

MATTER MODULE

(Teacher Lesson Plan with accompanying Student Lab Pages)

DAYS ELEVEN AND TWELVE

I. Objectives

1. TLW investigate and compare the following physical properties of matter:
 - a. Relative hardness of objects
 - b. Relative Transparency of objects
 - c. Flexibility and stretchability of objects
 - d. Water absorbent and waterproof objects
 - e. Objects that dissolve in water to form a solution
 - f. Objects that mix together to form a mixture and can be easily separated
2. TLW demonstrate scientific observation, measurement, experimentation, collection, organization and interpretation of data, and communication techniques during an activity.
3. TLW apply laboratory, safety and cooperative group procedures.

II. TEKS/TAKS

TEKS – 3.1, 3.2, 3.3, 3.4A, 3.7A

TAKS Obj. – 1 & 3

III. Materials

Day 1 – Lab sheets, Lab boxes with: (6 items to test relative hardness, i.e., cotton ball, tennis ball, Nerf ball, Ping Pong ball, bar of soap, sandstone, chalk, granite or quartz);

Day 2 – Lab sheets, Lab boxes with about 10 items to test (see suggestion below), water in a pouring container, aluminum pie pan, spoon

Teacher note: Below are suggested items for testing each of the categories. Select a total of about 10 items making sure you include at least 1 example that demonstrates each of the physical properties being tested and 1 non-example. Since many of the suggested items have more than 1 of these properties, you should not need more than 10 items.

- Transparency: clear plastic transparency sheet, waxed paper, tissue paper, student notebook paper, foil, black construction paper, textbook, etc.
- Flexibility and stretchability: rubber bands, paper, elastic, samples of fabric, i.e., knit, cotton, felt, silk; piece of yarn, ruler, nail, metal spoon, plastic cup, straw
- Absorbency and waterproofing: plastic cup, newspaper, paper towel aluminum pie pan, piece of disposable baby diaper, dish cloth, sponge, etc.
- Dissolvability: sugar, salt, powdered drink, flour, coffee grinds, sand, etc.

IV. Procedures

1. Prior to the day of this lesson, gather and organize all items to be tested and prepare cooperative group lab boxes for the first day. Set aside materials for Day 2 so that they will be readily available.
2. Begin Day 1 with a quick discussion about the physical properties of matter that they have already investigated. (Using 5 senses and comparing volume and mass)
3. Explain that in the next 2 days, the cooperative groups will be investigating other physical properties of matter. They will test a number of items to determine how hard or soft they are, whether they are transparent or not, whether they are flexible and/or stretchable, whether they are water absorbent or waterproof, whether they dissolve in water and finally how strong they are. They will compare these items to each other and then record their observations. Afterward, they will organize their data into a chart so that they can make some statements about the physical properties of different types of matter.

Teacher note: As you rotate among the groups, guide them to see commonalities in the types of materials that share some physical properties, i.e., glass, metals and plastics are waterproof, cloth and paper are flexible, etc.

You also want them to see that objects are usually compared to each other when determining such properties as transparency or hardness, i.e., metal is harder than a tennis ball, but the tennis ball is harder than the Nerf ball, etc. Clear plastic is more transparent than waxed paper, but the waxed paper is more transparent than the notebook paper, etc.

4. Pass out the lab sheets and go over the directions for the Day 1, Part A investigation which will compare and rank the order of the relative hardness of a variety of objects. They will easily be able to decide that some items are soft and others are hard. They must compare each item to rank them from softest to hardest.
5. After modeling and answering all questions, have materials managers check out lab boxes. Instruct cooperative groups to complete Part A of the investigation and to record their findings in the Observation Section.
6. Upon completion of Part A, hold a class discussion so that groups can share their findings and the various methods that were used to determine hardness.
7. As a culminating activity for Day 1, have students write a conclusion to Problem Question #1. Explain that they will be sharing these conclusions at the beginning of the next day's lesson.

Teacher note: Possible responses to Problem Question #1: We compared 2 objects at a time to determine hardness. We did this by feeling and squeezing the items. We also scratched some of the items that felt the same against each other to see which one could scratch the other. Then we placed them in order from the softest to the hardest.

8. **Begin Day 2**, by quickly having groups share conclusions from Part A.
9. Pass out the lab sheets and go over the directions for the Day 2, Part B investigation which will be determining the above mentioned physical properties

of the selected items. Explain that the cooperative groups will test each item for each physical property.

