Chapter: 9: The Periodic Table
Book/PDF: Chapter-09.pdf
Pages: 1–16 (134–149)
Exam level: Cambridge IGCSE (0610)

1) Big-picture overview

This chapter introduces the **Periodic Table**, the most important tool in chemistry for organizing the elements[cite: 6, 14]. You'll learn how Dmitri Mendeleev first arranged the elements based on their properties and atomic weights, even leaving gaps for undiscovered ones[cite: 19, 21]. The modern table arranges elements by **proton number**[cite: 208]. The chapter explains that an element's position reveals its secrets: its **group** (vertical column) tells you how many electrons are in its outer shell, which determines its chemical properties[cite: 248, 250]. Its **period** (horizontal row) tells you how many electron shells it has[cite: 251]. You will explore the specific properties and reactivity trends of key groups: the reactive **alkali metals** (Group I), the colourful **halogens** (Group VII), and the unreactive **noble gases** (Group 0/VIII)[cite: 11]. Finally, you will learn the characteristic properties of the **transition metals**[cite: 478].

2) Syllabus mapping

Outcome code	Outcome description	Where covered (page)
Not specified	Describe the Periodic Table as an arrangement of elements in periods and groups.	134, 136 [cite: 20, 209, 222]
Not specified	Describe the relationship between group number and the charge of ions formed.	139, 142 [cite: 295, 296, 388, 390]
Not specified	Explain similarities in the chemical properties of elements in the same group.	137 [cite: 250]
Not specified	Describe the change from metallic to non-metallic character across a period.	137 [cite: 233]

Outcome code	Outcome description	Where covered (page)
Not specified	Describe the alkali metals (Group I) as a collection of relatively soft metals.	138 [cite: 263]
Not specified	Predict properties of other elements in Group I, given data.	134, 139 [cite: 10, 289]
Not specified	Describe the halogens (Group VII) as a group of diatomic non-metals.	141 [cite: 348]
Not specified	Describe and explain the trend in reactivity in Group VII (displacement reactions).	142 [cite: 383, 386, 398]
Not specified	Describe the noble gases (Group 0/VIII) as unreactive, monatomic gases.	145 [cite: 459, 460]
Not specified	Explain the lack of reactivity of noble gases in terms of their electron structure.	145 [cite: 463, 464]
Not specified	Describe the transition elements by their general physical and chemical properties.	145, 147 [cite: 479, 480, 482, 483, 484, 503]

3) Key terms and definitions

Term	One-sentence definition	First appears (page)	Example/application
Periodic Table	A table that categorizes all known chemical elements based on their properties, arranged by increasing proton number[cite: 14, 15, 208].	134 [cite: 13]	Used to predict how elements will react[cite: 14].
Group	A vertical column in the Periodic Table containing elements with similar chemical properties[cite: 20, 209].	134 [cite: 20]	Group I elements all have one outer electron and are very reactive[cite: 249, 257].

Term	One-sentence definition	First appears (page)	Example/application
Period	A horizontal row in the Periodic Table[cite: 20].	134 [cite: 20]	Elements in Period 3, like sodium (Na), have three occupied electron shells[cite: 237].
Alkali metals	The elements in Group I of the Periodic Table[cite: 213, 217].	136 [cite: 217]	Sodium (Na) and Potassium (K) are alkali metals[cite: 257].
Halogens	The elements in Group VII of the Periodic Table[cite: 215, 219].	136 [cite: 219]	Chlorine (Cl) and Bromine (Br) are halogens[cite: 345].
Noble gases	The unreactive elements in Group 0 (or VIII) of the Periodic Table[cite: 216, 220].	136 [cite: 220]	Helium (He) and Neon (Ne) are noble gases[cite: 455].
Transition elements	The block of metals located between Groups II and III in the Periodic Table[cite: 223].	136 [cite: 223]	Copper (Cu) and Iron (Fe) are common transition elements[cite: 478].
Metalloids	Elements that lie on the dividing line between metals and non-metals and have properties of both[cite: 229, 230].	137 [cite: 229]	Silicon (Si) is a metalloid used to make computer chips[cite: 245].
Displacement reaction	A reaction where a more reactive halogen displaces a less reactive halogen from a solution of its compound[cite: 370, 371, 373].	142 [cite: 368]	$Cl_2(g) + 2KI(aq) \rightarrow 2KCl(aq) + I_2(aq)$ [cite: 378]

