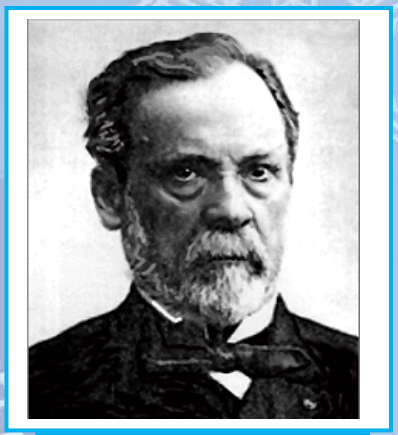
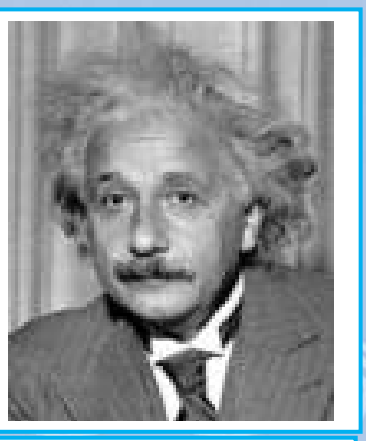
Sir Isaac Newton



Louis Pasteur



Albert Einstein

A SCIENCE Winter Inquiry Land

Answer Key

Physical Sciences
(Chemistry, Physics)

Winter 2011-2012

Miami-Dade County Public Schools
Curriculum & Instruction

THE SCHOOL BOARD OF MIAMI-DADE COUNTY, FLORIDA

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Appendix

WELCOME TO *A SCIENCE WINTER INQUIRY LAND*

Preparing for Science

Science is not something mysterious. Being "scientific" involves being curious, observing, asking how things happen, and learning how to find the answers. Curiosity is natural to children, but they need help understanding how to make sense of what they see.

Bruno V. Manno
Acting Assistant Secretary
Office of Educational Research and Improvement

Many people are frightened by science and see it as something that can only be understood by the mind of a genius. Increasing the number of people going into the fields of science and mathematics is the national goal. However, even if a student is not planning to pursue a career in one of those fields, they have to be prepared to live and work in a world that is becoming increasingly complex and technical.

What Is Science?

Science is not just a collection of facts. Facts are a part of science. However, science is much more. It includes:

- Observing what is happening,
- Predicting what might happen,
- Testing predictions under controlled conditions to see if they are correct,
- Trying to make sense of our observations, and
- Involving trial and error--trying, failing, and trying again.

Science does not provide all the answers. The world around us is always changing and we learn something new every day, so we have to be willing to make changes and adjustments to our knowledge when we discover something new.

The Winter Break Packet

The activities and reading passages in this packet were selected to allow students to experience the relevancy of science in a fun and engaging way. As they navigate through these activities, students should realize that science is not limited to the classroom but that it is all around in everyday lives and that it explains most of the phenomena encountered in life.

Included as part of this packet, is a link to the Miami-Dade County Public Schools Student Portal *Links to Learning* technology activities. Individualized student learning paths have been designed based on FCAT scores and are aligned to the District's Pacing Guides. These online activities are supplemental and, as such, are not to be assigned or graded. All online activities are provided as a resource to both parents and students to engage learning using technology. Please log on just as you do at your school.

Links to Learning

Resources:
Technology-based resources can be accessed through the Student Portal on the district website, http://www.dadeschools.net, under the *Links to Learning* initiative. Here you will find additional activities designed for each student's individual needs, like virtual laboratory investigations with Explorelearning Gizmos.

The Appendix provides information designed to give the student a framework for the expectation of the scientific writing process.

Who Were They?

Sir Isaac Newton was a physicist, mathematician, astronomer, alchemist, and natural philosopher. He is best known for his explanation of Universal Gravitation and the three laws of motion. He was also able to prove that the reason of both the motion of objects on Earth and of celestial bodies is controlled by the same Neutral laws. These findings would make a revolutionary change in the development of science. His invention of the reflecting telescope was his great contribution in optics.

