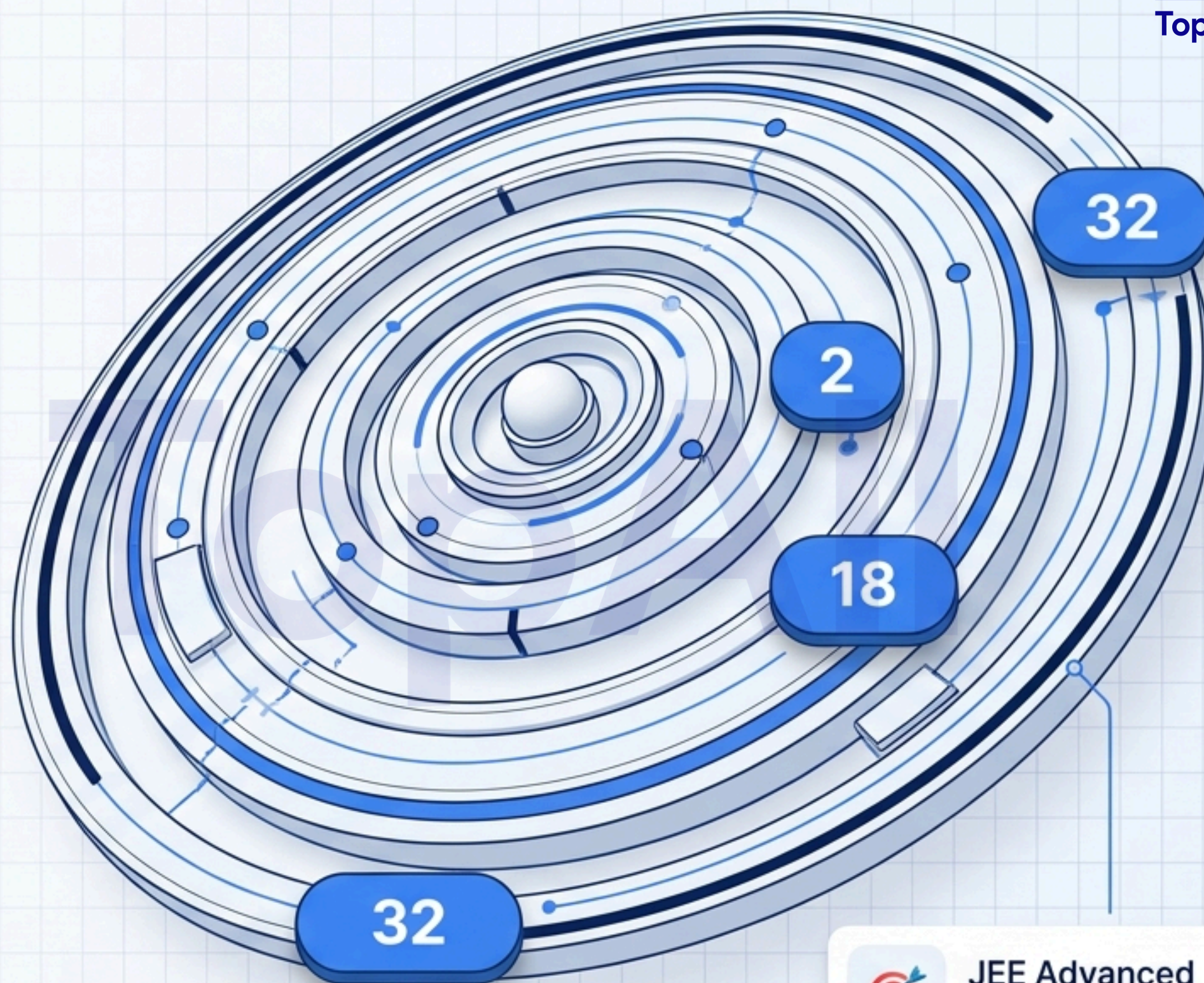
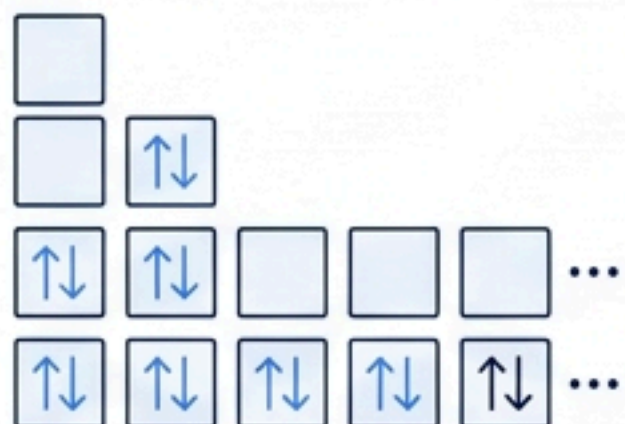


Why Period Lengths Are 2, 8, 18, 32.