4) Core concepts explained

Development of the Periodic Table (p. 134)

- Chemists began trying to organize elements about 150 years ago[cite: 7].
- In 1869, Russian chemist **Dmitri Mendeleev** created the most successful early version[cite: 17, 26].
- He arranged the 63 known elements in order of increasing **atomic weight**[cite: 19].
- Crucially, he placed elements with similar properties in the same vertical column (group) and left **gaps** for elements he predicted were yet to be discovered[cite: 19, 21].
- His predictions were proven correct when elements like Germanium were discovered, fitting perfectly into the gaps[cite: 27, 29, 30].
- The modern Periodic Table arranges the 118 known elements in order of increasing **proton number**[cite: 208].

Electronic Configuration and the Periodic Table (p. 137)

- An element's **group number** is the same as the number of electrons in its **outer shell** (except for Group 0)[cite: 248]. This is why elements in the same group have similar chemical properties[cite: 250].
- An element's **period number** is the same as the number of **occupied electron shells** in its atoms[cite: 251].
- **Example:** Sodium (Na) has an electronic configuration of 2,8,1[cite: 239].
    - It has **1 outer electron**, so it's in **Group I**[cite: 252].
    - It has electrons in **3 shells**, so it's in **Period 3**[cite: 237].
- As you go across a period, there is a gradual change from **metals** to **non-metals**[cite: 233].
- As you go down a group, the **metallic character increases** because the outer electrons are further from the nucleus, feel less attraction, and are easier to lose[cite: 253, 254, 255].

Group I – The Alkali Metals (p. 137-139)

- This group includes lithium (Li), sodium (Na), potassium (K), rubidium (Rb), caesium (Cs), and francium (Fr)[cite: 257].
- **Physical Properties:** They are soft metals with low densities, have shiny surfaces when freshly cut, and have low melting points[cite: 263, 264, 265, 266, 272].

- **Chemical Properties:**
  - They are very reactive and stored under oil to prevent contact with air or water[cite: 259].
  - They have **one outer electron** which they lose easily to form a +1 ion, achieving a stable noble gas configuration[cite: 295, 296].
  - They react vigorously with water to produce a metal hydroxide (an alkaline solution) and hydrogen gas. Example: $2K(s) + 2H_2O(l) \rightarrow 2KOH(aq) + H_2(g)$[cite: 282, 287].
- **Reactivity Trend:** Reactivity **increases** as you go **down the group**[cite: 293]. The outer electron is further from the nucleus and more easily lost[cite: 327]. Potassium is more reactive than sodium, which is more reactive than lithium[cite: 288].

Group VII – The Halogens (p. 141-142)

- This group includes fluorine (F), chlorine (Cl), bromine (Br), iodine (I), and astatine (At)[cite: 345]. They exist as **diatomic molecules** (e.g., Cl_2)[cite: 348].
- **Physical Properties:**
  - They are coloured, with the colour getting darker down the group[cite: 347].
  - The physical state at room temperature changes from gas (chlorine) to liquid (bromine) to solid (iodine)[cite: 350].
- **Chemical Properties:**
  - They have **seven outer electrons** and react by **gaining one electron** to form a stable -1 ion (halide ion)[cite: 387, 388].
  - They react with metals to form ionic metal halides. Example: $2Na(s) + Cl_2(g) \rightarrow 2NaCl(s)$[cite: 290, 292].
  - They react with hydrogen to produce hydrogen halides, which form acidic solutions in water[cite: 352].
- **Reactivity Trend:** Reactivity **decreases** as you go **down the group**[cite: 386]. It is harder for larger atoms (like bromine) to attract an incoming electron because the outer shell is further from the nucleus and shielded by more inner shells[cite: 394, 396, 397].

