

## LESSON 14. The Three States of Matter: Energy Matters

Grade Level: 7-8

### 1. Grades 7-8

**2. Overview** The Greek scientists classified anything which occupies space and has weight as matter. Matter could therefore be living or non-living. All non-living matter was further classified into three-solid, liquid and gas. These three classifications came to be known as the three states of matter. Matter can be changed from one state to the other depending on how energy is applied.

**3. Purpose** The purpose of this lesson is to examine how application of energy to non-living matter can change it from one state to the other.

**4. Objectives** Students will be able to:

- i. Classify matter into solid, liquid and gas
- ii. Discuss the characteristics of each state of matter
- iii. Explain how matter can be changed from one state to the other.

### 5. Resources/materials

- Several beakers
- Pieces of ice blocks
- Kettle of water, burner

**6. Activities and Procedures** The classification of matter into solid, liquid and gas is most applicable to non-living matter. The classic behaviour of water under different conditions provides interesting study. The students must already be familiar with liquid water and solid ice. Many would have held a piece of ice and see it gradually melt into water. They would have observed a boiling kettle with steam gushing out. This lesson will now enable them to have a classic explanation to all that they observe.

One way of explaining the three states of matter is to look at a human model. This model simple as it is tells it all. The students gather in an open space, then the teacher gives the instructions:

- **For solids:** Arrange yourselves in rows of three with arms tightly linked together. The people at the end of rows who have a free arm should firmly hold onto the shoulder of the one in front. Try to shake.

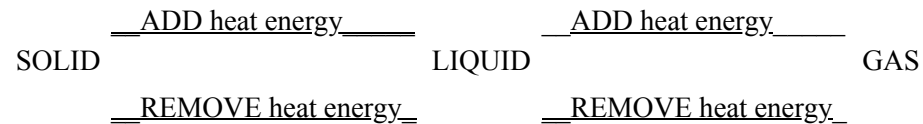
- **For a liquid:** Unlink your arms and spread out until you are all just holding hands. Keep moving around and shaking.
- **For a gas:** Release your hold so that you can run about freely. Run in different directions.

The individual students in this model behave like particles. In solids, movement is restricted; in the liquids, movement is a bit freer: in the gas, there is free motion all over.

The change of matter from one form to the other can be influenced by heat energy. The piece of solid ice changes to liquid water if the ice is warmed. In other words, when heat energy is added to a solid, it changes to liquid. Also when water is cooled, that is, if heat is removed, it changes into a solid. These same arguments could be used for the change from liquid to gas and from gas (vapour/steam) back to liquid. Thus the role of energy in change of state is explained.

The same explanation could be given when solid wax changes to liquid wax and then to wax vapour (gas).

**7. Tying it all together** Energy is involved when change of state takes place. The process could be summarised thus:



**8. Assessment** Ask the students to indicate the direction of the arrows in the diagram above.

**9. Author(s)** S. T. Bajah [stan@alpha.linkserve.com](mailto:stan@alpha.linkserve.com)

**10. References** Ministry of Education and Culture (1995). **Step Ahead New Secondary** Science . Students' Book I zim-sci. Harare: Longman Zimbabwe (Pvt) Ltd.