Decoding the mathematical architecture of the Periodic Table through electronic configurations.



Capacity Counters



■ Navy hex 000080

■ Info Blue

■ Success Green

■ Warning Amber

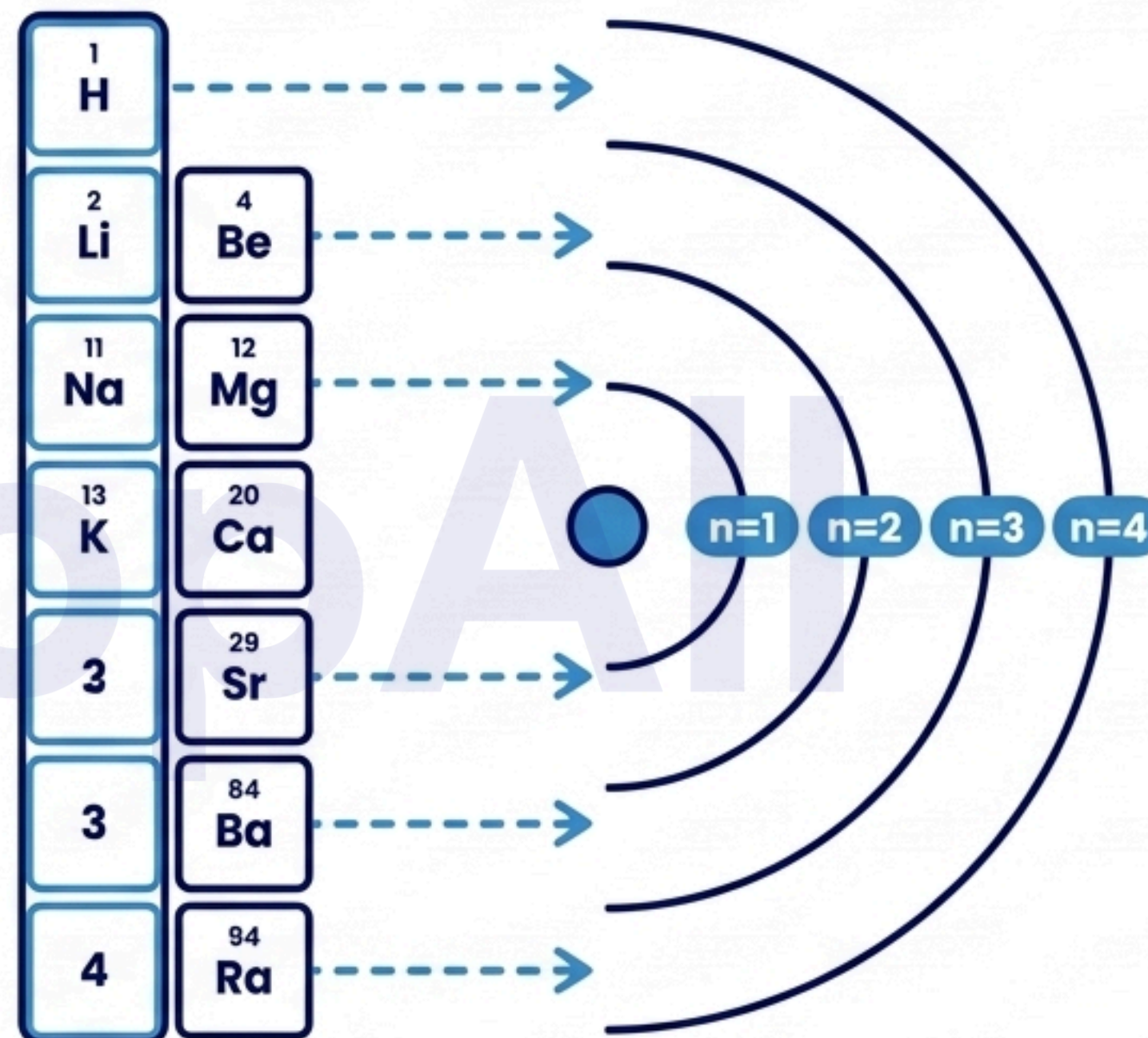


JEE Advanced
Core Concept

The Fundamental Axiom: Period = Outermost Shell

**Period Number
=
Highest Principal
Quantum Number (n)**

Successive periods in the Periodic Table are associated with the filling of the next higher principal energy level.



The elements' location directly reflects the quantum numbers of the last orbital filled.

Periods 1–3: The Baseline Pattern

Period 1: $n=1$

1s



1 orbital $\times$ 2 = 2 Elements (H, He)

Period 2: $n=2$

2s



2p



4 orbitals $\times$ 2 = 8 Elements (Li to Ne)

Period 3: $n=3$

3s



3p



4 orbitals $\times$ 2 = 8 Elements (Na to Ar)

Notice the pattern? Elements per
period = Available Orbitals $\times$ 2.