Group 0/VIII – The Noble Gases (p. 145)

- This group includes helium (He), neon (Ne), argon (Ar), krypton (Kr), xenon (Xe), and radon (Rn) [cite: 455].
- **Properties:**
  - They are colourless, monatomic (exist as single atoms) gases[cite: 458, 459].

    - They are very **unreactive**[cite: 460].
- **Explanation of Unreactivity:** They are unreactive because they have a **full outer shell** of electrons (2 for He, 8 for the others)[cite: 463, 466]. This is a very stable electronic configuration that is difficult to change[cite: 463]. Other elements react in order to achieve this stable configuration[cite: 464].

Transition Elements (p. 145, 147)

- This is the block of metals between Groups II and III, including familiar metals like iron, copper, and zinc[cite: 223, 478].
- **Comparison of Properties:**

Feature	Group I Metals (e.g., Sodium)	Transition Metals (e.g., Copper)
Hardness/Strength	Soft [cite: 263]	Harder and stronger [cite: 482]
Melting Point	Low [cite: 272]	High (except mercury) [cite: 484]
Density	Low [cite: 265]	Much higher [cite: 483]
Reactivity	Very reactive [cite: 259]	Less reactive [cite: 479]
Coloured Compounds	Form white solid oxides [cite: 273]	Form brightly coloured compounds [cite: 480]
Catalytic Activity	No	Yes, as elements and compounds [cite: 486]
Ion Formation	Form a fixed +1 ion [cite: 296]	Form ions with **variable oxidation numbers** (e.g., Cu^+ and Cu^{2+}) [cite: 503]

5) Diagrams and micrographs (figures)

- **Figure 9.2 Mendeleev's Periodic Table (p. 135):** Shows Mendeleev's original table with elements arranged by atomic weight[cite: 19]. It has gaps (marked with * and †) for undiscovered elements[cite: 23, 86].

- **Figure 9.3 The modern Periodic Table (p. 135):** The standard table used today, showing all 118 elements arranged by proton number[cite: 208]. It is colour-coded to show reactive metals, transition metals, metalloids, non-metals, and noble gases [cite: 194-200].
- **Figure 9.9 & 9.10 Electron shell diagrams (p. 139, 140):** Figure 9.9 shows a sodium atom (2,8,1) losing its single outer electron to become a stable sodium ion, Na^+ (2,8)[cite: 307]. Figure 9.10 shows the electron structures of Li, Na, and K, illustrating how the outer electron is in progressively further shells down the group[cite: 325].
- **Figure 9.14 Halogen electron gain (p. 142):** Shows a chlorine atom (2,8,7) gaining one electron to fill its outer shell and become a stable chloride ion, Cl^- (2,8,8)[cite: 393].
- **Figure 9.18 Coloured transition element compounds (p. 147):** Shows flasks containing brightly coloured solutions of various transition element compounds, demonstrating one of their key properties[cite: 501].

6) Processes and cycles

Reaction of Alkali Metals with Water (p. 139)

1. A piece of alkali metal (e.g., potassium) is dropped into water[cite: 282].
2. The metal reacts vigorously, often fizzing and moving across the surface[cite: 282]. For potassium, the reaction is vigorous enough to ignite the hydrogen gas produced[cite: 288, 269].
3. **Inputs:** Alkali metal (solid) + Water (liquid)
4. **Outputs:** Metal hydroxide (aqueous solution) + Hydrogen gas
5. **Equation:** $Metal(s) + Water(l) \rightarrow Metal\ hydroxide(aq) + Hydrogen(g)$
6. **Example:** $2K(s) + 2H_2O(l) \rightarrow 2KOH(aq) + H_2(g)$ [cite: 287]
7. The resulting metal hydroxide solution is alkaline[cite: 282].

