



Lesson Title	Kinetic Theory
Length of Lesson	15- 20 min.
Created By	Lucas Pounders
Subject	Physical Science
Grade Level	9 th -12 th Grade
State Standards	1d, 2a
DOK Level	2,3
DOK Application	Understand, Connect
National Standards	A: Inquiry, Structure and Properties of Matter
Graduate Research Element	Properties of Matter

Student Learning Goal:

To understand the kinetic theory and the principle behind the movement of molecules.
State Standards:

1. Apply inquiry-based and problem-solving processes and skills to scientific investigations.
 - c. Identify and apply components of scientific methods in classroom investigations. (DOK 3)
 - g. Communicate effectively to present and explain scientific results, using appropriate terminology and graphics. (DOK 3)
2. Describe and explain how forces affect motion.
 - c. Describe (with supporting details and diagrams) how the kinetic energy of an object can be converted into potential energy (the energy of position) and how energy is transferred or transformed (conservation of energy). (DOK 2)

National Standards

9-12: Science as Inquiry Standards: Understanding about scientific inquiry

Materials Needed (supplies, hand-outs, resources):

- 2 tubes of food coloring (Red and Blue)
- 2 – 600 ml beakers
- Hot and Cold water
- Rubber band
- Ping pong paddle
- Ping pong ball
-

Lesson Performance Task/Assessment:

The first activity will be to fill one beaker with hot water and the other beaker with cold water. The instructor will then drop a few drops of food coloring into each beaker. Then ask the students if one color seems to be spreading at a fast rate than the other color? The students will notice that in the beaker with hot water the color is spread much faster than in the beaker with the cold water. In both the beakers the color will still mix in evenly; however, hot water gets the job done at a quicker pace.



The second activity will begin by giving each student a rubber band. The students will then be instructed to hold the rubber band up close to their upper lip and slightly stretch out the rubber band. The students will then be instructed to place the rubber band against their upper lip noticing that the rubber band seems to be warm. They will remove the rubber band and let it go back to its original shape. Then place it against their lip again noticing that it has now cooled off. The instructor will then take the ping pong paddle and ball and begin bouncing the ball on the desk. Explain that this is an example of the energy, as you move the paddle closer to the desk the ball begins to move faster and as you move the paddle away it slows down again. This is what is happening in the rubber band. When there is more energy involved, such as when the rubber band is being stretched, the temperature will increase. This could also be done with a tennis ball, basketball, etc.

Lesson Relevance to Performance Task and Students

The objective of this lesson is to help to students to realize that molecules move. Through two different activities the instructor will help the students to understand the kinetic theory.

Anticipatory Set/Capture Interest:

The teacher should open this lesson with the question, “What do the items sitting on the table today have in common”?

Also, through visualization of the activities in class the instructor hopes to help the students to become more interested and understand the theory being presented to them.

Guided Practice:

The activity with the rubber band would be done with the class as a whole.

Independent Practice:

The students will be divided up into groups and be required to list 5 things in which the kinetic theory applies.

Remediation and/or Enrichment:

Follow Individualized IEP, enrichment for students needing help without an IEP, For those students who do not have an IEP to follow discussion can be done through discussion or a handout asking the students:

- 1.) Where do you think these principles can be applied in real life? How? Why?
- 2.) What is one thing that you have done today that involves these principles, other than the activities demonstrated?

Check(s) for Understanding:

- 1.) Which beaker of water diluted the food coloring faster and why?
- 2.) How does this apply in other aspects of the real world? (cooking, animal activity)
- 3.) What did the rubber band do when stretched, why?



Closure:

Facilitate a class discussion of the information covered and the final conclusions that were drawn. There can be a final correct answer or it could be left open ended for more discussion and another lesson.

Possible Alternate Subject Integrations:

Physics, Chemistry

Teacher Notes:

There are to be certain key points in this lecture exercise where the students need to be completely involved in the conversation. It may be a good practice to pause before these points and make certain that the students are paying attention. Also, when asking the questions in the remediation/ enrichment, make sure your knowledge of the applications of the kinetic theory is good enough to judge its applications. Also be cautious about the use of rubber bands, know your students and how their level of discipline.