

TITLE OF LESSON

Physical Science 1 Unit 1 Lesson 4 – How to Conduct a Lab
Nature of Matter: How do tribes experiment?

TIME ESTIMATE FOR THIS LESSON

One class period

ALIGNMENT WITH STANDARDS

California – Sciences: Investigation and Experimentation 1f

MATERIALS

Kirinyaga, Chapter 1 by Mike Resnick (not provided by ESubjects)
Lab Safety Contract – Student Page
Quiz 1 – SI Units, Significant Digits, and Scientific Notation – Teacher Page
Quiz 1 – SI Units, Significant Digits, and Scientific Notation KEY – Teacher Page
Lab 1 – Testing a Hypothesis – Student Page
Lab 1 – Testing a Hypothesis KEY – Teacher Page
Scientific Method Diagram – Teacher Page
calculator (optional)

LESSON OBJECTIVES

- To assess SI units, significant digits, and scientific notation
 - To introduce the scientific method
 - To create a hypothesis
 - To learn how to conduct an experiment
 - To review lab safety
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FOCUS AND MOTIVATE STUDENTS

- 1) Homework Check - Collect all homework and notes from yesterday's class. Hand back graded assignments. Have students place them in the appropriate section of their binder.
- 2) **Agenda** – Have students copy the agenda you post.
- 3) **Quiz 1** - Ask students to put everything on their desk away, except a pen or pencil. Hand out **Quiz-SI Units, Significant Digits, and Scientific Notation**. Have students write their name at the top and complete the quiz – 15 minutes. At the end of 15 minutes, call time. Collect all quizzes.
- 4) **Notetaking** - Write the words, the scientific method, on the board. Ask students, “Does anyone know anything about the scientific method?” Have students take out a sheet of paper, title it *The Scientific Method*, and prepare to take notes.
- 5) Mini Lecture: The Scientific Method - Discuss the scientific method and the role it plays in experimentation, (e.g., how one correctly does laboratory experiments like the ones the students will be doing in class.) Draw the **Scientific Method Diagram** (Teacher Page) on the board as you discuss the scientific method. Scientists study the world by questioning ideas and then formulating experiments to prove their theories. All scientists follow a format, **the scientific method**, when questioning. First, the scientist creates a **hypothesis** or an educated guess about a principle. The scientist then creates a **procedure** to test the hypothesis. While doing the experiment, the scientist collects **data**, which will later be **analyzed** in order to form a **conclusion**. The conclusion should state whether or not the original hypothesis was correct. Scientists can then do further experimentation, modifying their hypothesis until their data proves true. At this point, a hypothesis that has been proven true by experimentation is now classified as a **theory**. This should not be confused with **laws of nature**, which are facts that cannot be disproved.
- 6) **Notetaking Critique** - When you have finished with this mini-lecture, ask for a volunteer to write his/her notes on the board. Look at their notes. Ask the class if the student's notes contain all of the important points

you just spoke about. If not, ask what is missing and have the student write it on the board. Then tell the class that notes should not be whole sentences, just the essence of what was being said. Does this student's notes have whole sentences? If so, how could they get rid of them? You are helping all students to learn to take good notes. So take your time and make sure that they all understand how to clean up their notes. When you have finished, have students place their notes in the notes section of their binder. While they start their vocabulary, tell them you will be walking around the room initialing their notes. So they should leave their binders open to the notes page.

ACTIVITIES – INDIVIDUAL AND GROUP

1. **Group Definition** – Have students break into their lab groups and assign group roles (see *Group Roles* below.) Tell them they will have 10 minutes to create definitions and examples for the Target Vocabulary (see list below) words. Tell them they may use their notes from the lecture to agree upon definitions, but they may not use a dictionary or their textbook. They should generate definitions as a group, but everyone must write them down on individual sheets of paper. The definitions below are for you. Do not give them to the students. If left to their own devices, students usually come up with definitions close to the ones below. It will be easier for students to remember definitions they have generated in their own words, rather than those that have been given to them. Give them ten minutes to agree upon their definitions.

