

UNIT 4 • d- AND f-BLOCK ELEMENTS

Oxidation States of the Actinoids

Understanding the energetic staircase of the 5f series.

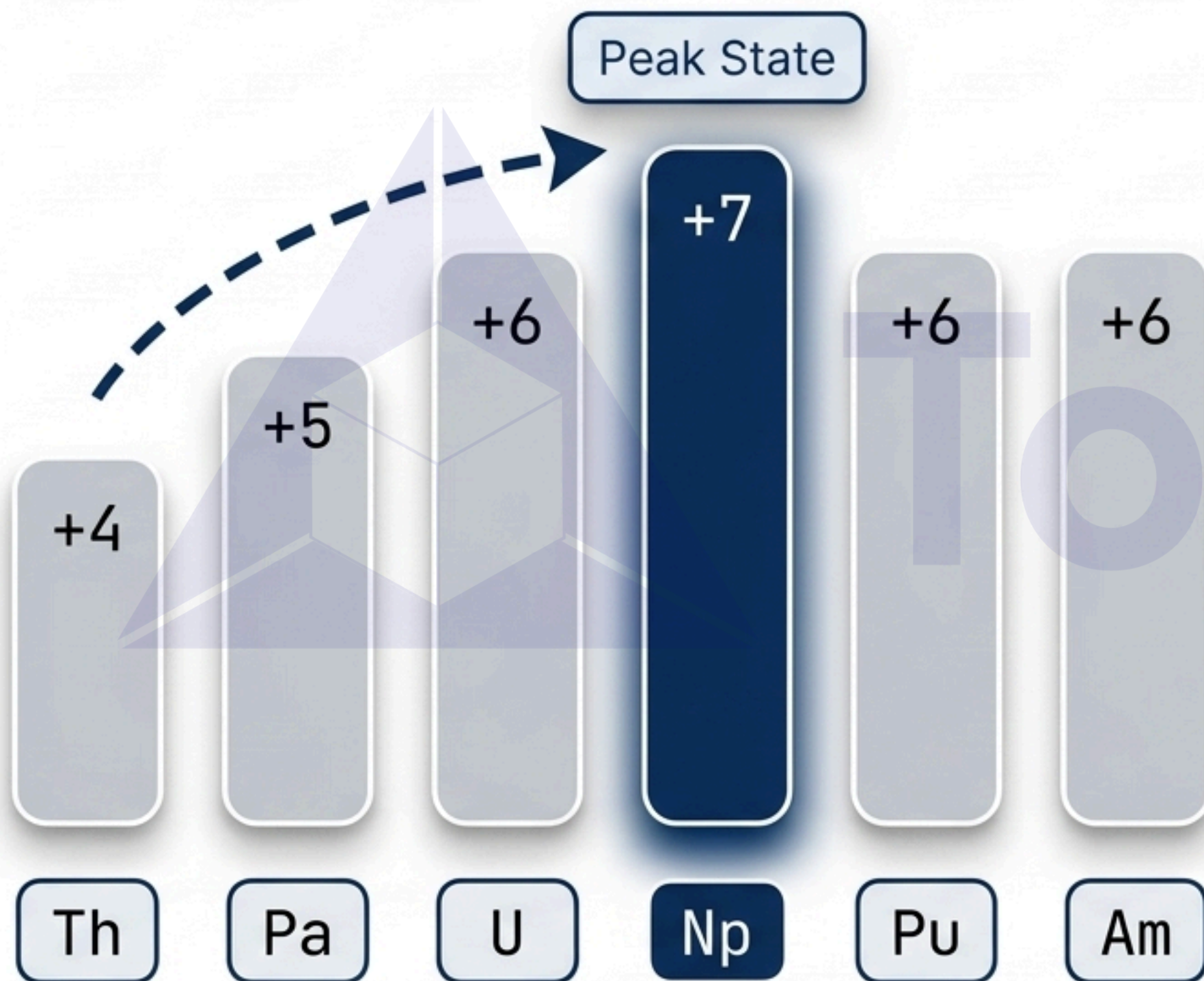
Wide Oxidation-State Range

Unlike lanthanoids, actinoids exhibit highly variable oxidation states, particularly in the first half of the series.

Comparable Energies

The energetic proximity of the outer orbitals $5f$ $6d$ $7s$ a greater number of electrons to participate in bonding.

Maximum Oxidation States: The Early Actinoids



The early actinoids show a steady climb in maximum oxidation state, **peaking at Neptunium.**



