Honors Physical Science

Sludge 2017

Last Scheduled Day of Lab: 5/23 (A days), 5/24 (B days)

Due Date for Project: 5/30(A days), 5/31 (B days)

Each "□" indicates a labeled portion of your report.

Your lab is due at the beginning of the listed class period.

The following is a reminder/checklist for completing your project. Please pay attention to the design and order of your packet. ***Do not use any binders or plastic slipcovers for your project or pages***.

□ **Cover Page**: This should be original (**no clip art**) and include the title of the project. Your name, date, instructor's name, and class should be included in the lower right of the cover page.

□ ***Table of Contents*** (include page numbers.)

□ **Purpose**: This is for the whole project. You should clearly state what you are doing and why you are doing it.

- Describe the problem investigated.
- Give background information. Don't be afraid to quote from the text if you have to.
  - ⇒ Define "characteristic properties"
  - ⇒ Give example of the characteristic properties that you found, by running tests during labs over the whole semester. Why are these characteristic properties?
  - ⇒ Relate the characteristic properties to what you have been doing the entire semester (for what reasons have you been doing all the labs and making all the observations all semester?)
- Write the "purpose" as if you are writing to someone your age or older who knows nothing about this class.

□ **Observations/Description of Sample**): This is the observations you made the first day of the project where you made diagrams and observations or descriptions of your sample. They should be clearly read and labeled.

□ ***Hypothesis***: This is where you will tell how you are going to solve the problem and why your method should work. What tests will you be running? Why did you choose the tests you will be running? Explain how the test will help you prove the identity of the substances.

- Give science background information.
- Describe observations for each test that will help you determine and "prove" the identity of the substances.
- Make sure to use the term "characteristic properties" in your hypothesis

☐ **Tests** (chronological order): These are the labs or tests you performed in each day of class.

Each test should have the following format:

- **Procedure Section**
  - ⇒ A mini purpose should be included.
  - ⇒ Title each test/procedure you will do. Don't use the lab number we used when doing the experiments during the chapter.
  - ⇒ Give a step-by-step detailed description of how to do each lab.
  - ⇒ Provide a clear list of materials that you used in this lab.
  - ⇒ Include a neat detailed diagram of how to set up the lab, including labels.

- D**ata Collection, Observations, and Calculations Presentation**: Include all data and observations. Be sure to include sketches if necessary.
  - ⇒ You need to include all calculations
  - ⇒ Make sure to use correct units for measurements.
  - ⇒ If you have data that can be graphed, do so. Make sure to include narratives.
  - ⇒ You can never have too many observations.
  - ⇒ Use color on graphs and sketches.
  - ⇒ Tables are very helpful when entering data and will help you clarify your results.
  - ⇒ Record EVERYTHING that happens in your labs. Sometimes it's the little mistakes that can take us to new places.
  - ⇒ Make sure to note any errors or discrepancies that might affect the validity of your results.

- **Results:** This is where you summarize in a brief manner what you found in this particular test. Just the facts and observations, no opinions.

☐ **Analysis and Interpretation**: This is where you are going to collate (gather) all your information for each substance into one place. Do not label as "part 1" or "part 2". It may be appropriate to label each substance section. This should be in paragraph form.

- This will be your collation of all the data, test-by-test and substance-by-substance.
  - ⇒ Discuss all of your data for a particular substance.
  - ⇒ Look for patterns and explain them. Are they significant? Use observations that are important. Remember you are using this section to pull all the facts together for each substance.

☐ **Error analysis**: Explain any discrepancies in your data or data errors. Are they technology based or are they weak spots in the procedure. Make sure to relate the cause of the error and the specific effect it might have had on the data. I am saying to be very specific on how the error "shows up."

☐ **Improvements**: This is what ***you*** could do differently, ***not what your instructor could do***.

- Suggest ways to improve the experiment or design. This could be about an individual test or the whole project.
- Explain any changes or revisions you made and why you made them.

☐ **Conclusion**: This is where we bring it all together. Again do not label parts of the conclusion.

- The first part will be a *paragraph* or so giving a brief explanation of what a characteristic property is and why it was important to you during the completion of this project. You should also discuss why characteristic properties are important to the scientific community and to the general population. The "big picture."

