

Concept 14

Ionic Radius

The Golden Rule: Cations Shrink,
Anions Expand.

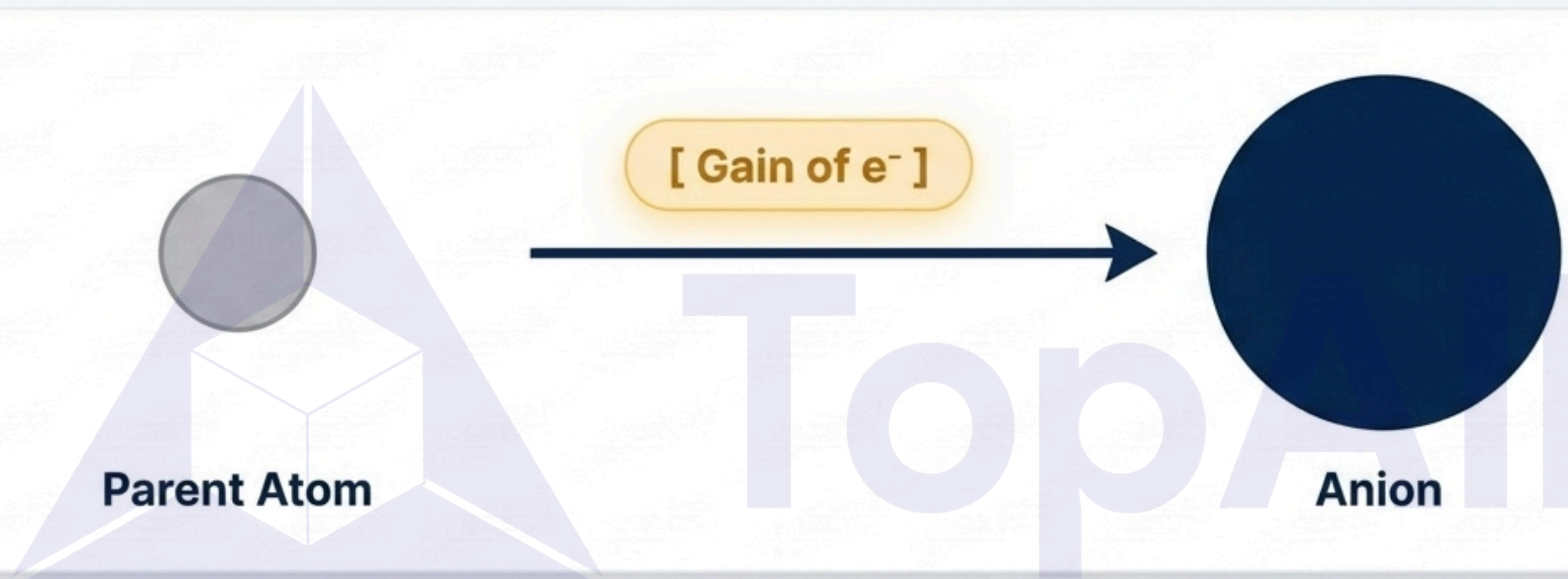


Cation Formation: Why Do They Shrink?



- Protons stay the same, but electrons decrease.
- This creates a greater effective nuclear charge.
- The nucleus pulls the remaining electrons tighter.

Anion Formation: Why Do They Expand?



- Protons stay the same, but electrons increase.
- This increases electron-electron repulsion.
- The effective nuclear charge drops, and the electron cloud expands.



