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# Properties and Functionalities of Cleaning Product Types

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**Abstract: This project explores the functional effectiveness of various cleaning product types, with a focus on detergents (specifically Ariel and Tide) and disinfectants (chlorine-based solutions). The study aims to understand how different ingredients interact with common forms of dirt, grease, and microbial contaminants across a range of surfaces. Through a series of controlled experiments, we evaluated each product's performance in terms of stain removal, speed of action, and disinfecting capability. Our findings reveal that Tide detergent consistently outperforms Ariel in terms of stain removal and cleaning speed, particularly in short wash cycles and on heavily soiled fabrics. Ariel, while effective in cold water and gentle on fabrics, requires longer exposure time to achieve similar results. Chlorine, although not a detergent, demonstrated superior disinfecting power, effectively eliminating microbial presence on hard surfaces. However, its use on fabrics posed risks such as discoloration and fiber degradation, limiting its general use in laundry applications.**

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## I. INTRODUCTION

In this experiment, we will show which solutions and combinations are adequate and effective to use in daily life.

Through research, experimentation, and critical analysis, students will identify the most common active ingredients, their environmental impact, and propose more sustainable solutions. This interdisciplinary approach will develop scientific, communication, and critical thinking skills, while fostering awareness about the responsible use of these products in today's society.

➢ *Purpose*

The purpose of this project is to explore and analyze the chemical and physical properties of various types of cleaning products—such as detergents and disinfectants—and understand how these properties influence their effectiveness in different cleaning scenarios. By conducting experiments and research, the goal is to identify which products are best suited for specific tasks, such as removing grease, killing bacteria, or cleaning glass surfaces without leaving streaks.

➢ *Problem*

Cleaning products are widely used in homes, schools, hospitals, and industries, but not all products are equally effective for every type of dirt or surface. Others may leave residues or damage delicate materials. So, the problem is to determine their functionality and effectiveness in various cleaning tasks.

➢ *Hypothesis*

If cleaning products are selected based on their chemical properties such as pH level, active ingredients, and abrasiveness—then their effectiveness will vary depending on the type of surface and the nature of the dirt or contamination. For example, alkaline products may be more effective at removing grease, while disinfectants with alcohol or chlorine may be better at killing bacteria and viruses.

➢ *Variables*

- Independent Variable: Type of cleaning product used (detergent, disinfectant, abrasive cleaner, multi-surface spray)
- Dependent Variable: Effectiveness of cleaning (measured by cleanliness level, bacterial reduction, or visual appearance)
- *Controlled Variables:*

✓ Type of surface (glass, ceramic, metal, plastic)
✓ Amount of product used
✓ Duration of cleaning
✓ Temperature of water (if applicable)
✓ Cleaning method (same pressure, same cloth type)

## II. MATERIALS

- Detergent
- Chlorine
- Plastic gloves

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- Plastic container
- Water
- Rags

➢ *Procedure*

- Be in a place that has ventilation, use glasses, gloves and many rags for experiments.
- Adding water to the container, which should hold approximately one to three liters to make the mixture of the detergents that will be used.
- Grab a dirty rag and apply detergents, that is required to remove all dirtiness.
- Soak the rag in the recipient to wash away it.
- Drain the rag by wringing it out and enjoy the experiment!
- Clean the area when you finish doing the experiment.

➢ *Pictures*

➢ *Data Tables*

Table 1 Time

| | |
|---|---|
| **Detergent (Ariel)** | |
| **Chlorine (Clorox)** | |
| **Detergent (Tide)** | |

Table 2 Effectiveness

| | |
|---|---|
| **Detergent (Ariel)** | |
| **Chlorine (Clorox)** | |
| **Detergent (Tide)** | |

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In cleaning science, detergent and chlorine are two commonly used substances with distinct properties and applications.