- The second part will be a few paragraphs that will summarize the purpose of the project and **relate to your hypothesis**, and your results.

- The Third part will be where you tell me what you think are the identities of the substances that are in your sludge. Back up everything with evidence. Refer to the specific data or observation (test result) by page number. When discussing graphs, be very specific. Don't underestimate the amount of time you spend here. All statements must be backed up by data (evidence.) Be confident in your results. You can never have too much evidence. If it supports you, USE IT.

☐ ***Appendix A***: Rough Drafts: Include all rough, first draft type of documents here. You do not to include the Sludge papers I have given you during the project.

☐ ***Any other documents you include will be Appendix B, C, D, etc***

Remember, your report may be typed (word processed.) You can imbed photography, graphs, etc. Make sure to have a backup system that is triple redundant (backed up three different ways.) A good method is to send a copy as an attachment to your school (or other web based email.) If you do this every so often you always have a back-up of work up to that date. ***I will not accept any "my computer crashed, my printer broke, my printer ran out of ink, etc." excuses at the end of the report. Being able to produce this report at the end is mission critical. Don't trust your whole assignment to one memory solution (keep emailing yourself different versions as a backup…..it will work.)*** You will also probably need to provide a small binder clip to keep you project together upon turning in, no folders or binders are accepted. Consult the sample score sheet for guide/information I will use in scoring for grades. Use the Inquiry Scoring Guide for information about the scoring of your project as a Science Inquiry task. As always, consult with your instructor about any special considerations, don't wait until the last moment to make special arrangements. You may request any special equipment, and if we can get it, the equipment may be available for the period it is requested but will usually only be available for the next period.

HPS **Name**_____

Science Task: Sludge 2017

Purpose ***(4 pts.)***

- Adequately described the problem _____
- Used Background Scientific information _____

Description of Sludge ***(1 pts.)***

- Observations and sketch of sample

Hypothesis ***(4 pts.)***

- Explained what do you hope to accomplish in your project
- Explicitly defend the tests you have chosen to use

Procedures ***(12 pts.)***

- Uses accurate descriptions, sketches, and instructions for each experiment _____

Data collections, observations, and calculations ***(10 pts.)***

- Includes all data tables and graphs with narratives and labels/units _____
- Includes sufficient amount of data/observations _____

Analysis and Interpretation ***(12 pts.)***

- Collation of data support for each of the substances, separately. _____

Error Analysis ***(4 pts.)***

- Review the entire project for sources of error and explicitly discuss their possible effect

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Improvements ***(2 pts.)***

- Explain any improvements or revisions _____

Conclusion ***(22 pts.)***

- Explanation of characteristic properties and discussion of why characteristic properties are important in the scientific community and the general population _____
- Summarize or review of hypothesis and purpose _____
- Discussion of the identity of each substance. Backed up by explicit reference to data.

_____

- Cover sheet ***(1 pts.)*** _____
- Conventions ***(1 pts.)*** _____
- Table of Contents ***(1pts.)*** _____
- Appendices ***(1 pts.)*** _____

Total Points _____ ***(75 pts.)***

2016-2017 Official Inquiry Scoring Guide
High School

	SI- Forming a Question or Hypothesis *Based on observations and science principles, formulate a question or hypothesis that can be investigated through the collection and analysis of relevant information.*
5/6**	• Forms a question or hypothesis that can be investigated through collection and analysis of relevant empirical data and generally points toward a broader understanding of existing scientific relationships (e.g. interaction, dependency, correlation, causation) and/or has the potential to lead to new scientific knowledge. • Provides comprehensive (well documented) background science knowledge and observations to establish a detailed context for this investigation. • The question or hypothesis clearly guides the design of an effective or innovative investigation.
4	• Forms a question or hypothesis that can be investigated through collection and analysis of relevant evidence. • Provides sufficient background science knowledge and/or preliminary observations to establish an appropriate context for this investigation. • The question or hypothesis is specific enough to guide the design of an effective investigation.
3	• Forms a question or hypothesis that cannot be adequately investigated through collection and analysis of evidence. • Provides relevant but insufficient background information and/or preliminary observations. • The question or hypothesis is not specific enough to guide the design of an effective investigation.
1/2*	• Forms a question or hypothesis that cannot be investigated using data and available resources. • Provides background science knowledge or preliminary observations that are not relevant to the investigation. • The question or hypothesis cannot guide the design of an effective investigation.

