EXPERIMENT 2

DECODING CHEMICALS ON COSMETIC LABELS

Making Healthy and Responsible Choices

BACKGROUND

Cosmetic products contain a variety of chemical ingredients, each serving a specific purpose — from preserving freshness to creating texture, scent, or desired effects on skin and hair. A single product can contain anywhere from 10 to over 50 different substances. Many of these names — like Methylchloroisothiazolinone, Butylphenyl Methylpropional, or Cyclopentasiloxane — may sound complex, unfamiliar, or even intimidating. It's no surprise that consumers, especially young people, often feel overwhelmed and unsure of what they're really applying to their skin, hair, or body.

At the heart of every cosmetic product is the **INCI list** — the International Nomenclature of Cosmetic Ingredients. This is a standardized system used globally to list all ingredients on product packaging. The INCI list follows specific rules:

- Ingredients are written in Latin (for plant extracts) or English (for chemical substances).
- They are listed in descending order of concentration (highest amounts first).
- It provides a transparent and universal way to understand what's really inside a product.

Understanding how to read an INCI list allows consumers to identify key functional ingredients (e.g., active agents, preservatives, emulsifiers), spot potential allergens or harmful substances, compare products from different brands, and make choices that align with personal health, ethical, or environmental values. By learning to navigate these lists with the help of science-based databases and user-friendly mobile applications, we can gain practical life skills — becoming more informed, responsible, and health-conscious consumers in a world saturated with marketing claims and complicated labels.

In this workshop, students will learn how to critically analyse cosmetic products using digital tools, understand the role of chemical ingredients, and make informed decisions about product safety and sustainability.

AIM OF THE EXPERIMENT

To explore how mobile applications and scientific databases can be used to analyse the ingredients in cosmetic products and assess their functions, safety, and environmental impact.

LEARNING OBJECTIVES

By the end of this experiment, students will be able to:

General Learning Objectives

- Read and interpret labels on cosmetic product declarations.
- Utilize mobile applications for ingredient research and safety assessment.
- Use scientific databases to analyse and evaluate cosmetic ingredients.

Specific Learning Objectives

- Identify and explain common chemicals found in cosmetic products.
- Distinguish between active ingredients, preservatives, emulsifiers, and fragrances in cosmetics.
- Compare the safety profiles of similar ingredients across different products and brands.
- Evaluate the potential effects of these ingredients on human health and the environment.
- Interpret ingredient ratings and potential risks as provided by different databases.
- Draw conclusions about the safety and sustainability of different cosmetic products based on ingredient analysis.

TIME

90 min

MATERIALS NEEDED

Equipment

- ☐ Various cosmetic products (shampoos, lotions, creams, makeup, etc.)
- ☐ Mobile device with internet access
- ☐ Mobile app GreenScan for ingredient analysis and product evaluation
- ☐ Access to scientific databases (e.g., PubChem is freely available)

SAFETY PRECAUTIONS

⚠️ Before conducting this experiment, ensure you have read and understood the **General Safety Precautions** section of this handbook.

Additionally, be aware of the following specific safety precautions:

⚠️ Follow ethical guidelines when using mobile applications and researching scientific databases.

EXPERIMENT SETUP

Step 1 → Prepare the Work Area

- Assign students into small groups (3–4 students).
- Make sure each group has a mobile device with internet access and a computer or tablet.
- Download the selected mobile application for ingredient analysis – **GreenScan app:** https://green-gate.eu/greenscan-app/
- Ensure that each group has access to the **PubChem database:** https://pubchem.ncbi.nlm.nih.gov/

Step 2 → Prepare the Experiment

Before the session:

- Each student brings 3 different cosmetic products from home in their original packaging (e.g., skin care items, oral care products, decorative cosmetics, etc.)
- If needed, you can also visit a shop together to purchase products as a group.

At the start of the session:

- Each group collects and arranges all products on the table.
- Each group should have approximately 9–12 different cosmetic products to analyse.

Step 3 → Conduct the Experiment

Follow the instructions A, B and C and write down all observations and data in the spreadsheet attached after the experiment procedure.

A Conduct the Product Review

1. Sort the cosmetic items into categories: skin care, oral hygiene, hair care, decorative, etc.
2. Carefully read the ingredient list on each product.

3. Count how many ingredients each product contains.
4. Identify and mark ingredients that are difficult to pronounce or unknown.
5. As a group, decide, does the product seem healthy/safe to use based on the label? Assign a rating "**My FLAG**" from 1 to 5 for each product:

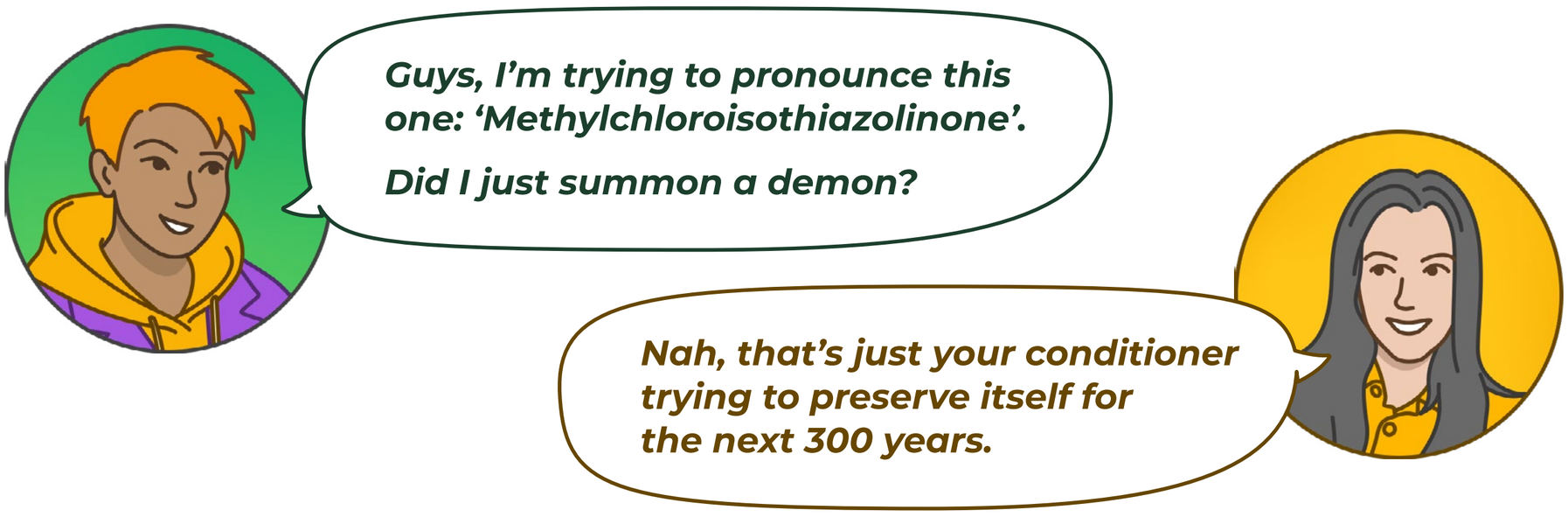
1 = Red = Poor (not safe, would avoid)

2 = Orange = Questionable (use with caution)

3 = Yellow = Fair (acceptable, but not ideal)

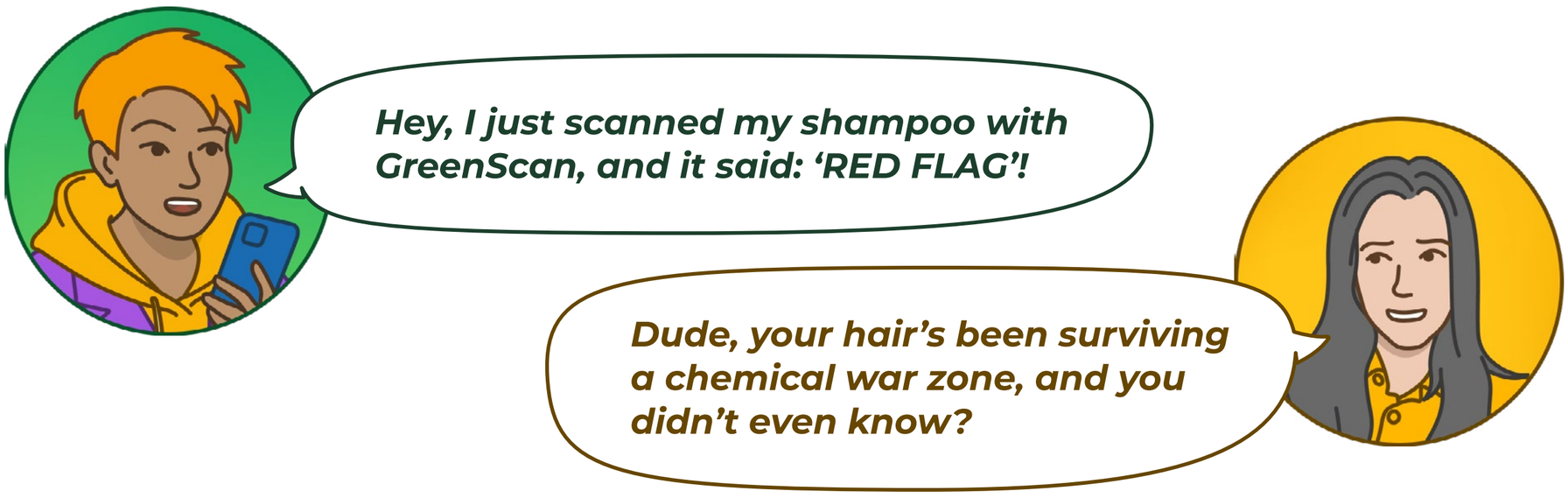
4 = Light Green = Good (mostly safe, reliable choice)

5 = Green = Excellent (safe, good choice)



B Conduct the Product Review

1. Scan the product barcode using the GreenScan app.
2. If the product is not in the database of the GreenScan app, scan the barcode and enter it yourself (and move to another product).
3. Check if the ingredient list shown in the app matches the actual label.
4. Look at the app's ingredient classification: How does the app rate the overall product? What colour or score does the app assign to it?
5. Focus on ingredients marked in red or flagged as hazardous in the app.
6. Write down the names of 2–3 of the most concerning chemicals found.
7. Assign a rating "**GreenScan FLAG**" based on the category in the app.



