# ChemSparks – Knowledge Booklet for Students

(Pre-Workshop Primer)

#### 1. Acids & Bases – The Basics

- **Acids**: Substances that taste sour and release *H*<sup>+</sup> *ions* in water.
  - Examples: Lemon juice, vinegar, citric acid, HCl.
- Bases (Alkalis): Substances that taste bitter, feel soapy, and release OH<sup>-</sup> ions in water.
  - Examples: Baking soda, washing soda, NaOH (drain cleaner).

#### Meutralization Reaction:

Acid + Base → Salt + Water (+ sometimes gas)

Example:

Vinegar (Acid) + Baking Soda (Base) → CO<sub>2</sub> (gas) + Water + Salt

#### 2. pH Scale – What It Means

The **pH scale** measures how acidic or basic a solution is.

- Range: 0 14
  - o pH  $0-6 \rightarrow$  Acidic (red/orange/yellow)
  - o pH 7 → Neutral (green)
  - o pH 8–14 → Basic (blue/purple)

#### **Quick Reference:**

- Vinegar  $\rightarrow$  pH  $\sim$  2–3
- Lemon juice → pH ~ 2
- Pure water  $\rightarrow$  pH = 7
- Baking soda  $\rightarrow$  pH  $\sim$  8–9
- Soap solution  $\rightarrow$  pH  $\sim$  10–11
- NaOH  $\rightarrow$  pH  $^{\sim}$  13–14

#### 3. Indicators – Chemistry's Color-Changers

Indicators are substances that change **color** depending on acidity or alkalinity.

- **Turmeric (Curcumin):** Yellow in neutral/acid, turns red in base.
- Red Cabbage / Periwinkle Flower (Anthocyanins):

Red in acids  $\rightarrow$  purple/blue/green in bases.

- **Beetroot (Betanin):** Reddish in acid, purple in mild base, yellow in strong base.
- **Universal Indicator:** Mixture of dyes that shows entire pH color chart.

## 4. Key Experiments You'll Do 🧪

- 1. Natural pH Indicators: Use turmeric, beetroot, cabbage to test household substances.
- 2. **Indicator Droplet Art:** Create colorful pH artwork using acids & bases.
- 3. **DIY Lava Lamp:** Acid + baking soda  $\rightarrow$  CO<sub>2</sub> bubbles rise/fall in oil.
- 4. **Electrolytic Writing:** Writing with electricity using salt solution & indicators.
- 5. **Rainbow Fizz:** Layered acid-base reaction showing all pH colors.
- 6. **pH Titration:** Careful neutralization by adding base to acid until endpoint.
- 7. Digital pH (RGB method): Using technology + phone camera to measure pH colors.

#### 5. Safety First 🔔



- Always wear goggles & gloves during experiments.
- Handle acids/bases (especially NaOH, HCI) very carefully they can burn.
- Do not taste or touch chemicals (except safe items like lemon juice or vinegar).
- Dispose of solutions only in teacher's instruction.
- Keep away from fire some chemicals like universal indicator are flammable.

## 6. Why Are We Doing This?



- To **see chemistry in action** (color changes, bubbles, patterns).
- To connect everyday items (lemon, soap, turmeric) with science concepts.
- To develop **experimental skills**: observation, recording, safety, creativity.
- To make chemistry fun, visual, and hands-on!

## Student Task Before Workshop:

- Revise what acid, base, neutral & pH mean.
- · Recall at least 3 everyday acids and 3 everyday bases.
- Think of where you have seen **color changes** (e.g. turmeric stains turning red-brown with soap).