10. Model (as necessary) techniques for students as to how they might test for each property.

*Teacher note: To test for transparency, have students hold the objects up to see if they can see an image clearly. If so, the material is transparent and they will mark **Y** for yes. If not, hold the object up to the light (or window) to see if light passes through. If so, it is somewhat transparent (translucent) and they will mark **S** or somewhat. If no light passes through and it casts a shadow, it is not transparent at all (opaque). They will mark **N** for no.*

*Tell students to save the tests that use water for last. To test to see if salt, sugar or flour dissolves, tell students to pour water into the clear cups and stir so they each can be seen clearly. They will be able to see the sugar and/or salt disappear in the water. Point out to students that when one type of matter dissolves into another type of matter, this is known as a **solution**. They will then be able to observe the flour being suspended in the water, but then falling to the bottom rather quickly. When different types of matter are put together but don't dissolve, this is known as a **mixture**. **Mixtures** can be easily separated, but **solutions** cannot. Both mixtures and solutions are types of physical changes.*

To test for absorbency, have students pour a small amount of water into the pan and test to see if the water is taken up into the item such as the sponge, paper towel or baby diaper.

To test for waterproofing, demonstrate how students would hold objects over the pan and then carefully pour a stream of water over them to see if water pours through. Mention that some items may be water absorbent but not waterproof and vice versa.

11. Instruct cooperative groups to complete Part B of the investigation and to record their findings in the data chart found in the Observation Section.
12. Upon completion of Part B, hold a class discussion so that groups can share their findings about the physical properties of each item. Guide students to evaluate the data to understand how scientists, such as, inventors and engineers use physical properties when choosing materials for projects to be built or completed.
13. Ask students to volunteer information about the physical properties of materials needed to build a bridge or to design new athletic shoes, etc. This discussion will help students connect the investigation to the real world. It will also assist them in formulating their conclusions.
14. As a culminating activity for Day 2, have students write a conclusion to Problem Question #2 and share these with the class.

Teacher note: Responses should focus on how scientists, such as, inventors and engineers look at the physical properties when they are choosing materials for certain products. For example, materials used to make clothing items need to be flexible, strong, soft, possibly waterproof or absorbent, etc. Materials for a bicycle need to be strong but flexible so that they can be shaped and molded; tires need to be durable, and soft enough to absorb impacts but hard enough to support weight, etc.

Baby diapers need materials that are soft for comfort and water absorbent to collect liquid, but also need a plastic, flexible covering to prevent leaking, etc.

V. Evaluation

1. Teacher observation
2. Student work

VI. Extension

Have students design a new toy. They will name the toy and describe how it is to be used. They will decide what physical properties are necessary in the materials to meet the requirements of the toy. (Does it need to be stretchy or bouncy or durable or waterproof, etc.?)

For the final product, have students draw a picture of their toy and write a paragraph explaining the toy and the physical properties of the materials that were needed to make the toy a success.

NAME _____ DATE _____

COMPARING MATTER

Problems:

1. How can you determine the hardness of an object?
2. How can the physical properties of matter be used to determine its best uses?

Hypothesis:

1. _____

2. _____

PART A

Materials:

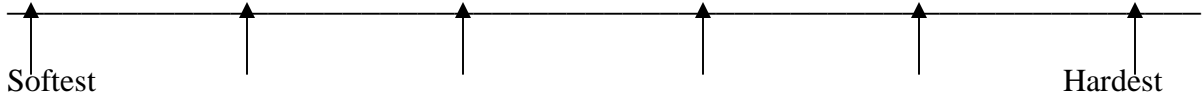
Lab sheets, lab boxes with 6 objects to test

Procedures:

1. Read and discuss the problem questions with your group.
2. Write your 2 hypotheses in the blanks given.
3. Remove the objects from the lab box and place them in the center of your table.
4. Your task is to compare these objects and rank them in order from softest to hardest.
5. Discuss with your group your plan to rank these objects for hardness. Decide on a way to compare the hardness of objects that seem close.
6. Write your group's plan below. _____

Observations:

Rank your objects on the line below.



Did you have to make changes to your plan to compare the objects? _____
If so, how? _____

Conclusion:

PART A (Answer to Problem Question #1

PART B

Materials:

Objects to test, container of water, aluminum pie pan, spoon

Procedures:

1. Read Problem #2 again and discuss with your group.
2. Discuss these physical properties in your group.
3. Remove the objects from the lab box and place them in the center of your table.
4. Your task is to test these objects for these physical properties:
 - a. Transparent (Can you see through it?)
 - b. Flexible (Can you bend it?)
 - c. Absorbent (Can it hold water?)
 - d. Waterproof (Does it keep water from going through?)
 - e. Dissolve (Will it disappear in water or just mix together?)
5. Select 1 item. Write the name of that object in the chart given below.
6. Test this object for each of the 5 physical properties.
7. Use the key to record your findings in the data chart below.
8. Repeat this with each of the other objects and record your findings.

9. Participate in the class discussion.
10. Complete the conclusions based on the data collected.
11. Share and compare information with the class.
12. Return the lab boxes and lab sheets.

Observations:

Key: Y = yes N = no S = somewhat

Physical Properties

Name of Object	Transparent	Flexible	Absorbent	Waterproof	Dissolve

Conclusion:

PART B (Answer to Problem Question #2)