	SI- Designing an Investigation *Design a controlled experiment, field study, or other systematic investigation that provides sufficient data to answer a question or test a hypothesis about the natural world.*
5/6**	• Proposes scientifically logical, safe, and ethical procedure in a precise and efficient design. • Thoroughly identifies, controls, and monitors relevant variables and describes a systematic investigative process that is clear and adaptable if necessary. • Presents a design that will provide data of exceptional quality and quantity to address the question or hypothesis and to investigate possible relationships.
4	• Proposes a scientifically logical, safe, and ethical procedure that can be easily followed. • Identifies relevant variables and defines a systematic, investigative process that has clearly defined procedures. • Presents a design that will provide data of sufficient quality and quantity to address the question or hypothesis.
3	• Proposes a scientifically logical, safe, and ethical procedure that can be easily followed but includes scientific or logical errors or omissions. • Identifies relevant variables but does not clearly define a systematic investigative procedure. • Presents a design that will provide data of insufficient quality or insufficient quantity to fully address the question or hypothesis.
1/2*	• Proposes a limited scientifically logical, safe, or ethical procedure that cannot be easily followed. • Partially identifies variables or presents an investigative procedure that lacks enough detail to be followed. • Presents a design that will provide data of neither sufficient quality nor quantity to fully address the question or hypothesis.

**5 for preponderance (most) completed, 6 for all completed.

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High School

	SI- Collecting and Presenting Data *Collect, organize, and display sufficient and appropriate data to facilitate scientific analysis and interpretation.*
5/6**	• Collects comprehensive, complete and detailed data that are consistent with the planned investigative design. • Records accurate raw data using appropriate units with quantity and quality consistent with the designed procedure and reports anomalous data. • Displays appropriate data in a manner that utilizes formats that clarify and highlight relationships to be analyzed and explained.
4	• Collects data that are consistent with the planned investigation design. • Records accurate raw data using appropriate units and labels. • Displays appropriate data in a manner that communicates results in an organized format to facilitate scientific analysis and interpretation.
3	• Collects data that are consistent with the planned investigation design, but may be incomplete. • Records accurate raw data with incorrect or some missing units or labels. • Displays appropriate data in a manner that communicates results understandably, but may be somewhat incomplete or disorganized.
1/2*	• Records data that are inconsistent with the planned investigation design. • Records inaccurate data and is missing units and labels. • Displays inaccurate, incomplete or disorganized data.

	SI- Analyzing and Interpreting Results *Summarize and analyze data, and identify uncertainties. Draw a valid conclusion, explain how it is supported by the evidence and communicate the findings of the scientific investigation.*
5/6**	• Draws a valid and comprehensive conclusion that addresses the question or hypothesis, identifies relationships in the data, and explicitly explains how the conclusion is supported by the data. • Uses the results to analyze and critique the design and procedures providing significant sources of uncertainties and discuss how these might affect the results, and suggest insightful improvements, revisions or extensions. • Communicates the findings using relevant terminology to report results, explain possible patterns within the data, and if needed justifies alternate reasonable explanations.
4	• Draws a valid conclusion that addresses the question or hypothesis and supports the conclusion explicitly using the data. • Provides evidence that the design, procedures, and data have been reviewed to identify sources of uncertainties and discuss how these might affect the results. • Communicates the findings using relevant terminology to report results, identify possible patterns within the data, and propose reasonable explanations.
3	• Draws a conclusion that addresses the question or hypothesis but is only partially supported by the evidence. • Provides minimal evidence that the design, procedures, and data have been reviewed to identify sources of uncertainties. • Communicates the findings using overly general terminology to report results and propose reasonable but incomplete explanations.
1/2*	• Draws a conclusion that is not clearly related to the question or hypothesis and is minimally supported by the evidence. • Provides incorrect evidence that the design, procedures, data have been reviewed to identify uncertainties. • Communicates the findings with inaccurate terminology to report results or proposes inaccurate explanations.