Substitution mechanisms and uses of polyhalogen compounds

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
SN2 rate law	rate = k[RX][Nu] Valid when: single-step bimolecular substitution; first order in each reactant	L mol^-1 s^-1 (k in this unit)
SN1 rate law	rate = k[RX] Valid when: unimolecular substitution; slow ionisation is rate-determining	s^-1 (k in this unit)
SN2 reactivity order	CH3X > 1 degree > 2 degree >> 3 degree; neopentyl very slow Valid when: same nucleophile and solvent; comparing alkyl halides	relative rate
SN1 reactivity order	benzylic, allylic, 3 degree > 2 degree >> 1 degree Valid when: same leaving group and solvent; comparing alkyl halides	relative rate
Enantiomeric excess (SN2 share f, rest SN1)	ee = f x 100 Valid when: chiral reactant; SN2 inverts fully, SN1 racemises fully	percent
Chloroform oxidation	2CHCl3 + O2 gives 2COCl2 + 2HCl Valid when: chloroform stored in air and light	mol ratio 2 : 1 : 2 : 2
Swarts reaction for Freon-12	3CCl4 + 2SbF3 gives 3CF2Cl2 + 2SbCl3 Valid when: CCl4 with SbF3 (SbCl5 catalyst); stoichiometry for CF2Cl2	mol ratio as balanced
DDT formation	2C6H5Cl + CCl3CHO gives C14H9Cl5 + H2O (conc. H2SO4) Valid when: chlorobenzene with chloral in conc. H2SO4	mol ratio 2 : 1 : 1 : 1
Ozone chain	Cl + O3 gives ClO + O2; ClO + O gives Cl + O2 Valid when: stratosphere, chlorine radical catalytic cycle	Cl is regenerated

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/chemistry/organic-compounds-containing-halogens/substitution-mechanisms-an

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