

The Periodic Table

Aims

You have been asked to make a documentary about the Periodic Table and the elements and groups found within it.

Work through the tasks below. Your teacher may ask you to use your answers to plan this documentary for homework.

Task 1: Metals and non-metals

1 Look at the Periodic Table below.

| | | | | | | | | | | | | | | | | | | |
|-------------------------------|---------------------------------|-------------------------------|-------------------------------------|-------------------------------|----------------------------------|-------------------------------|-------------------------------|----------------------------------|------------------------------------|-----------------------------------|-----------------------------------|--------------------------------|----------------------------------|-----------------------------|------------------------------|-------------------------------|---------------------------|------------------------|
| A | | B | | | | | | | | | | C | | | | | | 4 |
| 7 Li Lithium 3 | 8 Be Beryllium 4 | | | | | | | | | | | 11 B Boron 5 | 12 C Carbon 6 | 14 N Nitrogen 7 | 16 O Oxygen 8 | 17 F Fluorine 9 | 18 Ne Neon 10 | 2 He Helium 2 |
| 23 Na Sodium 11 | 24 Mg Magnesium 12 | | | | | | | | | | | 13 Al Aluminium 13 | 14 Si Silicon 14 | 15 P Phosphorus 15 | 16 S Sulphur 16 | 17 Cl Chlorine 17 | 18 Ar Argon 18 | |
| 39 K Potassium 19 | 40 Ca Calcium 20 | 45 Sc Scandium 21 | 46 Ti Titanium 22 | 51 V Vanadium 23 | 52 Cr Chromium 24 | 55 Mn Manganese 25 | 56 Fe Iron 26 | 59 Co Cobalt 27 | 58 Ni Nickel 28 | 63.5 Cu Copper 29 | 65 Zn Zinc 30 | 70 Ga Gallium 31 | 72 Ge Germanium 32 | 75 As Arsenic 33 | 78 Se Selenium 34 | 80 Br Bromine 35 | 84 Kr Krypton 36 | |
| 85.5 Rb Rubidium 37 | 88 Sr Strontium 38 | 89 Y Yttrium 39 | 91 Zr Zirconium 40 | 93 Nb Niobium 41 | 98 Mo Molybdenum 42 | 98 Tc Technetium 43 | 101 Ru Ruthenium 44 | 103 Rh Rhodium 45 | 106 Pd Palladium 46 | 108 Ag Silver 47 | 112 Cd Cadmium 48 | 118 In Indium 49 | 118 Sn Tin 50 | 122 Sb Antimony 51 | 128 Te Tellurium 52 | 127 I Iodine 53 | 131 Xe Xenon 54 | |
| 133 Cs Caesium 55 | 137 Ba Barium 56 | 139 La Lanthanum 57 | 178.5 Hf Hafnium 72 | 181 Ta Tantalum 73 | 184 W Tungsten 74 | 186 Re Rhenium 75 | 190 Os Osmium 76 | 192 Ir Iridium 77 | 195 Pt Platinum 78 | 197 Au Gold 79 | 201 Hg Mercury 80 | 204 Tl Thallium 81 | 207 Pb Lead 82 | 209 Bi Bismuth 83 | 209 Po Polonium 84 | (210) At Astatine 85 | 222 Rn Radon 86 | |
| (223) Fr Francium 87 | (226) Ra Radium 88 | (227) Ac Actinium 89 | (261) Rf Rutherfordium 104 | (262) Db Dubnium 105 | (266) Sg Seaborgium 106 | (264) Bh Bohrium 107 | (277) Hs Hassium 108 | (288) Mt Meitnerium 109 | (271) Ds Darmstadtium 110 | (272) Rg Roentgenium 111 | | | | | | | | |
| D | | | | | | | | | | | | | | | | | | |
| 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | (140) Pm Promethium 61 | 150 Sm Samarium 62 | 152 Eu Europium 63 | 157 Gd Gadolinium 64 | 159 Tb Terbium 65 | 163 Dy Dysprosium 66 | 165 Ho Holmium 67 | 167 Er Erbium 68 | 169 Tm Thulium 69 | 173 Yb Ytterbium 70 | 175 Lu Lutetium 71 | | | | | |
| 232 Th Thorium 90 | 231 Pa Protactinium 91 | 238 U Uranium 92 | 237 Np Neptunium 93 | 239 Pu Plutonium 94 | 243 Am Americium 95 | 247 Cm Curium 96 | 247 Bk Berkelium 97 | 252 Cf Californium 98 | (252) Es Einsteinium 99 | (257) Fm Fermium 100 | (258) Md Mendelevium 101 | (259) No Nobelium 102 | (260) Lr Lawrencium 103 | | | | | |

a State the section of the Periodic Table in which you can find non-metals. _____

b State whether Section A contains metals or non-metals. _____

2 a Categorise the following properties into those shown by metals, non-metals, or both. Complete the table below by ticking in the column.

