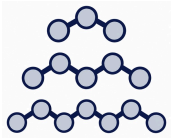
Boiling Temperatures and Solvents Map

Edexcel International A Level Chemistry · Unit 2 · Topic 7B Boiling Temperatures and Solvents

1 Alkane chain length

7.5 i

- Each CH_2 adds **8 electrons**
- More contact: **stronger London**
- CH_4 112 K → C_8H_{18} 399 K
- The rise per CH_2 shrinks



2 Branching

7.5 ii

- Isomers: **same electrons**
- Branched: compact, **less contact**
- Pentane 309 K; 2,2-dimethylpropane 283 K
- More branching, lower bp

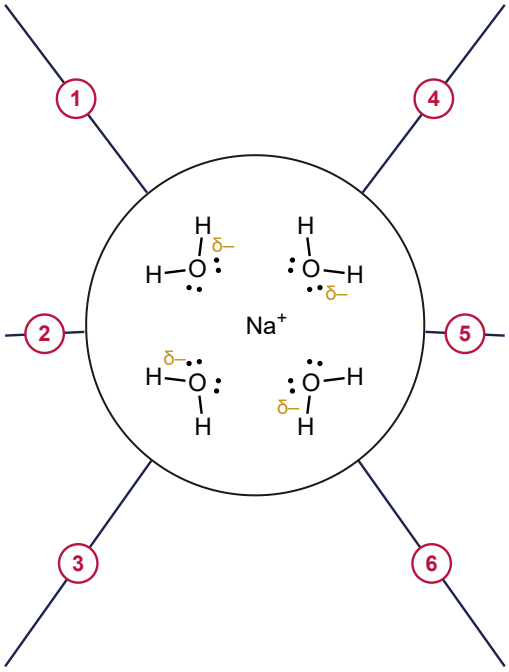


3 Alcohols and alkanes

7.5 iii

- Compare at **equal electrons**
- O–H: **hydrogen bonds**
- Ethanol 351 K; propane 231 K
- Alcohols: **less volatile**

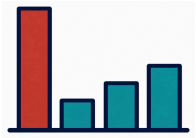




4 Hydrogen halides

7.5 iv

- HCl → HI: **more electrons**
- London rise outweighs polarity
- HCl 188, HBr 206, HI 238 K
- **HF** 293 K: hydrogen bonds



5 Water as a solvent

7.6 i-ii

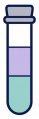
- Ions **hydrated**: δ− O to cations
- δ+ H to anions
- Simple alcohols: **hydrogen bonds**
- Longer chain: less soluble



6 Other solvents

7.6 iii-iv

- Halogenoalkanes: **no hydrogen bonds** with water
- They form a separate layer
- **Like dissolves like**
- I_2 in hexane: London forces



Will it dissolve?

compare the forces broken with the forces made

Solute	Water	Hexane	Why
NaCl	yes	no	water hydrates the ions; hexane cannot attract them
Ethanol	yes	yes	hydrogen bonds with water; its C_2H_5 gives London forces with hexane
Hexan-1-ol	slightly	yes	long non-polar chain; only one O–H
1-Bromobutane	no	yes	polar, but no hydrogen bonds with water
Iodine, I_2	hardly	yes	London forces only: matches hexane
$CaCO_3$	no	no	lattice too strong for hydration

Worked examples

Same electrons

- propan-1-ol 34 e^-: 370 K
- butane 34 e^-: 273 K
- **hydrogen bonds** add 97 K

Polar but low

- HCl most polar: 188 K
- HI least polar: 238 K
- **London forces** dominate

Two layers

- 1-bromobutane + water
- no hydrogen bonds formed
- denser layer **sinks**

These ideas return with alcohols, halogenoalkanes and carbonyl compounds (Topics 10 and 15) and in separating funnels.

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