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$$E=mc^2$$



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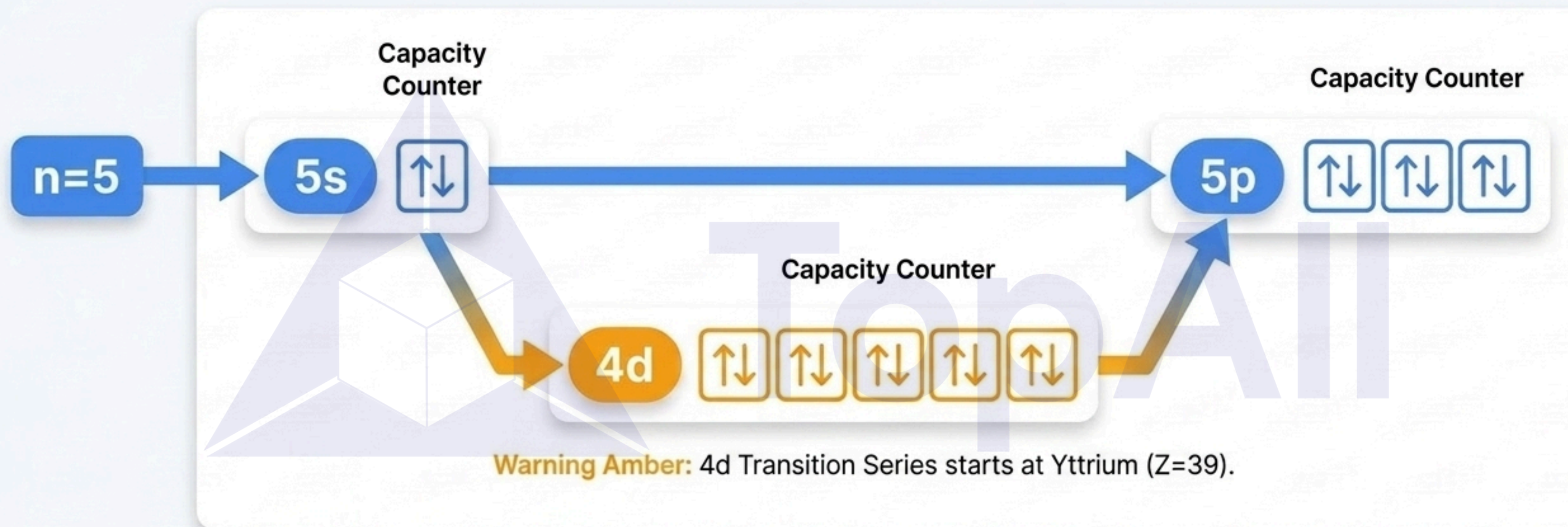


Period 4: The 3d Energy Anomaly



$1 (4s) + 5 (3d) + 3 (4p) = 9 \text{ Orbitals}$
 $9 \text{ Orbitals} \times 2 e^- = 18 \text{ Elements (Ends at Krypton).}$

Period 5: Replicating the Pattern



- Calculation: $5s < 4d < 5p$
- Total available orbitals = 9.
- Maximum electrons accommodated = 18.
- Result: 18 elements in the 5th period (Ends at Xenon).

The Blueprint Matrix

Period (n)	Subshells Filling	Total Orbitals	Period Length
n=1	1s	1	2
n=2, 3	ns np	$1 + 3 = 4$	8
n=4, 5	ns, (n-1)d, np	$1 + 5 + 3 = 9$	18
n=6, 7	ns, (n-2)f, (n-1)d, np	$1 + 7 + 5 + 3 = 16$	32

The Universal Rule: Period Length is strictly equal to $2 \times$ (Available Orbitals in the corresponding energy sequence).

Row 6 introduces the 4f inner transition series (Lanthanoids, Z=58 to Z=71).

The JEE Trap: The Inner-Transition Pitfall

Question: How many elements in Period 6?

Flawed Logic:

Period 6 means $n=6$.

Fills 6s and 6p.

1 orbital + 3 orbitals = 4.

Therefore, 8 elements.

Winning Logic:

Must account for energy overlaps!

Period 6 follows:

$6s \rightarrow 4f \rightarrow 5d \rightarrow 6p$.

The F-Block Formula: $(n-2)f^{1-14} (n-1)d^{0-1} ns^2$

$s(1) + f(7) + d(5) + p(3) = 16$ orbitals.

Correct Answer: $16 \times 2 = 32$ elements.

Always track the $(n-1)d$ and $(n-2)f$ drop-ins for periods $n \geq 4$ and $n \geq 6$.



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