Louis Pasteur was a French chemist and microbiologists and one of the most famous and influential contributors in medical science. He is remembered for his remarkable breakthroughs in the causes and preventions of diseases supported by his experiments on the germ theory of disease. He also created the first vaccine for rabies and anthrax. Pasteur also invented the method of "pasteurization", where harmful microbes are stopped from causing sickness in food.

Albert Einstein is the greatest scientist of the twentieth century and the most notable physicist of all time. He was born in Germany but eventually migrated to America to take a teaching position at Princeton University. It is told that he had a learning disability in his childhood. He could not talk till he was three and could not read till he was eight. Despite such problems, in 1921 he became the noble prize winner for his contributions to Physics. His *Theory of Relativity* is considered a revolutionary development of Physics.

ACTIVITY 1: EXPLORING KINETIC AND POTENTIAL ENERGY

(Adapted from String & Sticky Tape Experiments) by R. D.Edge Published by the AAPT

Benchmarks:
SC.912.P.10.1: Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

SC.912.P.10.2: Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

SC.912.P.12.2: Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

In order to investigate the relationship between potential and kinetic energy, you will need the following materials:

- Ruler
- One marble or small ball
- Paper
- Table
- Book

Problem Statement:
How does energy affect the distance a ball will travel?

Hypothesis: Write a hypothesis that attempts to provide a solution to the problem statement. Use variables observed, measured, or calculated in your writing. Make sure to use the IF – THEN – BECAUSE format.

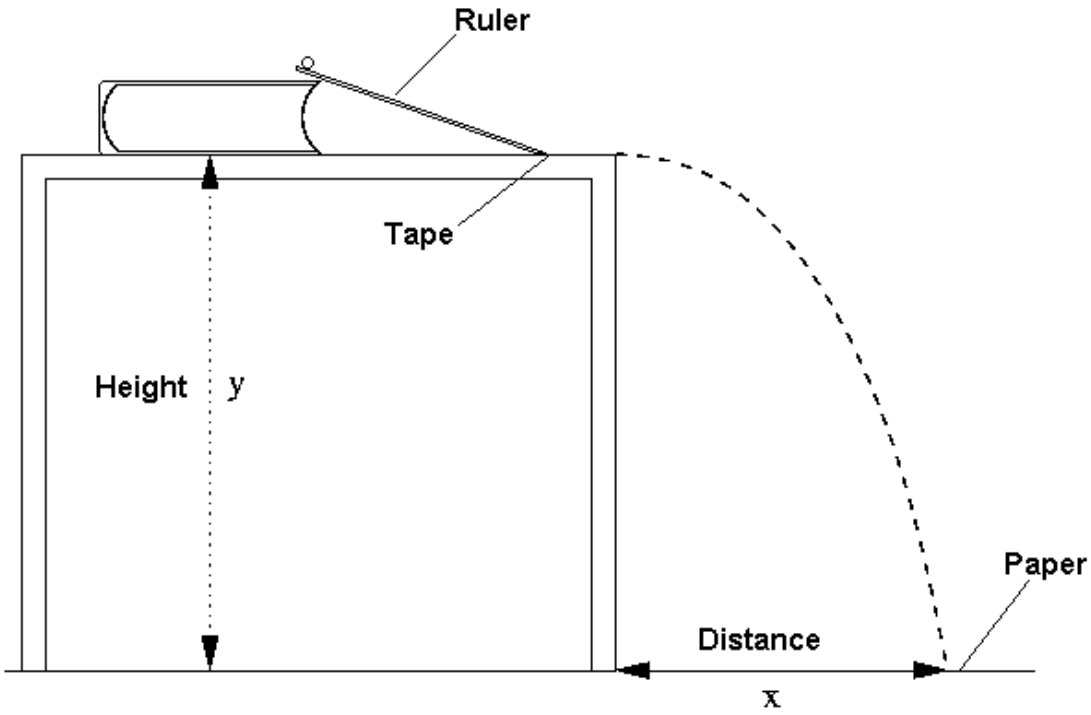
An example may read : _____

If the marble is released from a higher position on the ruler, then the ball will strike the floor_

farther from the table because the ball will acquire a greater horizontal velocity._____

Procedures:

1. Prop the ruler up against a book, as shown, so that the end is about two inches from the edge of the table, and the other end is about two inches above the table. Tape the lower end of the ruler to the table, to stop it from slipping. See diagram of lab setup.



