

#### TITLE OF LESSON

Physical Science 1 Unit 1 Lesson 9 – Matter and Energy

*Nature of Matter: How do tribes define the substances around them and their interactions?*

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#### TIME ESTIMATE FOR THIS LESSON

One class period

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#### ALIGNMENT WITH STANDARDS

California – Sciences: Chem, Atomic and Molecular Structure 1, Gases and Their Properties 4; Investigation and Experimentation 1a

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#### MATERIALS

Physical Science Textbook

*Kirinyaga* Chapter 2 pp. 33-47 – Reading (not provided by ESubjects)

*Cerium* – Reading from *The Periodic Table* by Primo Levi (not provided by ESubjects)

**Phase Change Worksheet** – Student Page

**Phase Change Key** – Teacher Page

**Figure 2-14** – Teacher Page

paper

pen or pencils

Demo 1: a bottle of ammonia, a bottle of perfume

Demo 2: a beaker full of dry ice or iodine crystals

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#### LESSON OBJECTIVES

- To introduce students to the Kinetic Theory
  - To introduce students to a phase change graph
  - To read a short story and answer questions about it
  - To write a journal
  - To analyze images and graphs in a textbook
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#### FOCUS AND MOTIVATE STUDENTS

- 1) Homework Check – Collect homework. Lab Report 2 will go into their portfolios when you return them as a demonstration of their writing skills and lab skills. Explain to students that this will be the place where they keep formal pieces of work to demonstrate their skills. By the end of the year, the portfolio should be full and be samples of how students have improved since coming to this class. Pass back graded assignments and have students place them in the appropriate section of their binders.
- 2) **Agenda** – Have students copy the agenda you posted.
- 3) Short Story – Ask students to get out their copies of *Cerium* and get into groups of four. Ask them to answer the following questions:
  - a) How did they identify the material that made up the rods? *They used a knife to scrape against the metal and saw a spark come off of it.*
  - b) Why did they steal the rods in the first place? *They stole them to sell in order to buy food and survive.*
  - c) How did they reduce the size of the rods to that required of flints? *They used a metal plate with a hole in it as a pattern for the correct size, and then they scraped them to the correct size with their knives while lying under their blankets so that no one would know what they were doing.*
  - d) What group does cerium belong to? *Rare-earth group family.*

Have each group share their answer with the class. Make sure there is a consensus between all groups. Ask them how this story relates to what they learned yesterday about identifying substances.

- 4) Mini Lecture – Tell students that since you will be writing on the board they should be taking notes. Write the words KINETIC THEORY on the board, leaving space underneath to write and explain the following :
    - ◆ All matter consists of atoms and molecules that act like very small particles
    - ◆ These very small particles are always in motion.
    - ◆ The speed of the small particles is dependent on the temperature (the higher the temperature the faster the particles move).
    - ◆ The heavier the particle, the slower it will move.
    - ◆ There is no attraction or repulsion between the particles when they are in the gaseous state.
  - 5) Demo 1 – Tell students you are going to open two bottles with aromatic substances and that you want them to notice how the odor moves through the room. They should take notes on their observations. First, open a bottle of ammonia in the back corner of the room. Ask students to raise their hand when they notice the odor. Open window/door to air out room. Close window/door, repeat with a spray of perfume.
  - 6) Review and Discuss - Ask students: *Did the gases travel across the room at the same speed? Why or why not? How can the Kinetic Theory be used to explain this demo?*  
*Answers should include: No, the ammonia traveled faster.*  
*Ammonia is probably lighter in mass than perfume. Therefore, it is faster.*
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#### ACTIVITIES – INDIVIDUAL AND GROUP

