"/> B | l                 | aq                |
| <input type="checkbox"/> C | s                 | aq                |
| <input type="checkbox"/> D | s                 | l                 |





(d) The results of the experiment are shown in Figure 7.



**Figure 7**

(i) Using Figure 7, give the pH of the acid at the start of the experiment.

(1)

pH = .....

(ii) Using Figure 7, give the mass of calcium hydroxide required to make a neutral mixture.

(1)

mass of calcium hydroxide = ..... g

(iii) Explain why the pH starts at a low value and ends at a higher value.

(3)

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 7 2 5 5 6 A 0 1 7 2 4

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(e) State what should be used to measure the pH of the mixture in this experiment.

(1)

(f) The calcium hydroxide used is corrosive to the eyes and an irritant to skin.

Using this information, state **one** safety precaution that should be taken during the experiment when using any corrosive substance.

(1)

(Total for Question 5 = 11 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**



P 7 2 5 5 6 A 0 1 9 2 4

6 Figure 8 shows part of the reactivity series of metals.

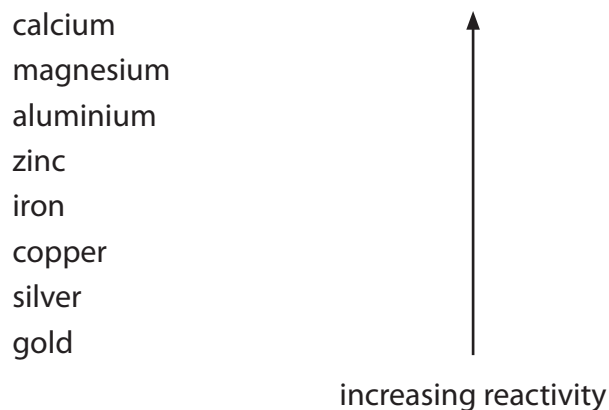


Figure 8

(a) Which metal reacts when added to cold water?

(1)

- A calcium
- B copper
- C gold
- D silver

(b) A student investigates the reactivity of four different metals.

The student adds an equal-sized piece of each metal to separate test tubes containing dilute hydrochloric acid.

The student's observations for zinc and copper are recorded in Figure 9.

| metal     | observations   |
|-----------|--|
| magnesium |  |
| zinc      | bubbles produced at a steady rate<br>test tube feels slightly warm |
| iron      |  |
| copper    | no reaction  |

Figure 9



(i) Use the information in Figure 8 and in Figure 9 to predict the observations for the reactions of magnesium and of iron with dilute hydrochloric acid.

(2)

magnesium

iron

(ii) When metals react with acids, hydrogen gas is produced.

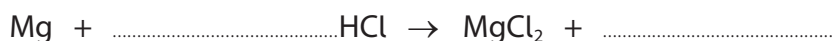
Describe the test to show that the gas is hydrogen.

(2)

(iii) When magnesium reacts with hydrochloric acid, magnesium chloride and hydrogen are formed.

Complete the balanced equation for the reaction.

(2)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



\*(c) There are **three** common methods of obtaining metals from the Earth's crust:

- mine the pure metal
- mine the metal ore and heat it with carbon
- mine the metal ore and electrolyse the molten compound.

The method used to obtain a metal is linked to its position in the reactivity series of metals.

Aluminium, gold, iron, and silver are some commonly used metals.

Use the reactivity series in Figure 8 to state and explain the method chosen to obtain each of these four metals.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area with 20 horizontal dotted lines.