Halogen Displacement Reactions (p. 142)

1. A solution of a more reactive halogen (e.g., chlorine water) is added to a solution of a less reactive halide salt (e.g., potassium iodide)[cite: 370].
2. The more reactive halogen takes the place of (displaces) the less reactive halide ion, turning it back into a halogen element[cite: 371].
3. The colour of the solution changes, indicating the presence of the newly formed halogen[cite: 439].
4. **Reactivity Series: Chlorine > Bromine > Iodine**[cite: 385].

5. **Inputs:** More reactive halogen (aqueous) + Less reactive halide salt (aqueous)
6. **Outputs:** Less reactive halogen (aqueous) + More reactive halide salt (aqueous)
7. **Example:** Chlorine displaces iodine from potassium iodide.
    - **Word Equation:** chlorine + potassium iodide → potassium chloride + iodine [cite: 375]
    - **Chemical Equation:** $Cl_2(aq) + 2KI(aq) \rightarrow 2KCl(aq) + I_2(aq)$ [cite: 378]

7) Formulae and calculations

This chapter focuses on qualitative trends and reaction equations rather than quantitative calculations. Key skills include writing and balancing symbol equations for the reactions studied.

Reaction Type	General Word Equation	Example Balanced Equation
Alkali Metal + Oxygen	metal + oxygen → metal oxide	$4Li(s) + O_2(g) \rightarrow 2Li_2O(s)$ [cite: 277]
Alkali Metal + Water	metal + water → metal hydroxide + hydrogen	$2K(s) + 2H_2O(l) \rightarrow 2KOH(aq) + H_2(g)$ [cite: 287]
Alkali Metal + Halogen	metal + halogen → metal halide	$2Na(s) + Cl_2(g) \rightarrow 2NaCl(s)$ [cite: 292]
Halogen Displacement	more reactive halogen + less reactive halide salt → less reactive halogen + more reactive halide salt	$Cl_2(aq) + 2KBr(aq) \rightarrow Br_2(aq) + 2KCl(aq)$

8) Required practicals / experiments

Halogen Displacement Reactions (p. 144)

- **Aim:** To determine the order of reactivity for chlorine, bromine, and iodine[cite: 428].
- **Apparatus:** Test tubes, solutions of chlorine water, bromine water, iodine water, sodium chloride, sodium bromide, sodium iodide, organic solvent[cite: 431, 439].
- **Method:**
    i. Add a solution of one halogen (e.g., chlorine water) to a solution of a different halide salt (e.g., sodium bromide solution) in a test tube[cite: 439].

ii. Observe any colour change. A colour change indicates a reaction has occurred and the halide has been displaced[cite: 439].
iii. To make the colours more distinct, add a small amount of organic solvent, stopper, and shake. The halogen colour will be more vivid in the upper organic layer[cite: 430, 432, 433].
iv. Repeat for all combinations of halogens and halide salts.

- **Variables:**
    - **Independent Variable (IV):** The combination of halogen and halide solution being tested.
    - **Dependent Variable (DV):** Whether a colour change occurs (i.e., whether a reaction happens).
    - **Control Variables:** Concentration of solutions, volume of solutions, temperature.
- **Safety:** Eye protection must be worn[cite: 426]. Halogens are toxic; perform in a well-ventilated area.
- **Sources of Error:** Misinterpreting subtle colour changes. Contamination of solutions.
- **Improvements:** Use a colour chart for comparison to standardize observations.
- **Expected Results:**
    - Chlorine will displace both bromine and iodine.
    - Bromine will displace iodine but not chlorine.
    - Iodine will not displace chlorine or bromine.
    - This shows the reactivity order is **Chlorine > Bromine > Iodine**[cite: 385].

9) Data handling and graphing

This chapter primarily uses **qualitative data** presented in tables to show trends.