You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



The Evidence: Parent vs. Ion

Sodium (Na) → Cation

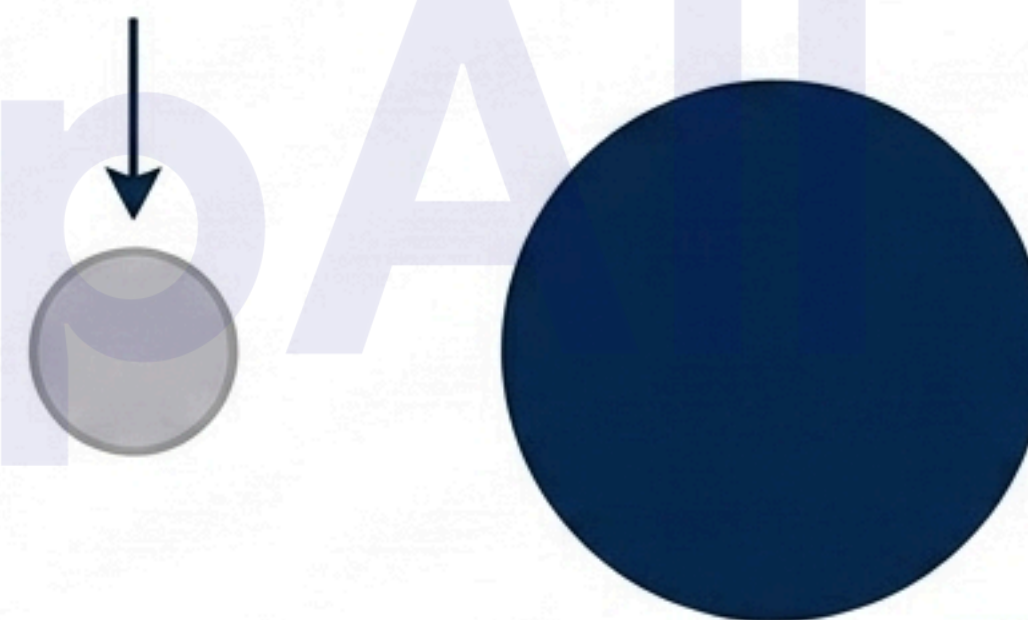
Na = **186** pm → Na⁺ = **95** pm



~50% reduction in size

Fluorine (F) → Anion

F = **64** pm → F⁻ = **136** pm



>100% increase in size

The Level-Up: Isoelectronic Species



Isoelectronic = Species containing the exact same number of electrons (e^-).



8 Protons | 10 Electrons



9 Protons | 10 Electrons



11 Protons | 10 Electrons



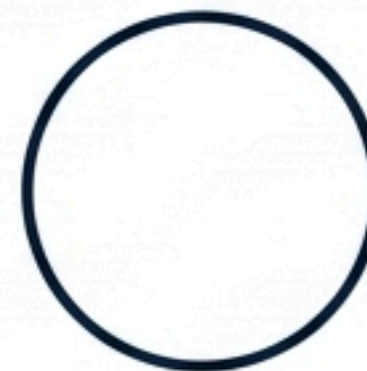
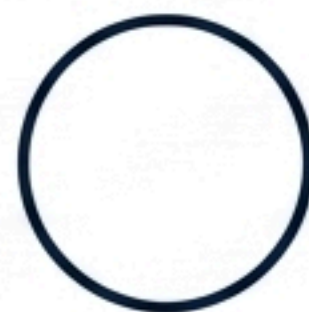
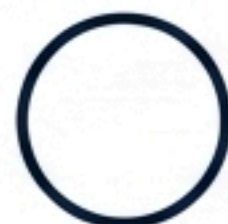
12 Protons | 10 Electrons

The Isoelectronic Rule

When electrons are identical, Nuclear Charge (**Z**) is the tie-breaker.
Higher positive charge = Stronger pull = Smaller radius.

$$\text{Radius} \propto 1/Z$$

for isoelectronic species



! The JEE Trap

Which species has the smallest ionic radius?

N^{3-} , O^{2-} , F^- , Na^+ , Mg^{2+}

The Trap

Trying to memorize individual radii or guessing based on atomic mass.

The Hack

Spot the isoelectronic series! They ALL have exactly 10 electrons. Just find the highest Z (Protons).

Magnesium ($Z=12$) has the highest positive charge.

Final Answer: Mg^{2+} is the smallest.



You've Learned the Theory.

Now Let's Test It.

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