Lab Setup

2. Record the height of the table – Y.
3. Hold the marble at the 3” mark and release. Allow the marble to roll down the ruler and off the edge of the table. When the ball hits the paper on the floor, make a mark where the impact occurred. Repeat several times for accuracy and consistency of results.
4. Before removing the paper from the floor, measure the distance X from the edge of the table to each mark on the paper, and label the paper 3”.
5. Repeat procedures 3 and 4 with initial marble positions of 6”, 9”, and 12”. Repeat the same number of trials making sure to mark the locations on the paper where the marble hits the floor. Measure each distance from the table to each mark and label each paper with the initial position of the marble.

Data: Collect all your data on the table provided:

Initial Position 3”	Height – Y (m)	Distance – X (m)	
Trial 1	Answers will vary		
Trial 2			
Trial 3			
Trial 4			
Trial 5			
Average			

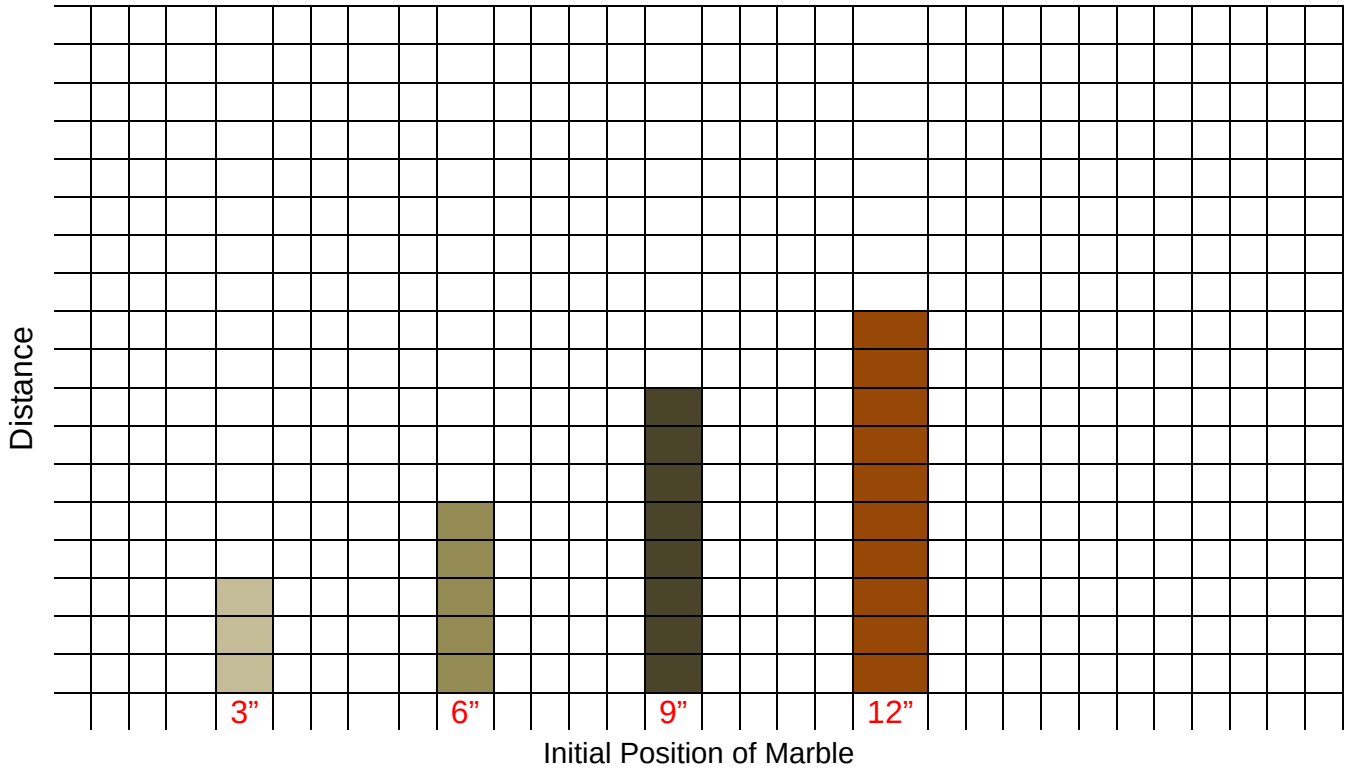
Initial Position 6”	Height – Y (m)	Distance – X (m)	
Trial 1	Answers will vary		
Trial 2			
Trial 3			
Trial 4			
Trial 5			
Average			

