HIGH SCHOOL CHEMISTRY

CHAPTER 3

Set 3: Periodic Table and Trends

Free Sample

Sample pages taken from the full Periodic Table and Trends study set. Try them, then get the whole set.

Try it, then get the whole set

7	5	20	★
files in the full set	sample sections	original diagrams	Honors kept separate

- Sample pages from the notes, revision sheets, traps, practice, flashcards and lab skills
- Answers included for every sample question
- Honors material clearly marked so Regular students can skip it

For high school chemistry, Regular and Honors. Chapter 3: Electrons and the Periodic Table, Set 3 of 3.

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FREE SAMPLE · SET 3 OF 3

Try the Periodic Table and Trends set before you buy

This free sampler shows you sample pages taken from six of the seven files in the full **Periodic Table and Trends** study set: the notes, the revision sheets, the exam traps, the practice questions, the flashcards and the lab skills.

7	20	★	✓
files in the full set	original diagrams	Honors kept separate	answers for everything

What's in the full Periodic Table and Trends set

File	What it does for you
1 · Complete Study Notes	14 lessons on how the table is built and the five periodic trends, with real element data.
2 · Quick Revision Sheets	The whole set on a few pages: trend maps, tables, a flowchart and a one-page cheat sheet.
3 · Exam Traps and Mistakes	The mistakes that cost points on trend questions, and how to dodge each one.
4 · Practice Question Bank	Questions by topic, easy to hard, with full worked answers.
5 · Quizzes and Unit Test	Quizzes and a unit test, with an explained answer key.
6 · Glossary and Flashcards	Every key term defined, plus cut-out flashcards.
7 · Lab Skills for Tests	Five trend data sets to graph and read, plus test-style lab questions, with answers.

NOTE | Regular or Honors?

Honors material sits in blue boxes marked ★ HONORS . Regular students can skip every one of them and still master the topic.

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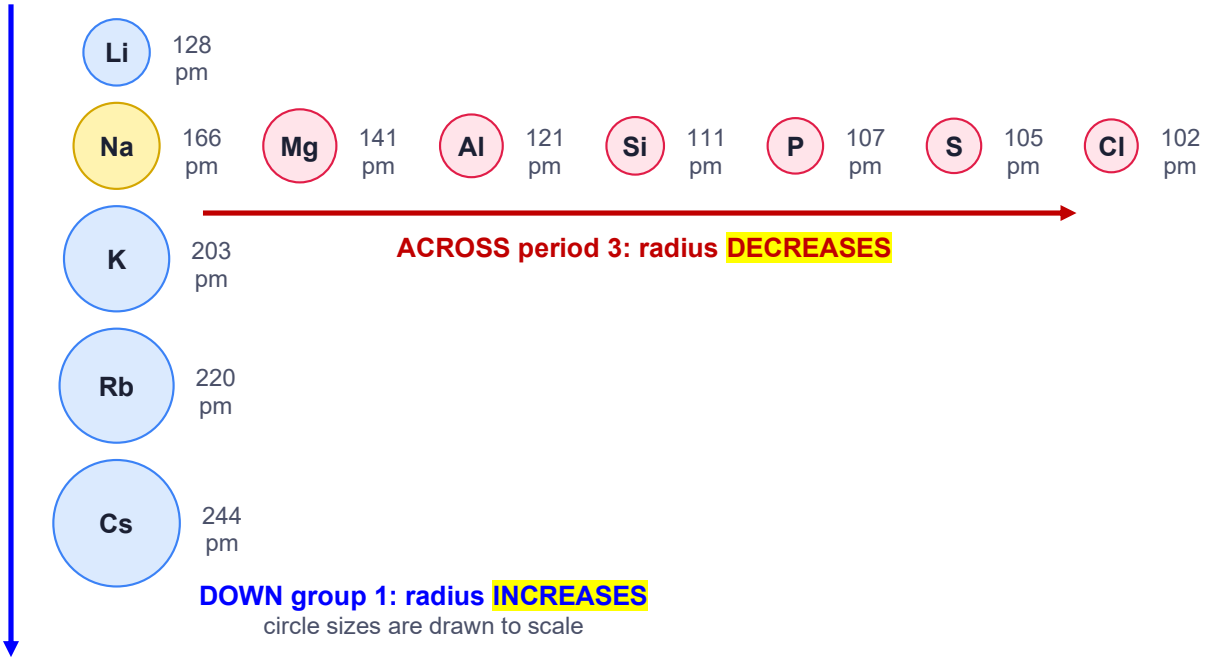
SAMPLE 1 From the Complete Study Notes

SAMPLE PAGE | FREE SAMPLE

This page is taken from Complete Study Notes, one of the seven files in the full Periodic Table and Trends set.

DEFINITION | Atomic radius

The **atomic radius** is half the distance between the nuclei of two identical atoms bonded together. It is measured in **picometers** (pm); 1 pm = 10^{-12} m.



Sizes to scale: atomic radius increases down group 1 (Li 128 pm to Cs 244 pm) and decreases across period 3 (Na 166 pm to Cl 102 pm).