The scientific method – a schematic used by scientists to describe something that is not obvious

Hypothesis – an educated guess based on observations

Procedure – the step-by-step process by which an experiment is completed

Data – numerical values or observations obtained during an experiment

Analysis – discussion of results and observations of an experiment

Conclusion – answers the hypothesis and states the pattern observed in the experiment

Theory – an explanation of what we know based on experimentation, can be disproved

Law of Nature – an explanation of nature that cannot be disproved

2. **Class Definition** - At the end of ten minutes, call time. Randomly, call on a student to give their group definition for the Scientific Method. Write it on the front board. Ask if anyone in the class came up with something different. Have them tell their definition. Then ask the class if they can figure out a way to combine the ideas of the two. Using the first definition, cross out and add the ideas from the second directly on the board until you come up with a definition the whole class can live with. Ask if there is anything missing. If there is, continue adding and deleting until you have one class definition. Do the same thing for each word. Have students copy the agreed upon definitions onto their papers. Tell them these will be the definitions they will be tested on.
3. **Scientific Definitions** – In addition, have the students compare their group definitions to scientific definitions you have taken from a scientific text or dictionary. Have the students briefly look at how their group definitions are similar or different. Explain that it is important for them to realize that scientific definitions frequently are very specific in order that all scientists work from the same premise or point. Make sure they understand that a definition for a word may vary depending on how or where it is being used and that is all right, but when they are working in a scientific format they must use a scientific definition to be consistent. Ask them if their definitions mean the same as the scientific version, but are in their own words. If they are, ask if they think their definitions would be acceptable to use. If they do not think their definition should be used, either have them modify it so that it would be acceptable or ask if they would prefer to write out the scientific definition next to their definition so they may call upon them when necessary.
4. **Lab 1 and Hypothesis**- Hand out **Lab 1 – Testing a Hypothesis**. Explain to students that tomorrow they will work in their lab groups to determine if the hypothesis that they will create today is true. In their groups, ask them to assign group roles and then ask them to read over **Lab 1 – Testing a Hypothesis** by **Reading Out Loud** within their group. Ask students to look at each step in the lab procedure and identify which step in the scientific method it corresponds to and why. They should be comparing the lab procedure to the diagram of the scientific method. Have them write their answers next to the step of the lab procedure. Review as a class to make sure everyone understands the steps in the scientific method and how they relate to the lab and why they are performing it. Then have them work through what it means to create a hypothesis for a specific protocol.

Based on the information in the handout, ask them to formulate a question and create a hypothesis about this lab as if they were following the scientific method. Tell them they will have until five minutes before the period ends to come up with their question and hypothesis. They should write them in the spaces provided on their handout.

5. Review and Discuss - Five minutes before the end of the period, call time. Collect the Lab 1 handout where students should have written in their question and hypothesis. Pass out the **Lab Safety Contract**. Review lab safety rules by having students **read out loud** the **Lab Safety Contract**. Remind students that they must have the sheet signed by their guardian before tomorrow's lab. Ask students to get out their list of good or bad safety techniques from the story Hydrogen. Discuss the items on their lists and why they are considered good or bad safety practices.
 6. Homework Review – Tell students to read Kirinyaga Chapter 1 and write **Dialectical Journal 2** with at least three entries.
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HOMEWORK

- 1) Review **Lab 1 – Testing a Hypothesis**. Make sure you understand the procedure before coming to class tomorrow.
 - 2) Have parents read and sign **Lab Safety Contract**.
 - 3) Read *Kirinyaga*, Chapter 1.
 - 4) Write **Dialectical Journal 2** with at least three entries.
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GROUP ROLES

Manager – Responsible for making sure assignment is complete by the end of the period. Should keep track of time and make sure the group has all of the materials necessary to complete the lab.

Recorder – Will record question & hypothesis & share with partners, making sure that all group members have copies of the question & hypothesis in order to successfully understand the lab tomorrow.

Facilitator – Keeps group focused on task. Makes sure the lab is complete by the end of the period.

DOCUMENTATION FOR PORTFOLIO

None