- **Tables of Properties:** Tables 9.1-9.6 show electronic configurations for elements in different groups[cite: 238, 240, 242, 466]. Table 9.4 shows the colour and state of the halogens[cite: 364]. These are used to identify patterns (e.g., all Group I elements have 1 outer electron).
- **Results Tables:** The results from the halogen displacement practical are recorded in a table (p. 144)[cite: 442]. The table shows the combinations tested and the resulting colour changes.
- **Typical Exam Prompts:**
    - "Use the data in the table to predict the properties of francium/astatine."
    - "Explain the trend in reactivity shown in the results."
    - "Complete the table to show the expected result if bromine water is added to sodium chloride solution." (Answer: No reaction/no colour change).

10) Common misconceptions and exam tips

- **Misconception:** Reactivity *always* increases down a group.
    - **Correct Understanding:** Reactivity increases down the group for **metals** (like Group I) because they lose electrons more easily[cite: 293, 327]. Reactivity decreases down the group for **non-metals** (like Group VII) because they gain electrons less easily[cite: 386, 398].
    - **Quick Tip: M**etals **M**ore reactive down. **N**on-metals **N**ot more reactive down.
- **Misconception:** Group 0 elements are called inert gases.
    - **Correct Understanding:** They are now called **noble gases**[cite: 220]. While very unreactive, some compounds of the heavier noble gases (like xenon) have been made[cite: 462].
    - **Quick Tip:** Think "noble" as in they don't mix with other elements, not "inert" as in completely unable to react.
- **Misconception:** Chlorine is a liquid.
    - **Correct Understanding:** At room temperature, chlorine is a pale yellow-green **gas**, bromine is a red-brown **liquid**, and iodine is a grey-black **solid**[cite: 350, 365].
    - **Quick Tip:** Remember the states in order down the group: Gas → Liquid → Solid (GLS).
- **Exam Tip:** When explaining reactivity trends, *always* link it back to the **ease of losing or gaining electrons** due to the distance from the nucleus and electron shielding.

11) Exam-style practice

Multiple Choice Questions (MCQs)

1. Which element is in Group VII and Period 3?
   A) Sodium (Na)
   B) Bromine (Br)
   C) Chlorine (Cl)
   D) Argon (Ar)
   Answer: C. *Chlorine has electron configuration 2,8,7 (7 outer electrons = Group VII; 3 shells = Period 3).*
2. What is the trend in reactivity for the Group I alkali metals?
   A) Decreases down the group
   B) Increases down the group
   C) Stays the same
   D) Increases then decreases

Answer: B. *The outer electron is lost more easily from larger atoms lower down the group.* [cite: 293]

3. Astatine (At) is at the bottom of Group VII. What is its likely state at room temperature?

   A) Gas

   B) Liquid

   C) Solid

   D) Plasma

   Answer: C. *The trend down Group VII is Gas (Cl) → Liquid (Br) → Solid (I), so Astatine will also be a solid.* [cite: 350]

4. Which of the following is NOT a property of transition metals?

   A) They form coloured compounds

   B) They have low densities

   C) They can be used as catalysts

   D) They have high melting points

   Answer: B. *Transition metals have high densities compared to Group I and II metals.* [cite: 483]

5. What happens when chlorine gas is bubbled through potassium bromide solution?

   A) No reaction occurs

   B) A brown solution of bromine is formed

   C) A black solid of iodine is formed

   D) A colourless solution is formed

   Answer: B. *Chlorine is more reactive than bromine and will displace it from its salt solution.* [cite: 385]

6. Why are the noble gases unreactive?

   A) They have a full outer shell of electrons

   B) They are all gases at room temperature

   C) They have low boiling points

   D) They are monatomic

   Answer: A. *A full outer electron shell is a very stable configuration.* [cite: 463]

7. How did Mendeleev originally arrange the elements in his Periodic Table?

   A) By increasing proton number

   B) By increasing atomic weight

   C) In alphabetical order

   D) By increasing melting point

   Answer: B. *Mendeleev arranged the elements by atomic weight, which was later revised to proton number.* [cite: 19]

