

Purification & Characterisation: one-page cheat sheet

NEET Chemistry · Unit 13 · Organic Chemistry

1 • Purification methods

Method	Use
Sublimation	camphor, naphthalene, benzoic acid
Crystallisation	sugar, benzoic acid (hot water)
Simple distillation	$\Delta b.p. > 25\text{ K}$: CHCl_3 + aniline
Fractional distillation	$\Delta b.p. < 25\text{ K}$: crude oil
Reduced pressure	glycerol from spent-lye
Steam distillation	aniline-water; essential oils
Differential extraction	organic solute from water

Steam distillation: boils when $p_1 + p_2 = p_{\text{atm}}$, so below 373 K.

2 • Chromatography

Adsorption column and TLC (silica gel, alumina)**Partition** **paper chromatography** (water in cellulose)

$$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent front}} \leq 1$$

Spots UV light; iodine vapour; ninhydrin for amino acids

3 • Lassaigne's test

Fuse with Na: covalent N, S, X become **ionic** NaCN, Na₂S, NaX.

Element	Test	Result
N	FeSO ₄ , then acid + Fe ³⁺	Prussian blue
S	lead acetate / nitroprusside	black / violet
N + S	FeCl ₃ (NaSCN)	blood red
X	HNO ₃ , then AgNO ₃	AgCl white; AgBr pale yellow; AgI yellow
P	Na ₂ O ₂ , HNO ₃ , molybdate	canary yellow

4 • Exceptions

C, H heat with CuO: CO₂ (lime water) and H₂O. **Not** part of Lassaigne's test**No C** hydrazine gives no NaCN, no Prussian blue**Boil with HNO₃** first, if N or S is present, to avoid AgCN and Ag₂S**Excess Na** NaSCN splits: no blood red**Phthalein test** identifies the **phenolic** group

5 • Estimation of C, H, N

$$\%C = \frac{12 m_{\text{CO}_2} \times 100}{44 m}, \quad \%H = \frac{2 m_{\text{H}_2\text{O}} \times 100}{18 m}$$

Dumas N₂ collected over conc. KOH at STP

$$\%N = \frac{28 V_{\text{STP}} \times 100}{22400 m}$$

Kjeldahl N → (NH₄)₂SO₄ → NH₃; back titration

$$\%N = \frac{1.4 \times M \times 2 (V - V_1/2)}{m}$$

Kjeldahl fails for nitro, azo and ring nitrogen (pyridine).

6 • Estimation of X, S, P

$$\%X = \frac{\text{at. mass of X} \times m_{\text{AgX}} \times 100}{\text{molar mass of AgX} \times m}$$

$$\%S = \frac{32 m_{\text{BaSO}_4} \times 100}{233 m}, \quad \%P = \frac{62 m_{\text{Mg}_2\text{P}_2\text{O}_7} \times 100}{222 m}$$

Carius fuming HNO₃ in a sealed tube; AgX or BaSO₄**Oxygen** by difference: $100 - \sum(\text{others})$

AgCl 143.5, AgBr 188, AgI 235.

7 • Empirical formula

Step 1 % as grams in 100 g; divide by atomic mass**Step 2** divide all by the **smallest**; clear fractions (×2, ×3)

$$n = \frac{\text{molar mass}}{\text{empirical formula mass}}, \quad \text{MF} = (\text{EF})_n$$

Vapour density: molar mass = 2 × V.D.

Seen in NEET 2024

32% A, 20% B, rest C (A = 64, B = 40, C = 32).

$$\frac{32}{64} : \frac{20}{40} : \frac{48}{32} = 1 : 1 : 3 \Rightarrow \text{ABC}_3$$

Seen in NEET 2025

Mixture	Method
CHCl ₃ + aniline	simple distillation
crude oil	fractional distillation
glycerol from spent-lye	reduced pressure
aniline-water	steam distillation

Also: $2\text{CuO} + \text{C} \rightarrow 2\text{Cu} + \text{CO}_2$ is the carbon test, **not** Lassaigne's.

Seen in NEET 2020, 2024

Paper chromatography is **partition** chromatography (water in cellulose is the stationary phase).Solids that vaporise without melting are purified by **sublimation**.

Seen in NEET 2026

Lassaigne's test converts elements from **covalent** to **ionic** form.The phthalein dye test identifies the **phenolic** group.

Seen in NEET 2022

Kjeldahl works for aniline (amino N) but not nitrobenzene, azobenzene or pyridine.

Also 2023: with N and S together, NaSCN gives blood-red $[\text{Fe}(\text{SCN})]^{2+}$.

Six traps to remember

- Paper chromatography is **partition** chromatography.
- Lassaigne's test turns covalent N, S, X into ionic salts.
- N and S together give blood red $[\text{Fe}(\text{SCN})]^{2+}$, not Prussian blue.
- Kjeldahl's method fails for nitro, azo and pyridine-type nitrogen.
- The phthalein dye test identifies phenols.
- R_f is always ≤ 1 because the solvent front moves farther.