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

$$E=mc^2$$



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Practice Now



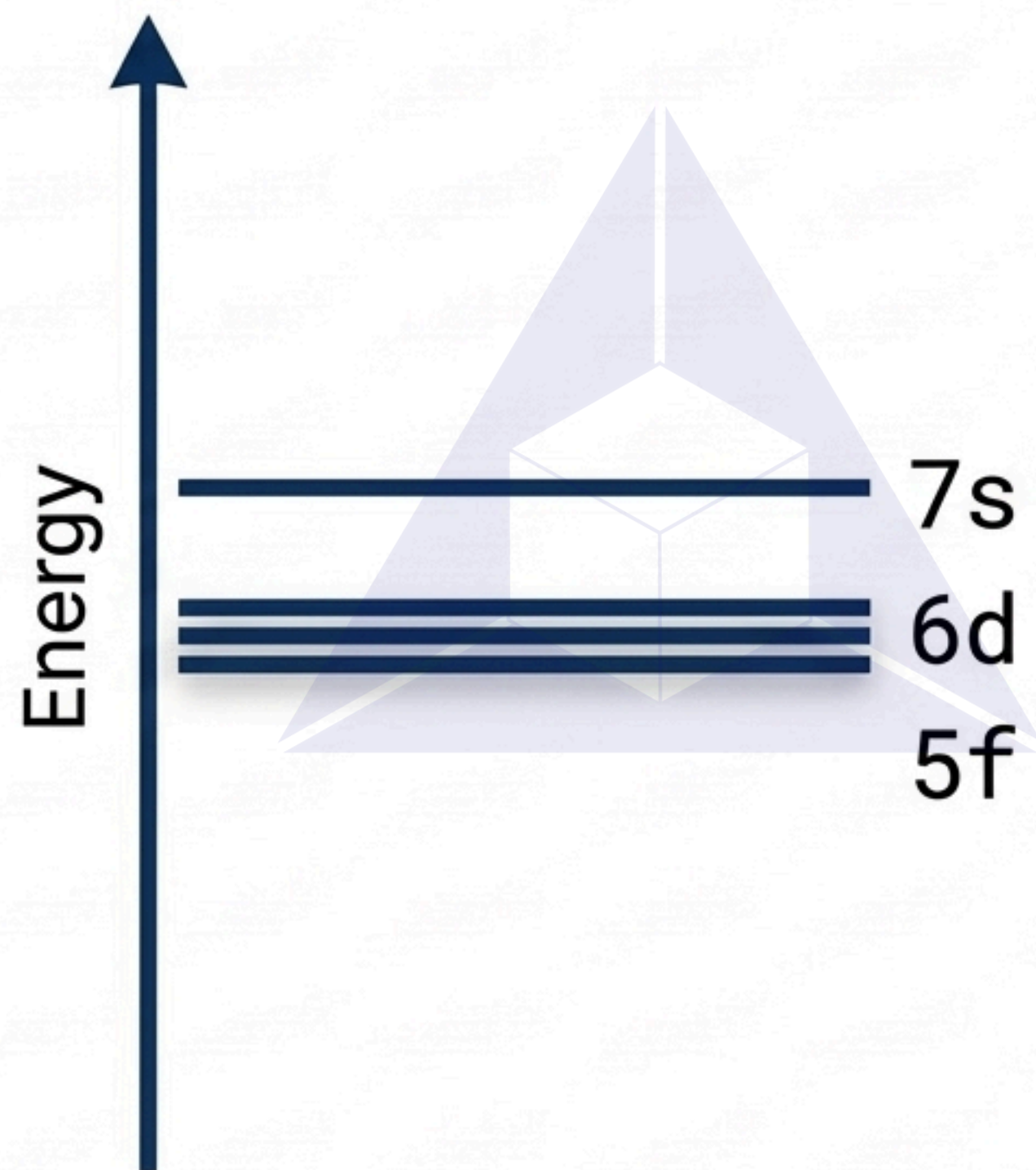
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Key Highlights

- » Free Study Material, Videos & Infographics
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Energy Level Proximity in Early Actinoids



$$5f \approx 6d \approx 7s$$

Why the high states? Because these levels are of comparable energies, all outer electrons can be lost or shared. This pushes the maximum state to +7 before the 5f electrons become too deeply buried in later elements.

Watch for this common assumption...

The Trap:

Assuming that because actinoids are **f-block elements**, their early members are strictly +3 dominant like the lanthanoids.

The Reality:

While +3 becomes the general state later, the **first half** of the **actinoid series thrives** on **higher** oxidation states due to those comparable orbital energies.

~~+3~~
only +7

Actinoid Oxidation States MCQ

Which of the following actinoids exhibits the highest maximum oxidation state (+7) due to the comparable energies of its 5f, 6d, and 7s orbitals?

A) Thorium

B) Uranium

C) Neptunium



D) Curium

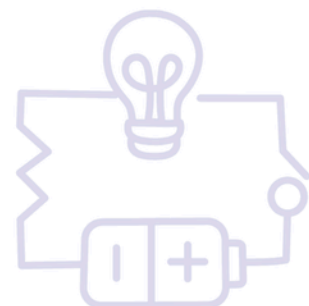
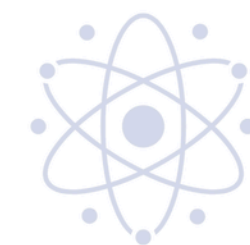
Key Takeaways

- **The Staircase Trend:** Early actinoid oxidation states climb steadily from Th (+4) up to a peak at Np (+7) before decreasing in later elements.
- **The Driving Force:** This wide range is possible because the 5f, 6d, and 7s orbitals have comparable energies, allowing **all of them** to participate in bonding.



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