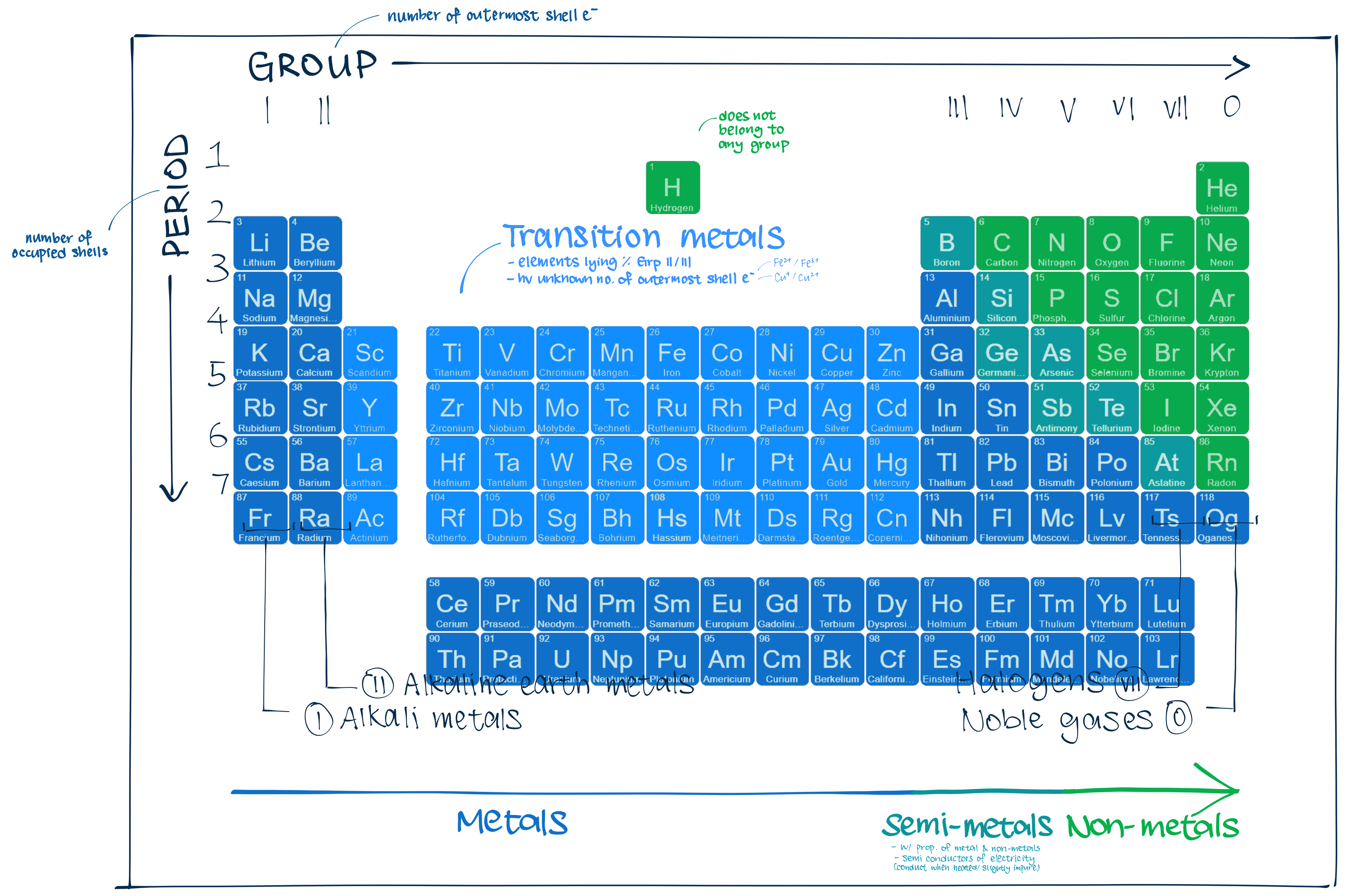
Elements

1 Arrangement – periodic table



2 Main group elements

For more metal reactions see topic 3: Metals

GRP I – ALKALI METALS

- silvery solids
- soft metals (✓ cut by knife)
- low density (Li, Na, K floats on water)
- reactive
  > $4M + O_2 \rightarrow 2M_2O$ ⇒ stored in paraffin oil
  > $2M + 2H_2O \rightarrow 2MOH + H_2$ ⇒ gives out hydrogen ⇒ alkaline solution
- reactivity increases down the group

GRP II – ALKALINE EARTH METALS

- silvery solids
- low density (but denser than Grp I)
- less reactive than Grp I (harder to lose outermost e⁻)
  > $M + 2H_2O \rightarrow M(OH)_2 + H_2$ ⇒ less vigorous than Grp I
  ⇒ base, insol. in water
- reactivity increases down a group

WHY DOES REACTIVITY DIFFER DOWN A GROUP?

- atomic size ↑
- attraction ∕. nucleus & outermost shell e⁻ ↓
- easier to lose / harder to gain e⁻
- reactivity increases / decreases

Grp I–III
Grp IV–VII

GRP VII – HALOGENS

- toxic

→ Fluorine, Chlorine, Bromine, Iodine, Astatine
|← gas →|← liquid →|← solid →| m.p./b.p.↑ (size↑ ⇒ VDW↑)
|← pale yellow →|← yellowish green →|← reddish brown →|← black →| colour light → dark

- reactivity decreases down a group

GRP 0 – NOBLE GASES

- colourless gases
- very unreactive (duplet / octet electronic structure → very stable)

3 Isotopes

DEFINITION

- different atoms of the same element
- w/ same no. of p & e⁻ but different no. of n
- same chem. prop. (∵ same electronic arrangement)
- different phy. prop. (∵ different mass)

RELATIVE ABUNDANCE

- proportion of a particular isotope of element in nature
- eg. ^{16}O 99.76%
  ^{17}O 0.04%
  ^{18}O 0.20%

RELATIVE ISOTOPIC MASS

- mass of isotope compared w/ referencing standard → $^{12}C = 12.00$
- ≈ mass number → p/n ≈ 1, e⁻ ≈ 0
- no unit (relative value)

4 Relative atomic mass (R.a.m.)

DEFINITION & CALCULATION

- Element – Isotope A – Relative isotopic mass A
  – Isotope B – Relative isotopic mass B
  – Isotope C – Relative isotopic mass C
  → weighted average → R.a.m.
  (all naturally occuring isotopes) (weight = relative abundance)

- R.a.m. = $M_A \cdot a\% + M_B \cdot b\% + M_C \cdot c\% \ldots$