**Subject area/course**: Science/Chemistry

**Grade level/band**: 9-11

**Task source**: Stanford Center for Assessment, Learning, and Equity (SCALE); author: Susan Schultz

**Relieve IT?**

**STUDENT INSTRUCTIONS**

1. **Task context**:

You are an employee for a chemical company called Achoo-B-Gone and your team has been working for the past year to create a new drug that will instantly relieve cold symptoms. The new product, Relieve IT, is in the final testing stages before being sent to the Food and Drug Administration (FDA) for human trials. Part of the FDA approval process requires your team to share your current knowledge about acids and bases and to provide all of your experimental data on Relieve IT.

As a part of the approval process, the FDA conducted a preliminary test on the pH of Relieve IT and reported some concerns about potential negative human side effects. Unfortunately, the report did not indicate whether the product is too acidic or too basic. The FDA wants to know what you are going to do to neutralize the product to achieve a more neutral pH level before beginning human trials.

**Your Task**

Your team will synthesize your current knowledge about acids, bases, and neutralization reactions. You will design and conduct an experiment to determine the pH of the Relieve IT product and the unknown solutions. As a team you will design and conduct the experiment, record and analyze data, discuss your results, and present your recommendations to the FDA panel.

Each member of the team will prepare an individual lab report (your teacher will provide the format) including recommendations for neutralizing the pH levels of Relieve IT.

1. **Final product**:

For this task you will need to work collaboratively with a team of students to:

* Share what you have learned about acids and bases and what happens when these two types of solutions interact.
* Design and conduct an experiment to determine which solution or combination of solutions will neutralize your company product, Relieve IT.
* Record, analyze, and interpret your data.
* Generate recommendations as to which solution or solutions should be used to neutralize Relieve IT.
* Make an oral presentation to the FDA panel to share your experimental procedures, analysis, findings, and recommendations for neutralizing Relieve IT (see *Criteria for Oral Presentations* document).

Individually you will:

* Write a lab report that clearly explains the design, procedures, implementation, analysis, and findings of your experiment (see *Laboratory Report Criteria* document). You will also need to explain the recommendations your group presented to the FDA panel.

**ADDITIONAL INFORMATION**

1. **Knowledge and skills you will need to demonstrate on this task:**
2. On this task, you will show that you know these things:
   * Describe the properties of acids and bases.
   * Explain how to characterize solutions as acidic, basic, or neutral.
   * Explain how to “fix” the Relieve IT product by applying what you know about neutralization reactions.
3. On this task, you will show that you are able to do these things:

* Generate a testable question, make a hypothesis, and design procedures that can be replicated by another person.
* Conduct your planned experiment, use pH indicators to determine the pH of the various solutions, run multiple trials of the procedure, and record data.
* Represent the data to inform others, analyze the information, and construct an explanation using evidence from your experiment.
* Provide constructive feedback to your peers on their draft lab reports and take into consideration feedback they provide you.
* Prepare a lab report that details your findings and recommendations and correctly cites your sources.
* Communicate your recommendations to the FDA panel clearly, creatively, and effectively using evidence to support your conclusions in a way that will engage the audience.

1. **Materials needed:**

When designing and planning your experiment, you will provide your teacher with a list of lab equipment that you plan to use. If you need any equipment or materials not normally in your classroom, please ask your teacher if these items can be made available. Your teacher will supply the pH indicators, Relieve IT samples, and the other 4 solutions you will need for your investigation. You will also need a copy of the *Laboratory Report Criteria* and *Criteria for Oral Presentations* documents.

1. **Time requirements:**

Your teacher will provide the due dates for completing each portion of the task.

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| **Due Date** | **What You Need To Do** | **Product** |
|  | Prepare an introduction for the FDA application (lab report) where you present background information about acids, bases, and how to neutralize a solution | Team Activity |
|  | Design an experiment to determine the pH of Relieve IT and which solution or combination of solutions will neutralize Relieve IT |
|  | Conduct the experiment |
|  | Gather and represent the data |
|  | Analyze and interpret the data |
|  | Draw conclusions and make recommendations on how to neutralize Relieve IT |
|  | Reflect on your findings |
|  | Group presentation to the Food and Drug Administration board | Oral Presentation |
|  | Each team member prepares a draft application to FDA (lab report) | Individual  Lab  Report |
|  | Get peer feedback on your draft application (lab report) |
|  | Prepare and turn in final application (lab report) |

1. **Scoring:**

You work will be scored using the SCALE Science and Engineering Practices Rubric and the SCALE Effective Communication Oral Presentation Rubric (see both rubrics before beginning the project). You should make sure you are familiar with the language that describes the expectations for proficient performance.