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WORKED EXAMPLE | Rank three atoms by size

Rank **potassium (K)**, **magnesium (Mg)** and **sulfur (S)** from the largest atom to the smallest.

Step 1. Find each element on the table. K: period 4, group 1. Mg: period 3, group 2. S: period 3, group 16.

Step 2. Compare the two in the same period. Mg and S are both in period 3. S is farther right, so it has more protons pulling on the same energy level. **S is smaller than Mg.**

Step 3. Bring in the third element. K is one period lower than Mg (one more energy level) and also farther left. Both rules say K is larger. **K is larger than Mg.**

Answer: K > Mg > S. Real values: K 203 pm, Mg 141 pm, S 105 pm.

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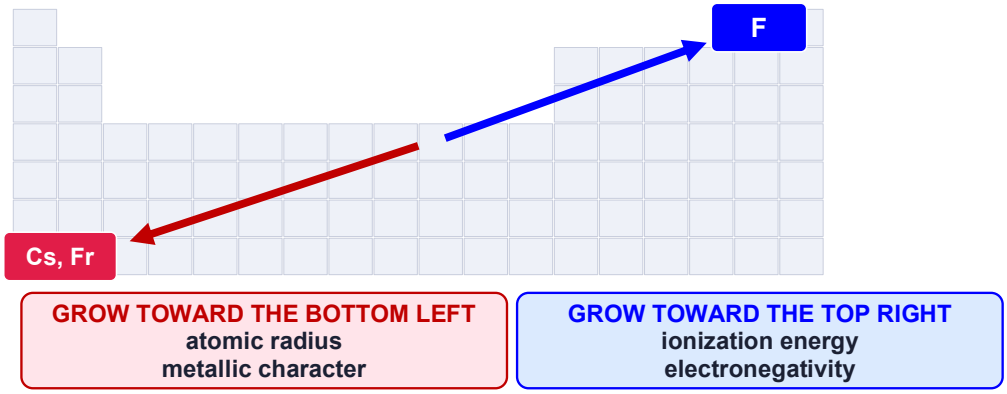
SAMPLE 2 From the Quick Revision Sheets

SAMPLE PAGE | FREE SAMPLE

This page is taken from Quick Revision Sheets, one of the seven files in the full Periodic Table and Trends set.

Two corners, four trends



MEMORY TRICK | Two corners

Bottom left: biggest atoms, most metallic. **Top right:** highest ionization energy and electronegativity (fluorine). Noble gases aside.

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SAMPLE 3 From Exam Traps and Mistakes

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These traps are taken from Exam Traps and Mistakes, one of the seven files in the full Periodic Table and Trends set.

EXAM TRAP 11 | Explaining with “more electrons”

✗ WHAT STUDENTS WRITE	✓ WHAT EARNS THE POINTS
“Chlorine has more electrons than aluminum, so chlorine is the larger atom.”	Chlorine is **smaller** (102 pm vs 121 pm). It has **more protons**, and its extra electrons go into the **same energy level**, so the stronger nucleus pulls that level in closer.

Why it’s wrong: Across a period the extra electrons do not add a new level. The extra protons are what change the pull.

MEMORY TRICK **Across: more protons, same level.**

EXAM TRAP 17 | Ranking ions by the size of their atoms

✗ WHAT STUDENTS WRITE	✓ WHAT EARNS THE POINTS
“A sodium atom is bigger than a chlorine atom, so Na^+ is bigger than Cl^-.”	Count first. Na^+ has lost its outer level (10 electrons); Cl^- has gained one (18 electrons). **Cl^- is larger** (167 pm vs 116 pm).

Why it’s wrong: Forming ions shrinks the metal and swells the nonmetal, so the order of the atoms can flip.

MEMORY TRICK **Ions? Count electrons first.**

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EXAM TRAP 23 | Linking a high IE to a reactive metal

✗ WHAT STUDENTS WRITE	✓ WHAT EARNS THE POINTS
“Cesium is very reactive because it has a high ionization energy.”	Cesium is reactive because its ionization energy is **low** (376 kJ/mol). Its outer electron comes off easily.

Why it’s wrong: Metals react by losing electrons, so the easier the electron leaves, the more reactive the metal.

MEMORY TRICK **Low IE, lively metal.**

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SAMPLE 4 From the Practice Question Bank

SAMPLE PAGE | FREE SAMPLE

These questions are taken from Practice Question Bank, one of the seven files in the full Periodic Table and Trends set.

Try these five, then check your answers below.

Q30 Which atom is larger, **strontium** or **beryllium**? Explain.

Q34 Mg^{2+}, Na^{+} and F^{-} all have 10 electrons. Rank them from **smallest to largest**.

Q56 Rank from **lowest to highest** first ionization energy: phosphorus, cesium, sodium.

Q43 Which is more electronegative, **bromine** or **calcium**? Explain.

Q81 L3 ★ HONORS Element X is in period 6. Its first three ionization energies are 503, 965 and 3600 kJ/mol. Which group is X in, and which element is it?

