

The Molecular Laundry Lab

PhD Laundry Chemistry Cheat Sheet · Burlington, Ontario Hard Water

01

Your 4-Product Arsenal

The only products you need — and why

01	Persil ProClean Liquid or Tide Hygienic Clean	High enzyme payload (Lipase, Protease, Amylase, Mannanase). Replaces Gain entirely.
02	Citric Acid Powder — food-grade, bulk	Rinse cycle. Chelates Ca^{2+} / Mg^{2+} . Strips mineral crust. Replaces fabric softener.
03	OxiClean / Sodium Percarbonate	Releases H_2O_2 in warm water. Free radicals shatter stain chromophores. Replaces chlorine bleach.
04	Arm & Hammer Super Washing Soda	$\text{pH} \rightarrow 11$. Saponifies petroleum grease into soap. Swells cotton fibers to release metal particles.

02

Master Load Cheat Sheet

Every load, temperature, and booster at a glance

LOAD TYPE	TEMP	DETERGENT	DRUM BOOSTERS	RINSE COMPARTMENT
Scrap Yard — Cycle 1	HOT	Half dose liquid	$\frac{1}{2}$ cup Washing Soda	None
Scrap Yard — Cycle 2	WARM/HOT	Full dose liquid	None	2 tbsp Citric Acid
Baby Blankets / Formula	WARM (NEVER HOT)	Full dose liquid	1 scoop OxiClean	1–2 tbsp Citric Acid
Everyday Colors	WARM	Standard dose	None	1 tbsp Citric Acid
Pure Whites	WARM/HOT	Standard dose	1 scoop OxiClean	1 tbsp Citric Acid
Blacks & Darks	COLD	Under-dose slightly	None	1 tbsp Citric Acid

03

Key Chemistry Rules

The science behind the routine — never mix these up

HOT water DENATURES formula proteins	WARM water (30–40°C) for ALL baby items. Hot water cooks formula into fabric — permanent.
COLD water locks dye into darks	Warm water swells cotton fibers, releasing trapped dye molecules. Cold keeps them sealed in.
Baking soda + vinegar = salt water	Acid-base neutralization. They cancel each other out. Use separately: soda in wash, citric in rinse.
Citric acid chelates Burlington minerals	Ca^{2+} + Mg^{2+} hijack your detergent. Citric acid cages them in the rinse so they drain away.
Washing soda = saponification engine	$\text{pH } 11$ converts petroleum grease into water-soluble soap inside your machine. Only for scrap yard loads.
Dryer sheets = bacterial greenhouse	Quaternary ammonium wax melts onto all fabrics, trapping oils and bacteria. Switch to wool dryer balls.
Liquid > powder for grease loads	Non-ionic alcohol ethoxylates in liquid detergent outperform anionic LAS in powder for industrial oil.
OxiClean ≠ chlorine bleach	OxiClean destroys chromophores without oxidizing sweat proteins. Chlorine bleach turns sweat yellow permanently.

■ Top-Loader Rule:

Always add powder boosters (OxiClean, Washing Soda) to the empty drum first. Let the machine fill with water for 30 seconds to dissolve. Then add clothes. Never dump powder on dry fabric.

Enzyme Quick Reference

What each biological catalyst in your detergent actually does

ENZYME	BREAKS DOWN	DESTROYS
Protease	Peptide bonds	Blood, sweat, dairy proteins, baby formula, grass
Lipase	Triglycerides & esters	Sebum (body oil), cooking oils, baby formula fats, cosmetics
Amylase	Starch chains	Gravy, baby food, tomato sauce, pasta, rice stains
Cellulase	Cotton fiber surface	Restores fabric by shearing off frayed microfibers that trap dirt
Mannanase	Biological biofilms	Guar gum, personal care residues, workout gear funk glue