C

Research Using Scientific Database

1. Search the ingredients on PubChem.
2. Search for each of the red-flag ingredients.
3. Record the following information:
    - Chemical function
    - Health risks
    - Environmental impact
    - Toxicity level (if available)
4. Assign a rating “**Database FLAG**” from 1 to 5 for each product:

    1 = Red = Poor (not safe, would avoid)

    5 = Green = Excellent (safe, good choice)

Step 4 → Monitor and Record Data

Write all your findings clearly and accurately in the spreadsheet below.

RESULTS

Consider your initial score, app rating, and database findings. Put all observations in the spreadsheet and compare the results.

Colour the product based on your own feeling (My FLAG), on the GreenScan app (GreenScan FLAG) and the database data (Database FLAG).

Based on your three-step evaluation process assign a final product flag as a group (“**OVERALL FLAG**”):

Green Flag = Safe, good choice, low-risk ingredients

Yellow Flag = Moderate, mixed ingredients, some concerns

Red Flag = Unsafe, contains hazardous or toxic substances

	NAME of the product	TYPE of the Product	No. of Ingredi-ents	My FLAG	Green-Scan FLAG	Data-base FLAG	OVERALL Flag
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

MY NOTES

ANSWER KEY QUESTIONS

Work together as a group to discuss your results and reflect on your findings. Answer the questions either orally or in writing. Emphasize collaboration and critical thinking throughout the process!

1. Why is it important for cosmetic products to list all ingredients clearly on the label?
2. How can ingredient labelling help protect consumer health and safety?
3. What challenges do consumers face when trying to understand these labels?
4. What trends did you notice in the data regarding common cosmetic ingredients?
5. Why do you think certain chemicals are more frequently used in cosmetic products?
6. How do ingredient ratings vary between different databases or mobile apps?
7. What are the real-world applications of understanding cosmetic ingredients?
8. How can consumers use this knowledge to make informed purchasing decisions?

Let's think critically

9. What patterns or trends did you observe in the ingredients used across different products?

10. What surprised you most about the data you found? (e.g., a natural-looking product having many red-flag ingredients?)

11. What are some real-world applications of being able to analyse cosmetic ingredients?

12. How can this knowledge empower consumers when choosing products?

13. If you were to create your own cosmetic product, what standards or guidelines would you follow for ingredient safety and sustainability?

FOR EDUCATORS

Additional Activities / Extensions (Optional):

- **Analyse:** compare chemical compositions of different cosmetic products; identify recurring ingredients; create basic statistics such as frequency charts or tables; categorize ingredients by function; discuss trends and patterns
- **Debate:** Harmful or Helpful? debate about controversial cosmetic ingredients (e.g., parabens, sulphates).
- **DIY Safer Product Labels:** redesign cosmetic labels to include safety icons.
- **Greenwashing Investigation:** research brands that market themselves as "natural" or "eco-friendly" and verify the accuracy of those claims using databases.

Adapting the Experiment for Secondary School Students:

- **Create Ingredient Flashcards:** Each group designs cards for 10 common ingredients. with info like function, risk level, and environmental impact—use them for class review games.

Adapting the Experiment for Primary School Students:

- **Posters:** Create visual posters categorizing common cosmetic ingredients (preservatives, emulsifiers, etc.) with examples and functions.
- **Interview a Professional:** Invite a cosmetic chemist, pharmacist, or dermatologist to share insights, or have children prepare questions and research expert opinions online.

General safety precautions

The following general safety precautions apply to all experiments in this handbook.

Please review them carefully before conducting any lab work. Some experiments may also have additional specific precautions listed within their respective tutorials.

⚠️ **Follow Instructions:** Always listen to your teacher/educator/assistant and follow the lab instructions carefully. If you're unsure about any step, ask for clarification before proceeding.

⚠️ **Know Safety Equipment:** Familiarize yourself with the location and proper use of safety equipment like eyewash stations and fire extinguishers.

⚠️ **Be Careful with Glassware:** Exercise caution when handling and washing glassware to avoid breakage and injury.

⚠️ **Safety Gear:** Always wear a lab coat, safety goggles, and gloves. Ensure you have closed-toe shoes and tie back long hair.

⚠️ **Handle Chemicals Safely:** Handle chemicals and equipment with care. Never taste or sniff chemicals. Always label containers or tubes.

⚠️ **Check Pictograms:** Before using any chemical, review the safety pictograms on the label to understand the hazards associated with it.

⚠️ **Handle Solvents Carefully:** Use solvents in a fume hood to avoid inhaling fumes and ensure proper ventilation.

⚠️ **Dispose of Waste Properly:** Follow proper procedures for disposing of chemical and biological waste. Do not pour chemicals down the drain unless instructed.

⚠️ **Report Accidents:** Immediately inform your teacher/educator/assistant of any accidents, spills, or injuries, no matter how minor they seem.