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ANSWER KEY | Answers

Q30 Strontium (195 pm vs 96 pm).

Both are in group 2. Strontium is in period 5 and beryllium in period 2, so strontium has three more energy levels and its outer electrons are much farther from the nucleus.

Q34 $Mg^{2+} < Na^{+} < F^{-}$

Same number of electrons, so count protons: Mg 12, Na 11, F 9. The more protons, the tighter the pull and the smaller the ion (86, 116 and 119 pm).

Q56 Cs < Na < P

Cesium is below sodium in group 1 (farther electrons). Phosphorus is right of sodium in period 3 (more protons). Values: 376, 496 and 1012 kJ/mol.

Q43 Bromine (2.96 vs 1.00).

Both are in period 4. Bromine has 35 protons and calcium 20, and their bonding electrons are in the same energy level, so bromine pulls much harder on shared electrons.

Q81 ★ HONORS Group 2: barium

$$\frac{IE_3}{IE_2} = \frac{3600}{965} \approx 3.7 \text{ (big jump)}$$

The first step is much smaller (965 ÷ 503 ≈ 1.9). The big jump comes after the 2nd electron, so X has 2 valence electrons (group 2). The group 2 element in period 6 is barium.

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SAMPLE 5 Flashcards and Lab Skills

SAMPLE PAGE | FREE SAMPLE

These cards are taken from Glossary and Flashcards, one of the seven files in the full Periodic Table and Trends set.

Front	Back
Period	A horizontal row of the periodic table. There are 7 periods.
Group (family)	A vertical column of the periodic table, numbered 1 to 18. Elements in the same group have similar chemical properties.
First ionization energy	The energy needed to remove one electron from a neutral atom in the gas state, usually in kJ/mol.
Electronegativity	The ability of an atom in a chemical bond to attract the shared electrons toward itself. It is measured on the Pauling scale, which has no unit.

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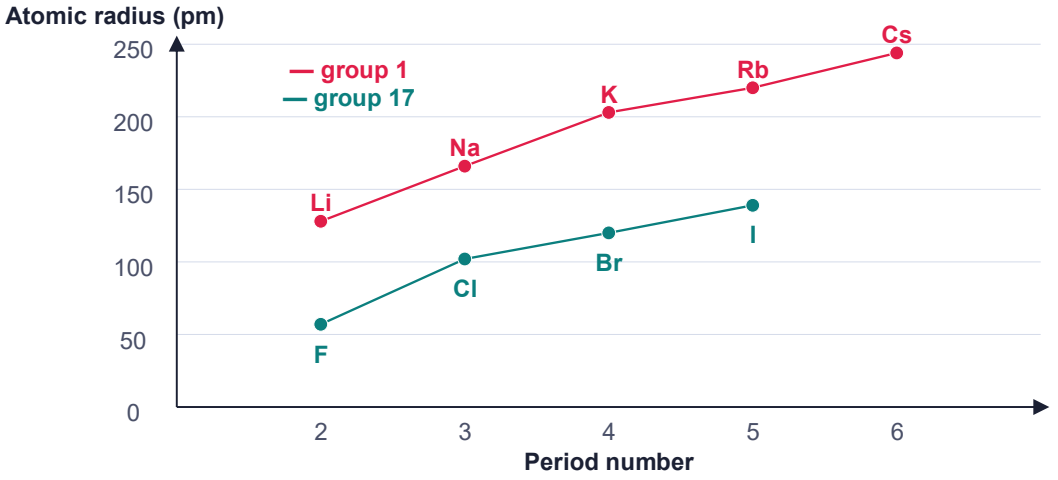
SAMPLE PAGE | FREE SAMPLE

This data set is taken from Lab Skills for Tests, one of the seven files in the full Periodic Table and Trends set.

Data Set C · Atomic Radius Down Two Groups

What the student did: A student graphed the atomic radius of the group 1 and group 17 elements against period number, so the two groups could be compared on one graph. The reference table had no value for astatine, the period 6 halogen.

Period	Group 1	Radius (pm)	Group 17	Radius (pm)
2	Li	128	F	57
3	Na	166	Cl	102
4	K	203	Br	120
5	Rb	220	I	139
6	Cs	244	At	no value



The student's graph: group 1 in red, group 17 in teal.

C2 Describe how atomic radius changes down each group, and give the cause.

C3 In period 4, potassium is 203 pm and bromine is 120 pm. Explain the difference.

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ANSWER KEY | What the data show

C2 Both lines rise: radius increases down group 1 (128 to 244 pm) and down group 17 (57 to 139 pm). Cause: each step down adds an energy level, so the outer electrons are farther from the nucleus.

C3 Bromine has 35 protons and potassium has 19. Both use the same outer (fourth) energy level, so bromine's 16 extra protons pull its electrons much closer.

The full file has five data sets like this one, plus test-style lab questions, all with answers.

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Get the Full Periodic Table and Trends Set

You've seen a few pages. The full set covers **the whole periodic table and all five trends**, start to finish.

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Also in this series: Set 1, Light and Atomic Models, and Set 2, Electron Configurations. Each set works on its own.

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