8. An element has the electronic configuration 2,8,2. In which group and period is it found?

   A) Group 2, Period 2

   B) Group 8, Period 2

C) Group 2, Period 3

D) Group 3, Period 2

Answer: C. *2 outer electrons = Group II; 3 occupied shells = Period 3.* [cite: 248, 251]

9. What are the products when sodium reacts with water?

   A) Sodium oxide and hydrogen

   B) Sodium hydroxide and oxygen

   C) Sodium oxide and oxygen

   D) Sodium hydroxide and hydrogen

   Answer: D. *Alkali metals react with water to form a metal hydroxide and hydrogen gas.* [cite: 282]

10. Which statement about the position of hydrogen is correct?

    A) It fits perfectly into Group I

    B) It fits perfectly into Group VII

    C) Its properties are unique and it doesn't fit neatly into any group

    D) It is a noble gas

    Answer: C. *Hydrogen has unique properties, sharing some similarities with Group I and Group VII but not fitting the trends of either.* [cite: 511, 512]

Short-Answer Questions

1. **State two physical properties of alkali metals.**
   - They are soft metals[cite: 263].
   - They have low densities / low melting points[cite: 265, 272].
2. **Explain why chlorine is more reactive than iodine.**
   - Reactivity in halogens is about gaining an electron[cite: 388].
   - Chlorine's outer shell is closer to the nucleus than iodine's[cite: 394].
   - Therefore, the incoming electron is more strongly attracted by the positive nucleus in chlorine, making it more reactive[cite: 395].
3. **Write a balanced chemical equation for the reaction between lithium and oxygen.**
   - $4Li(s) + O_2(g) \rightarrow 2Li_2O(s)$[cite: 277].
4. **Describe two properties that are typical of transition metals but not of Group I metals.**
   - Transition metals form coloured compounds, whereas Group I compounds are white[cite: 480, 273].
   - Transition metals have high melting points/densities, whereas Group I metals have low melting points/densities[cite: 483, 484, 265, 272]. (Also accept catalytic activity or variable oxidation states).
5. **What would you observe when bromine water is added to a solution of potassium iodide?**
   - The solution would turn brown/orange-brown[cite: 442].

- This is because bromine is more reactive than iodine and displaces it from the solution[cite: 385].

Structured Questions

1. The table shows information about the first three elements in Group VII.

Halogen	**Symbol**	**State at RTP**	**Colour**	**Electronic Config.**
Fluorine	F	Gas	Pale yellow	2,7
Chlorine	Cl	Gas	Pale yellow-green	2,8,7
Bromine	Br	Liquid	Red-brown	2,8,18,7
a) **PREDICT** the state and colour of iodine (I), the next halogen in the group. [2]				
b) **EXPLAIN** why all these elements are placed in Group VII. [1]				
c) **WRITE** a balanced chemical equation for the displacement reaction between chlorine and potassium bromide. [2]				
Marking Points:				

- a) State: **Solid** [1]. Colour: **Grey-black** [1][cite: 365].
- b) They all have **7 electrons** in their outer shell [1][cite: 387].
- c) $Cl_2(aq) + 2KBr(aq) \rightarrow 2KCl(aq) + Br_2(aq)$ [1 for correct formulae, 1 for balancing].

2. Sodium is a typical alkali metal in Group I.
   a) **DESCRIBE** what you would see when a small piece of sodium is added to water containing universal indicator. [3]
   b) When sodium reacts, it forms a positive ion, Na^+. **DRAW** the electronic structure of a sodium

ion. [2]

c) **COMPARE** the reactivity of sodium with that of potassium, explaining your reasoning in terms of atomic structure. [3]

Marking Points:

- a) Sodium **fizzes/bubbles** [1]. It **melts into a silvery ball** and moves on the surface [1]. The indicator turns **blue/purple** because an alkaline solution is formed [1][cite: 282].
- b) A central nucleus (labelled Na+ or 11p) [1]. Two electron shells with the configuration **2,8** [1][cite: 307].
- c) Potassium is **more reactive** than sodium [1][cite: 288]. A potassium atom is larger/has more shells than a sodium atom [1]. Its outer electron is further from the nucleus and so is **lost more easily** [1][cite: 327].