Initial Position 9”	Height – Y (m)	Distance – X (m)	
Trial 1	Answers will vary		
Trial 2			
Trial 3			
Trial 4			
Trial 5			
Average			

Initial Position 12”	Height – Y (m)	Distance – X (m)	
Trial 1	Answers will vary		
Trial 2			
Trial 3			
Trial 4			
Trial 5			
Average			

Evaluation of Data:

Graph the results of your investigation in a plot describing Distance vs. Initial Position of marble.
Sample graph shown below



Results:

Qualitative Observations:

1. What is the purpose of releasing the marble from different positions?

Releasing the marble from higher positions increases the marble’s gravitational potential energy, causing it to move faster along the table after the potential energy transfers into kinetic energy.

2. How does the initial position of the marble affect the striking distance?

Increasing the potential energy of the marble increases the kinetic energy of the marble along the table, which means that the horizontal velocity of the marble will increase causing it to travel farther.

3. Can you relate the striking distance of the marble to potential energy?

The striking distance depends on the horizontal velocity of the marble as it leaves the table. The velocity of the marble depends on the kinetic energy, which is the energy transferred from the potential energy of the marble related to its initial position

4. Can you relate the striking distance of the marble to kinetic energy?

The striking distance depends on the horizontal velocity of the marble as it leaves the table. The velocity of the marble depends on the kinetic energy, which is the energy transferred from the potential energy of the marble related to its initial position

5. What happened to the potential energy of the marble as it collided with the floor?

The potential energy of the marble transfers into kinetic energy as it drops in height until it hits the floor. Right before hitting the floor most of the potential energy is transferred into kinetic energy, other portions of the initial potential energy are transferred into heat due to air friction and sound when hitting the floor.

6. When the marble left the table, it had a potential energy determined by its height (vertical component), and kinetic energy determined by its motion (horizontal component).
    a. Does the potential energy of the marble as it leaves the table affect the distance that it strikes the floor? Explain.

    The potential energy of the marble on the table has no effect on the distance it strikes away from the table. Since potential energy depends on the vertical position of the marble, it only affects the motion of the marble in the downward direction.

    b. Does the kinetic energy of the marble as it leaves the table affect the distance that it strikes the floor? Explain.

The kinetic energy of the marble on top of the table is the reason that the marble has a horizontal velocity. As the marble falls, the horizontal velocity causes the ball to move away from the table.

Conclusion:

Write a conclusion using the Power Writing Conclusion format found at the end of this document; attach additional paper as needed.

Conclusion will depend on the original hypothesis, but should reflect understanding of the transfer of potential energy to kinetic energy.

ACTIVITY 2: PROPERTIES OF MATTER

Benchmarks:
SC.912.P.8.2: Differentiate between physical and chemical properties and physical and chemical changes of matter

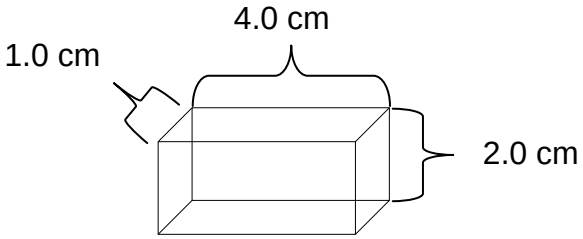
SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

One way to describe matter is by observing its **physical properties**, including **volume**, **mass**, and **density.** A physical property is one that you can describe with your senses. Other physical properties include color, smell, texture, and hardness.

