

SQUEAKY CLEAN

Practical Project
For Teachers **p2&3**, for Students **p4**

HEALTH AND SAFETY

Students should be encouraged to make their own risk assessment before they carry out any activity, including surveys. In all circumstances this must be checked by a competent person. Students using specialised equipment should be supervised at all times.

Students may want to set up unorthodox experiments and you may need to seek specialist advice.

Organisations such as CLEAPSS and the Royal Society of Chemistry are able to help. The MISAC (Microbiology in Schools Advisory Committee) can provide advice concerning microbiological investigations.

SQUEAKY CLEAN:

Gold Practical Project - For Teachers



Cleaning Up?

Supermarkets seem to have a product for every cleaning job that you can think of, then more besides! They include a range of 'value' products, but these take up much less shelf space and are much less attractively packaged than more expensive brands. There are also products that claim to be ecologically friendly. Controlling what we put down our drains is very important if we want a sustainable future.

What is the environmental impact of domestic cleaning? - and who's cleaning up, you or the supermarket?

HAVE YOU EVER WONDERED?

...if you could experiment with cleaning products to find the best ones to use?

You might like to imagine yourself in a situation such as...

Your friend has just had a baby and has become both more house proud and environmentally aware. They say to you, "You're a scientist, tell me how I can get things really clean, save money and still be environmentally friendly". You decide that you will start by investigating one kind of cleaning product. Your first step is to **undertake practical experiments** to:

- compare the effectiveness of different cleaning products used for the same purpose
- investigate factors that affect the performance of cleaning products
- evaluate cleaning products in terms of their effectiveness, cost and likely environmental impact.

POSSIBLE EQUIPMENT, MATERIALS AND RESOURCES

Equipment might include materials for:

- comparison of the effectiveness of two cleaning agents. You could test the two agents on different materials (e.g. squares of standardised soiled cloth, dyed wool samples)
- bioassay to test antimicrobial properties or toxicity using the safe culture and incubation of micro-organisms or of germinating seeds or aquaculture of plants (e.g. culture of safe bacterium, culture medium such as nutrient broth or agar, sterile Petri dishes, incubator)
- soap synthesis

Experience of using sophisticated instrumental techniques may possibly be arranged through the mentor, local company or university.

Prompts

The **Student Brief** gives some triggers to start students thinking. They should realise that each trigger implies that several ideas need to be considered. Encourage them to identify these themselves. However, if necessary, prompts such as those below might be given, to point students in suitable directions.

■ The types of cleaning product you want to investigate

- What kinds of cleaning jobs are found in the home or industry?
- Can you make effective cleaning products yourself?

■ Why there is a market for 'green' cleaning products

- What environmental damage can cleaning products do?

■ How different types of cleaning product work

- What is meant by soap, detergent and surfactant?
- What are stain removers?
- Why do some products contain enzymes?

■ The factors that affect the performance of a cleaning product

- How do the ingredients of cleaning products differ?
- How does temperature and dosage affect performance?
- Do the substances present in water used for cleaning have an effect?

■ How to compare the effectiveness of different cleaning products used for the same purpose

- What do you need to do to make any comparison a fair test?
- How much data will you need, to show a significant difference (if there is one)?
- How many different products could you reasonably compare in the time you have available?

■ The factors that need to be taken into account, to decide if one cleaning product is better than another

- Is cleaning performance the only criterion that should be used when choosing a cleaning product?
- What kinds of research are the companies themselves conducting?
- Are cheaper products less effective than more expensive brands?
- What kinds of environmental problems can be caused by cleaning products?
- What do you understand by the terms non-toxic and biodegradable?

Suggestions for supporting students

Though primarily based on laboratory investigations, the Practical project will require some initial research into, for example, the range of cleaning products on the market, their main components and how they work.

Gold Award students are required to have an external Mentor (normally a scientist or engineer) for their project. The Mentor's role is to provide guidance and support.

Depending on the nature of the project, someone with knowledge and/or experience of hygiene practice, cleaning technologies or ecology could be ideal. The Mentor might be involved in...

- academic or industrial research in pollution, hygiene or cleaning products
- professional cleaning, for example of hospitals or schools
- environmental protection
- health education or health visiting
- occupational hygiene or environmental health

Contact your Local Coordinator for details.

Internet search

Combine 'cleaning' with terms such as: products, green, environment, environmentally friendly, health, hygiene, pollution, infection control, house, household or domestic. Or try:

- Comparing light- and heavy-duty detergents, RSC (Royal Society of Chemistry)
practicalchemistry.org/experiments/comparing-light-and-heavy-duty-detergents,299,EX.html
- Detergents, soaps and surface tension, RSC
practicalchemistry.org/experiments/detergents-soaps-and-surface-tension,301,EX.html
- Determining the acidity of limescale remover
www.pro-base.eu/files/e-clean-t-en-tg.pdf
- Researching and planning bioassays, Nuffield Foundation
nuffieldfoundation.org/researching-and-planning-bioassays
- The chemistry of household cleaning products
chemistryinyourcupboard.org

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friendly. Controlling what we put down our drains is very important if we want a sustainable future.

What is the environmental impact of domestic cleaning? - and who's cleaning up, you or the supermarket?



HAVE YOU EVER WONDERED?

... if you could experiment with cleaning products to find the best ones to use?

You might like to imagine yourself in a situation such as...

Your friend has just had a baby and wants the house clean for the baby without compromising the environment. She has asked you how to get things really clean, save money and still be environmentally friendly. You decide to investigate one kind of cleaning product, and **undertake practical experiments** to..

- compare the effectiveness of different cleaning products used for the same purpose
- investigate factors that affect the performance of cleaning products
- evaluate selected cleaning products in terms of their effectiveness, cost and likely environmental impact.

Some things to think about...

- The types of cleaning product you want to investigate
- Why there is a market for 'green' cleaning products
- How different types of cleaning product work
- The factors that affect the performance of a cleaning product
- How to compare the effectiveness of different cleaning products used for the same purpose
- The factors that need to be taken into account, to decide if one cleaning product is better than another

Health and Safety

Before you carry out any experiment:

- (a) find out if any of the substances, equipment or procedures are hazardous
- (b) assess the risks (think about what could go wrong and how serious it might be)
- (c) decide what you need to do to reduce any risks (such as wearing personal protective equipment, knowing how to deal with emergencies and so on)
- (d) make sure your teacher agrees with your plan and risk assessment

NOTE: Your teacher will check your risk assessment against that of your school. If no risk assessment exists for the activity, your teacher may need to obtain special advice. This may take some time.

- (e) if special tools or machines are needed, arrange to use them in a properly supervised design & technology workshop.