

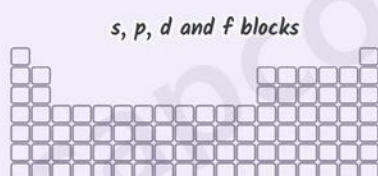
118 boxes, four blocks, and one number, Z , that predicts almost all of it

From Mendeleev to the modern law

- Mendeleev (1869) ordered 63 known elements by increasing atomic mass, folding the list so properties recurred
- he deliberately left gaps, predicting undiscovered elements' properties
- when they matched, the table was accepted; noble gases later fit by adding one group
- Moseley (1913): X-ray frequency correlates with atomic number Z , not mass; Z is the fundamental quantity
- modern periodic law: properties are a periodic function of atomic number, not atomic mass

Structure of the long-form table

- 7 periods (rows 1-7), 18 groups (columns 1-18), IUPAC numbering; 118 boxes for 118 elements
- two 14-element series, lanthanoids and actinoids, sit below the table as the f-block
- four blocks by the last electron's subshell: s, p, d, f, by group and footer row



the table's shape by block: s on the far left, p on the far right, d filling the centre

one number, Z , decides an element's electronic configuration, and the configuration alone decides where it sits and how it behaves

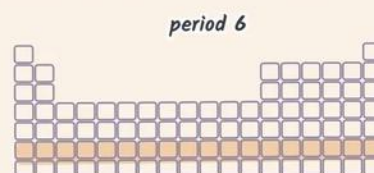
Electronic configuration across periods

- period number = principal quantum number n of the valence shell: period 3 means $n=3$
- a period starts filling a new shell's s subshell, ends at a complete octet (or duplet)
- period 1: only 1s (2 elements). periods 2, 3: only s, p (8 elements each)
- period 4 onward: the $(n+l)$ rule inserts $(n-1)d$, and from period 6, $(n-2)f$
- so periods 4-5 hold 18 elements $(2+10+6)$, periods 6-7 hold 32 $(2+14+10+6)$

Worked: how many elements in period 6?

Q. How many elements are present in the 6th period? Explain.

- period 6 fills 6s to 6p; the $(n+l)$ rule sets the order: 6s, 4f, 5d, 6p
- capacity of each: 6s = 2, 4f = 14, 5d = 10, 6p = 6
- sum across the period: $2+14+10+6$



period 6 banded across the main table: 18 boxes here, and the 14 lanthanoids of the f-block footer, which this outline leaves out, make the other 14

Answer **32 elements in period 6**

Electronic configuration in groups

- a new shell adds down a group, so groups 1, 2, 13-18 repeat the SAME outer config
- groups 3-12 (d) and the f-block settle into a fixed pattern only once the subshell appears
- period 4 for d, period 6 for f; before that the configuration still varies