12) Quick revision checklist

- [ ] I can define Group, Period, Alkali Metal, Halogen, and Noble Gas.
- [ ] I can explain that elements in the same group have similar properties because they have the same number of outer electrons.
- [ ] I can state that the period number equals the number of occupied electron shells.
- [ ] I can describe the physical properties of Group I metals (soft, low density).
- [ ] I can describe the trend in reactivity for Group I metals (increases down the group) and explain why.
- [ ] I can write balanced equations for the reactions of alkali metals with water and oxygen.
- [ ] I can describe the physical properties of Group VII halogens (coloured, diatomic, changing state down the group).
- [ ] I can describe the trend in reactivity for Group VII halogens (decreases down the group) and explain why.
- [ ] I can describe halogen displacement reactions and predict their outcomes.
- [ ] I can explain why Group 0 noble gases are unreactive (full outer shell).
- [ ] I can list at least four properties of transition metals that distinguish them from Group I metals (e.g., higher density, coloured compounds, catalytic, variable oxidation states).

13) Flashcards (ready-to-use)

Question	Answer
What is a Group in the Periodic Table?	A vertical column. Elements in it have similar chemical properties and the same number of outer electrons[cite: 20, 209].
What is a Period in the Periodic Table?	A horizontal row. Elements in it have the same number of occupied electron shells[cite: 20, 251].
How did Mendeleev arrange his Periodic Table?	In order of increasing atomic weight, leaving gaps for undiscovered elements[cite: 19, 21].
How is the modern Periodic Table arranged?	In order of increasing proton number[cite: 208].
What are Group I elements called?	The alkali metals[cite: 217].
What is the reactivity trend in Group I?	It increases down the group[cite: 293].
Why does reactivity increase down Group I?	Atoms get larger, the outer electron is further from the nucleus and is lost more easily[cite: 327].
Products of alkali metal + water?	Metal hydroxide + hydrogen gas[cite: 282].
What are Group VII elements called?	The halogens[cite: 219].
What is the reactivity trend in Group VII?	It decreases down the group[cite: 386].
Why does reactivity decrease down Group VII?	Atoms get larger, making it harder for the nucleus to attract the extra electron needed[cite: 394, 397].
What happens if chlorine water is added to potassium iodide solution?	A reaction occurs. The solution turns brown as iodine is displaced. $Cl_2 + 2KI \rightarrow 2KCl + I_2$[cite: 378].
What are Group 0 elements called?	The noble gases[cite: 220].

Question	Answer
Why are noble gases unreactive?	They have a full, stable outer shell of electrons[cite: 463].
State three properties of transition metals.	High density, high melting point, form coloured compounds, act as catalysts, have variable oxidation states[cite: 480, 483, 484, 486, 503].

14) 60-second recap

The Periodic Table organises elements by increasing proton number into vertical groups and horizontal periods. An element's group number tells you its outer electron count, defining its chemical properties, while the period number shows how many electron shells it has. Group I alkali metals are soft, low-density, and highly reactive, with reactivity increasing down the group as atoms lose their single outer electron more easily. Group VII halogens are reactive non-metals that exist as diatomic molecules, with reactivity decreasing down the group as it becomes harder to gain an electron. A more reactive halogen can displace a less reactive one from its salt solution. Group 0 noble gases are unreactive due to their stable, full outer electron shells. Transition metals are hard, dense, form coloured compounds, and act as catalysts.

15) References to pages

16) Excluded "Going further" sections (not summarized)

Section title	Pages
Mendeleev arranged all the 63 known elements...	134
Group II the alkaline earth metals	140
Uses of the halogens	143
Total excluded: 3	