**(Total for Question 6 = 13 marks)**

**TOTAL FOR PAPER = 60 MARKS**



P 7 2 5 5 6 A 0 2 3 2 4

# The periodic table of the elements

|                                   |                                    |                                     |                                    |                                    |                                     |                                     |                                    |                                  |                                      |                                  |                                  |                                   |                                    |                                  |                                   |                                   |                                   |                                |
|-----------------------------------|------------------------------------|-------------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|----------------------------------|--------------------------------------|----------------------------------|----------------------------------|-----------------------------------|------------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|--------------------------------|
| 1                                 | 2                                  | 3                                   | 4                                  | 5                                  | 6                                   | 7                                   | 0                                  |                                  |                                      |                                  |                                  |                                   |                                    |                                  |                                   |                                   |                                   |                                |
| 7<br><b>Li</b><br>lithium<br>3    | 9<br><b>Be</b><br>beryllium<br>4   | 11<br><b>Na</b><br>sodium<br>11     | 12<br><b>C</b><br>carbon<br>6      | 13<br><b>Al</b><br>aluminium<br>13 | 14<br><b>N</b><br>nitrogen<br>7     | 15<br><b>P</b><br>phosphorus<br>15  | 16<br><b>O</b><br>oxygen<br>8      | 17<br><b>F</b><br>fluorine<br>9  | 18<br><b>Ne</b><br>neon<br>10        |                                  |                                  |                                   |                                    |                                  |                                   |                                   |                                   |                                |
| 19<br><b>K</b><br>potassium<br>19 | 20<br><b>Ca</b><br>calcium<br>20   | 23<br><b>Sc</b><br>scandium<br>21   | 24<br><b>Ti</b><br>titanium<br>22  | 25<br><b>V</b><br>vanadium<br>23   | 26<br><b>Cr</b><br>chromium<br>24   | 27<br><b>Mn</b><br>manganese<br>25  | 28<br><b>Fe</b><br>iron<br>26      | 29<br><b>Co</b><br>cobalt<br>27  | 30<br><b>Ni</b><br>nickel<br>28      | 31<br><b>Cu</b><br>copper<br>29  | 32<br><b>Zn</b><br>zinc<br>30    | 33<br><b>Ga</b><br>gallium<br>31  | 34<br><b>Ge</b><br>germanium<br>32 | 35<br><b>As</b><br>arsenic<br>33 | 36<br><b>Se</b><br>selenium<br>34 | 37<br><b>Br</b><br>bromine<br>35  | 38<br><b>Kr</b><br>krypton<br>36  |                                |
| 39<br><b>Rb</b><br>rubidium<br>37 | 40<br><b>Sr</b><br>strontium<br>38 | 45<br><b>Y</b><br>yttrium<br>39     | 48<br><b>Zr</b><br>zirconium<br>40 | 51<br><b>Nb</b><br>niobium<br>41   | 52<br><b>Mo</b><br>molybdenum<br>42 | 55<br><b>Tc</b><br>technetium<br>43 | 56<br><b>Ru</b><br>ruthenium<br>44 | 59<br><b>Rh</b><br>rhodium<br>45 | 63.5<br><b>Pd</b><br>palladium<br>46 | 65<br><b>Cd</b><br>cadmium<br>48 | 70<br><b>In</b><br>indium<br>49  | 73<br><b>Sb</b><br>antimony<br>51 | 75<br><b>Te</b><br>tellurium<br>52 | 79<br><b>I</b><br>iodine<br>53   | 80<br><b>Xe</b><br>xenon<br>54    | 81<br><b>Po</b><br>polonium<br>84 | 82<br><b>At</b><br>astatine<br>85 | 84<br><b>Rn</b><br>radon<br>86 |
| 55<br><b>Cs</b><br>caesium<br>55  | 56<br><b>Ba</b><br>barium<br>56    | 57<br><b>La*</b><br>lanthanum<br>57 | 72<br><b>Hf</b><br>hafnium<br>72   | 73<br><b>Ta</b><br>tantalum<br>73  | 74<br><b>W</b><br>tungsten<br>74    | 75<br><b>Re</b><br>rhenium<br>75    | 76<br><b>Os</b><br>osmium<br>76    | 77<br><b>Ir</b><br>iridium<br>77 | 78<br><b>Pt</b><br>platinum<br>78    | 79<br><b>Au</b><br>gold<br>79    | 80<br><b>Hg</b><br>mercury<br>80 | 81<br><b>Tl</b><br>thallium<br>81 | 82<br><b>Pb</b><br>lead<br>82      | 83<br><b>Bi</b><br>bismuth<br>83 | 84<br><b>Po</b><br>polonium<br>84 | 85<br><b>At</b><br>astatine<br>85 | 86<br><b>Rn</b><br>radon<br>86    |                                |

1 H hydrogen 1

Key  
relative atomic mass  
atomic symbol  
name  
atomic (proton) number

\* The elements with atomic numbers from 58 to 71 are omitted from this part of the periodic table.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