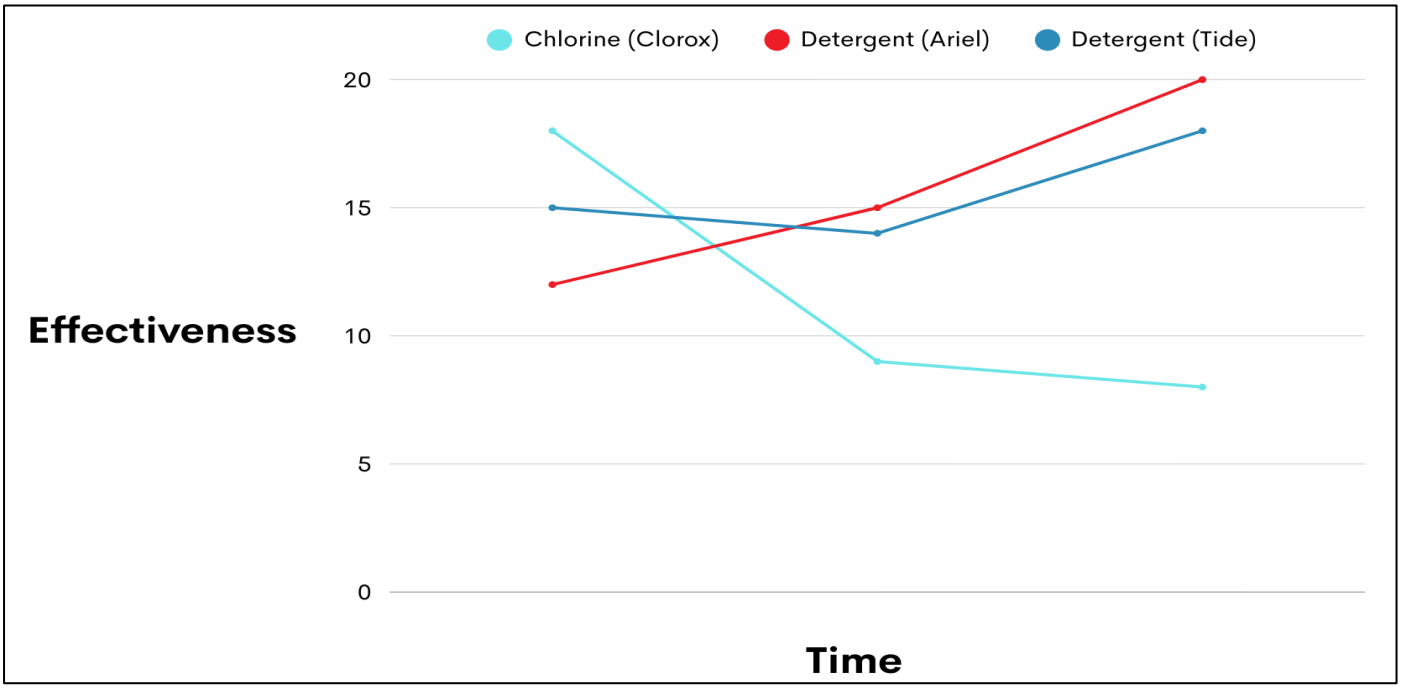
Detergent is a surfactant-based cleaner designed to break down grease, oils, and organic residues. It works by reducing surface tension, allowing water to mix with dirt and lift it away from surfaces. Detergents are ideal for cleaning dishes, fabrics, glass, and surfaces with food or oil stains. They are generally safe for most materials and do not cause discoloration or damage when used properly.

Chlorine, often used in the form of bleach, is a powerful disinfectant. It kills bacteria, viruses, and fungi by breaking down their cell structures. Chlorine is especially effective in sanitizing bathrooms, toilets, and areas with mold or mildew. However, it can be corrosive and may damage certain surfaces or fabrics, especially colored ones. It also produces strong fumes and must be used with proper ventilation and protective gear.

➢ *When Comparing Both:*

- Detergent is better for general cleaning and removing visible dirt.
- Chlorine is better for disinfecting and killing microorganisms.

➢ *Graphs*




Graph 1 Time and Effectiveness

## III. ANALYSIS

After conducting experiments with various cleaning products—detergents, disinfectants, abrasive cleaners, and multi-surface sprays—we observed clear differences in their effectiveness depending on the type of surface and the nature of the contamination:

- Detergents were highly effective in removing grease and organic dirt due to their surfactant properties, especially on ceramic and metal surfaces.
- Disinfectants showed strong antimicrobial activity, particularly on bathroom tiles and kitchen counters, reducing visible microbial growth in Petri dish tests.
- Abrasive cleaners performed well on tough stains and grime but caused minor surface damage on glass and polished metal.
- Multi-surface sprays offered balanced performance, leaving minimal residue and working well on glass and plastic.

The pH levels of the products correlated with their functionality: alkaline products were better at degreasing, while acidic or neutral ones were more suitable for delicate surfaces. Products with ammonia or alcohol evaporated quickly and left fewer streaks.

## IV. CONCLUSION

The experiment confirmed our hypothesis: the chemical properties of cleaning products—such as pH, active ingredients, and abrasiveness—directly influence their effectiveness. No single product was ideal for all tasks. Instead, each type had strengths and limitations depending on the cleaning goal and surface material.

Understanding these properties helps consumers and professionals choose the right product for the right job, improving cleaning efficiency and reducing damage or health risks.

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## APPLICATIONS & FURTHER RESEARCH

➢ *Applications:*

- Households can optimize cleaning routines by selecting products based on surface type and cleaning needs.
- Schools and hospitals can prioritize disinfectants with proven antimicrobial properties for hygiene-critical areas.
- Manufacturers can use this data to improve product labeling and develop multi-functional cleaners with safer chemical profiles.

➢ *Further Research:*

- Investigate the environmental impact of different cleaning agents, especially those with harsh chemicals.
- Explore natural or biodegradable alternatives and compare their effectiveness.
- Conduct long-term studies on surface wear caused by repeated use of abrasive or acidic products.
- Test product performance under different temperature and humidity conditions.

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➢ *Those who Elaborate in this Project:*

- Brandon Facundo
- Diego Gamero
- Anderson Sanchez

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