1. Textbook Usage – Ask students to get out their school textbook for Physical Science. Have them open the book to an image you have chosen and have them look at the caption. What can they learn from this caption? Then have them look at a graph you have chosen. How do they use the information given to read the graph? Do they need to know what the x and y axes are labeled in order to fully understand the graph? Why? Remind them that the information they have been discussing is what is required to quickly understand the meaning behind images and/or graphs. Tell them that today they are going to create a graph (phase diagram) and that they need to understand how to label it, as well as use it to provide clear information to someone reading it.
  2. Board Work – Draw three boxes on the board labeling each SOLID, LIQUID, GAS.
  3. Class Work – Ask for three volunteers to come to the board and draw a picture of what each looks like.
  4. Review and Discuss – Ask students “How do solids become liquids and gases?” For example, ask students if they had a block of ice, how would they change it into a liquid and then a gas?  
*Answers should include: Heat or energy is added.*  
*For example, taking ice out of freezer will cause it to melt because the temperature in the room is higher than in the freezer, or heating the ice in a kettle on the stove would increase the temperature by adding energy as heat.*  
*Left heating on the stove long enough, the temperature and energy will increase enough to cause the water to turn to steam or a gas.*
  5. Group Work – Have students break up into groups and brainstorm definitions for *melting*, *freezing*, *condensation* and *evaporation*. They should also locate on the graph where these phase changes occur.  
*Responses may include: melting – the change of a substance from solid to liquid*  
*freezing – the change of a substance from liquid to solid*  
*condensation- the change of a substance from gas to liquid*  
*evaporation- the change of a substance from liquid to gas*
- Walk around the room and check groups’ progress.
6. Review and Discuss – Write the word SUBLIMATION on the board. Have students write the word in their notes. Ask students: *Does anyone know what the word sublimation means?*
  7. Demo 2 – Place either solid dry ice in a beaker or solid iodine crystals in a beaker. Have students observe results.

8. Review and Discuss – Ask the question: *Now can anyone give an educated definition for the word sublimation?*  
*Responses may include: sublimation is the change of a substance from solid to gas*  
Ask a student to look up the definition in their physical science textbook if they don't come up with the answer. Ask students if they can give another example of sublimation. If not, ask them if they have ever had a tray of ice in the freezer for a long time and the ice cubes were smaller or disappeared. This is another example of sublimation.
  9. Graphic Organizer – Draw a phase diagram on the board (Energy as y axis and Temperature as x axis). Label the diagonal lines that represent solid, liquid, and gas (see **figure 2-14**, Teacher Page, for an example but only draw solid, liquid and gas phases and point out the vertical lines that represent the change from one phase to another. Students will complete the phase change diagram for water later in class today. So don't give them all the details.) Tell students to copy this diagram into their notes. Use this diagram to explain the phases and their relationship to temperature and energy. Explain to students that they will be completing a phase diagram later in class.
  10. **Journal 4** – Have the students write a journal in class today called Phase Journal. First, tell them they should choose which phase they would prefer to be, solid, liquid or gas. Then tell them they will be writing a journal about why they chose to be this phase. Tell them they will be writing for 10 minutes straight. They are only to concentrate on the ideas, not the grammar or spelling. Answering why in detail is the most important part of this journal. At the end of 10 minutes call time.
  11. **Group Read Around** – Have the students work in groups of four to complete the group read around of their journals. The students will pass their journal to the person on their right. Then they will read the journal the received. After 2 minutes have them pass the journal to the right and read the next one. Repeat until they have read all journals. Have them choose the best journal and have the author stand and read the journal to the class. Hand in journals to be graded.
  12. Individual Work – Hand out the **Phase Change Worksheet** and if there is time have the students work on it until the end of the class period. They should complete the handout as homework.
  13. Notes – Ask students to hand in their notes to be graded.
  14. Homework Review – Tell students to read Kirinyaga Chapter 2 (pp. 33-47) begins with the beginning of chapter and ends with “Finally I returned to my own *boma*, for I always take a nap during the heat of the day, and the rain was not due for another few hours.” Tell them to write **Dialectical Journal 3** with at least three entries.
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#### HOMEWORK

- 1) Complete **Phase Change Worksheet**.
  - 2) Read *Kirinyaga* pp. 33 – 47.
  - 3) Write **Dialectical Journal 3** with at least three entries.
  - 4) Study class notes to date.
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#### GROUP ROLES

- Recorder: will record group's responses
  - Facilitator: keeps group focused
  - Manager: responsible for reporting back to class
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#### DOCUMENTATION FOR PORTFOLIO

Lab Report 2