

Exercise walk-through

1.8

Valence Electrons and Ionic Compounds

AP Chemistry

Valence electrons and ionic compounds

Main-group atoms chase a full
octet :

- **metals** lose electrons → cations
- **nonmetals** gain them → anions

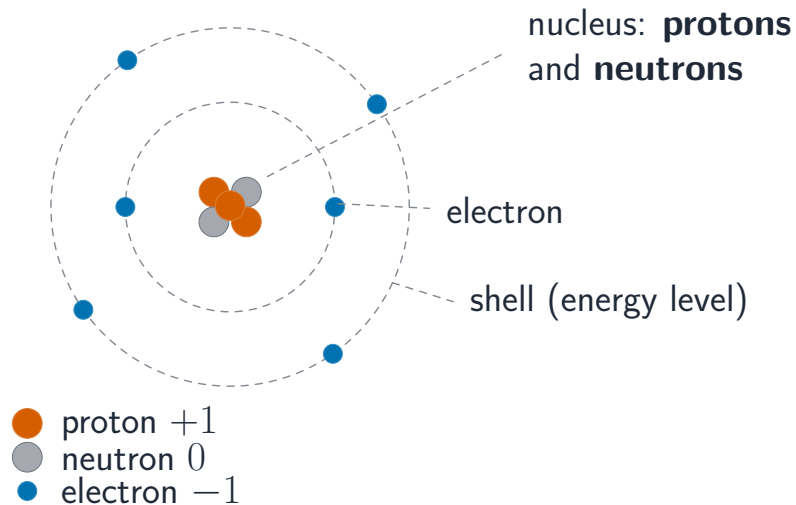
An **ionic bond** is the
Coulomb pull; higher
charge + smaller ions ⇒ stronger
lattice energy (MgO ≫
NaCl).

PERIODIC TABLE OF ELEMENTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra		104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn						
	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu			
	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr			

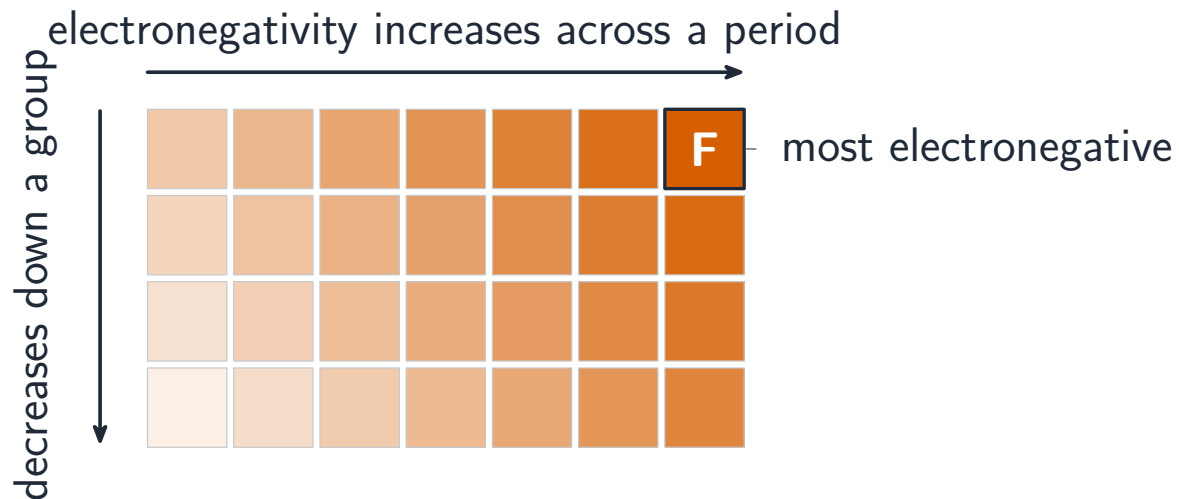
Trends follow the table's structure

Atomic Structure and Electron Configuration, continued



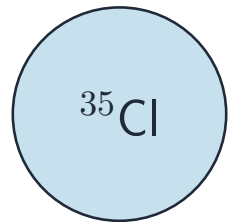
An atom: a tiny nucleus of protons and neutrons, with electrons in shells

