

# 2023 Ch H1 Q8

Section: Chemical Changes and Structure

Topic: Periodicity

## Question Summary

Which of the following statements is true?

A: The sodium atom is larger than the sodium ion.

B: The chloride ion is smaller than the chlorine atom.

C: The magnesium ion is larger than the magnesium atom.

D: The oxygen atom is larger than the oxide ion.

## Worked Solution

- Sodium atom vs sodium ion: Na atom loses an electron to form  $\text{Na}^+$ , reducing electron-electron repulsion, so  $\text{Na}^+$  is smaller, meaning the atom is larger → statement A is correct so far.
- Chloride ion vs chlorine atom: Cl atom gains an electron to form  $\text{Cl}^-$ , increasing repulsion, so  $\text{Cl}^-$  is larger, not smaller →

statement B is false.

- Magnesium atom vs ion: Mg atom loses 2 electrons to form  $\text{Mg}^{2+}$ , making the ion much smaller, so statement C is false.
- Oxygen atom vs oxide ion: O atom gains 2 electrons to form  $\text{O}^{2-}$ , making the ion larger, not smaller → statement D is false.

## **Final Answer**

**A — The sodium atom is larger than the sodium ion**

## **Revision Tips**

- Positive ions are smaller than their atoms (loss of electrons reduces size).
- Negative ions are larger than their atoms (gain of electrons increases repulsion).
- Watch out for common exam traps:  $\text{Cl}^-$  is bigger than Cl,  $\text{O}^{2-}$  is bigger than O.