| Property | Metal | Non-metal |
|---|-------|-----------|
| conductor of heat and electricity | | |
| insulator of heat and electricity | | |
| shiny | | |
| low density | | |
| dull | | |
| sonorous (makes a ringing sound when hit) | | |
| brittle (breaks easily) | | |
| malleable (can be hammered into shape) | | |
| ductile (can be drawn into wires) | | |
| high density | | |
| not sonorous | | |

b An unknown element is sonorous, conducts electricity, and can be drawn into wires. State whether this unknown element is a metal or a non-metal. Explain your answer.

3 An oxide is produced when an unknown substance dissolves in water. This solution turns universal indicator orange. Explain whether the unknown substance is a metal or non-metal, and describe how the observations will be different if the unknown substance is of the other category.

Task 2: Patterns in groups and periods

1 Complete the sentences below by crossing out the incorrect answer.

The rows of the Periodic Table are called **groups/periods**.

The columns of the Periodic Table are called **groups/periods**.

2 a Look at the data provided in the table. Describe the trend shown across a period.

| | | | | |
|---------------------------|--------|-----------|-----------|---------|
| Element | sodium | magnesium | aluminium | silicon |
| Melting point (°C) | 98 | 649 | 660 | 1410 |

b Here is another set of data for a different period. Compare the data provided for the two periods.

| | | | | |
|---------------------------|---------|-----------|-------|--------|
| Element | lithium | beryllium | boron | carbon |
| Melting point (°C) | 181 | 1287 | 2076 | 3527 |

Task 3: Patterns in Group 1

The following table shows some of the trends in Group 1 elements.

| | Melting point (°C) | Boiling point (°C) | Reactivity with water |
|-----------|---------------------------|---------------------------|-------------------------------------|
| lithium | | 1330 | fizzes steadily |
| sodium | 98 | 890 | |
| potassium | 64 | | fizzes and burns with a lilac flame |
| rubidium | 39 | 688 | explodes with sparks |

1 Describe the pattern shown in the data for Group 1 elements.

2 Predict the missing properties in the table above using the patterns described in Question 1. Fill in the missing entries in the table above.

Task 4: Patterns in Group 7

The table below shows whether reactions will occur between Group 7 elements (halogen water) and Group 7 compounds in solution (potassium halide).

| | potassium fluoride | potassium chloride | potassium bromide | potassium iodide |
|----------------|---------------------------|---------------------------|--------------------------|-------------------------|
| fluorine water | X | ✓ | ✓ | |
| chlorine water | X | | | ✓ |
| bromine water | X | | X | ✓ |
| iodine water | | X | X | X |

1 Complete the table above using patterns in Group 7 elements.

2 a State what is meant by a displacement reaction.

b Describe displacement reactions using examples from the table above.

3 Predict if the following pairs of reactants will undergo displacement reactions. Write a word equation for reactions that occur. Explain your answer.

a chlorine water and sodium iodide

b bromine water and magnesium bromide

c iodine water and aluminium chloride

Task 5: Patterns in Group 0

1 The table below shows some of the properties shown by Group 0 elements.

Categorise them into chemical or physical properties by ticking the appropriate column for each property stated.

| | Physical | Chemical |
|------------------------------------|-----------------|-----------------|
| low melting points | | |
| low boiling points | | |
| colourless gas at room temperature | | |
| good insulator of heat | | |
| unreactive | | |

2 Describe the differences between chemical and physical properties. Use examples from the table above.

3 Predict if xenon will react with nitrogen. Explain your answer.

4 The boiling points of helium, neon, and argon are $-269\text{ }^{\circ}\text{C}$, $-246\text{ }^{\circ}\text{C}$, and $-186\text{ }^{\circ}\text{C}$ respectively. Predict the boiling point of krypton. Explain your answer.