Periodic Trends, continued



Electronegativity rises across a period and falls down a group

Mass Spectra of Elements



25%

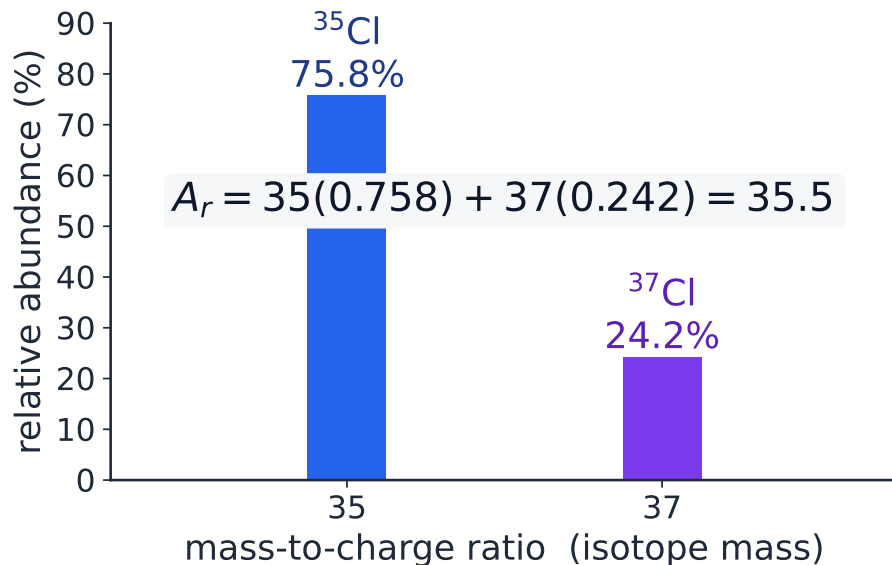
$A_r = 35.5$
closer to the common isotope



$$A_r = \frac{(35 \times 75) + (37 \times 25)}{100} = 35.5 \quad \text{a weighted average by abundance}$$

Relative atomic mass is the abundance-weighted average of the isotopes

The mass spectrum of chlorine



The mass spectrum of chlorine: two isotopes with different abundances

Exercises 2.1-2.3

2.1 State where valence electrons are located in an atom. [1]

2.2 A metal atom loses electrons. State the sign of the ion it forms. [1]

2.3 Write the neutral formula from Mg^{2+} and Cl^- . [2]

Exercises 2.1-2.3

2.1 State where valence electrons are located in an atom. [1]

2.1

- In the outermost shell
-

2.2 A metal atom loses electrons. State the sign of the ion it forms. [1]

2.2

- Positive (a cation)
-

2.3 Write the neutral formula from Mg^{2+} and Cl^- . [2]

2.3

- MgCl_2 (one 2+ needs two 1-)

Exercises 2.4·3.1

2.4 How many Cl^- ions balance one Al^{3+} ion?

[1]

3.1 Valence electrons are found in the

[1]

☐

A nucleus

B innermost shell

C outermost shell

D neutrons

Exercises 2.4·3.1

2.4 How many Cl^- ions balance one Al^{3+} ion?

[1]

2.4

- Three

3.1 Valence electrons are found in the

[1]

☐

A nucleus

B innermost shell

C outermost shell

D neutrons

3.1 C

- the outermost shell

Exercise 3.2

3.2 The neutral formula from Ca^{2+} and Cl^{-} is

[1]

☐

A CaCl

B CaCl_2

C Ca_2Cl

D CaCl_3

Exercise 3.2

3.2 The neutral formula from Ca^{2+} and Cl^{-} is

[1]

☐

A CaCl

B CaCl_2

C Ca_2Cl

D CaCl_3

3.2 B

- CaCl_2

Exercise 3.3 (a)

3.3 Consider aluminium (Al^{3+}) and oxide (O^{2-}).

(a) Write the neutral ionic formula.

[2]

Exercise 3.3 (a)

3.3 Consider aluminium (Al^{3+}) and oxide (O^{2-}).

(a) Write the neutral ionic formula.

[2]

(a)

- Al_2O_3

Exercise 3.3 (b)

3.3 Consider aluminium (Al^{3+}) and oxide (O^{2-}).

(b) State the method you used to balance the charges.

[1]

Exercise 3.3 (b)

3.3 Consider aluminium (Al^{3+}) and oxide (O^{2-}).

(b) State the method you used to balance the charges.

[1]

(b)

- Criss-cross the charge magnitudes into subscripts (so total + equals total −)

Exercise 3.4 (a)

3.4 A metal M forms M^{2+} and a nonmetal X forms X^{-} .

(a) Write the formula of the compound they make.

[1]

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[1]

(a)

- MX_2

Exercise 3.4 (b)

3.4 A metal M forms M^{2+} and a nonmetal X forms X^{-} .

(b) State whether M is more likely a metal or a nonmetal, and why.

[2]

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3.4 A metal M forms M^{2+} and a nonmetal X forms X^{-} .

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[2]

(b)

- A metal – metals lose electrons to form positive cations like M^{2+}