Volume is the amount of space that matter takes up. You normally use a graduated cylinder or a measuring cup to measure the volume of matter. What other tool can you use to measure volume?

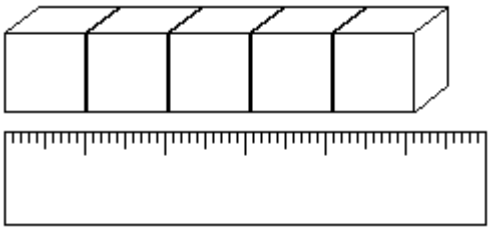
Measuring Volume:
To do science, you need to understand volume. In many science experiments, you need to measure volume. Volume is a physical property of matter. It is a measure of how much space an object takes up. Volume of regular solids can be calculated using a ruler. The volume of an irregular solid can be calculated using water displacement.

One way to measure the volume of a regular shaped object is to use a ruler to determine the length, width, and height of an object.



In this example: length = 4.0 cm, width = 1.0 cm, and height = 2.0 cm
You can multiply the length (l) times the width (w) times the height (h) to get the total volume. This calculation is equal to, V = 4.0 cm x 1.0 cm x 2.0 cm = 8 cm^3

1. Imagine you have 5 plastic cubes arranged in a straight line. Each cube's side measures **1.0 cm**. How can you determine the volume of the line of five cubes? (l) x (w) x (h)



5 cm x 1 cm x 1 cm = 5 cm^3

There is another way to measure volume, called **water displacement.** The ancient Greek mathematician, **Archimedes**, discovered this principle while taking a bath!

Archimedes was trying to figure out how to measure the volume of the King's crown. It was not a regular shape like the plastic blocks you measured. He could not just measure the length, width, and height. He was frustrated, so he decided to take a bath. He filled the water all the way up to the top of the bathtub and what do you think happened when he got in the tub? Water spilled out of the tub all over the floor.

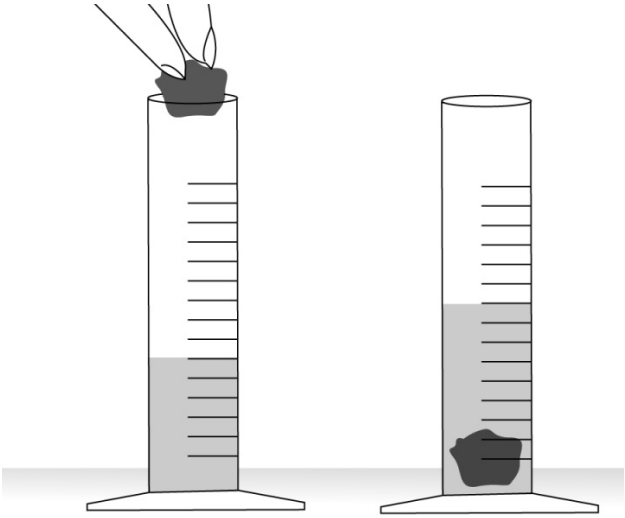
How much water spilled out? An amount equal to the volume of Archimedes' body!
This principle is called water displacement or ***Archimedes' principle***. The amount of water that is moved or displaced is equal to the volume of the object placed into the water. In this story, Archimedes was the object. His body moved or displaced the water, and the amount of water that spilled was equal to the volume of his body that went into the tub.

2. How did Archimedes' experience in the bathtub teach him how to find the volume of the King's crown? What do you think he did with the crown?

   Archimedes submerged the crown to collect the spilled water.

3. Think back to Archimedes and the bathtub and explain why the water level in the graduated cylinder pictured below changed. (By how much volume did it change?)

   Submerging the rock caused the volume of water to increase by 3 lines. If each line represents 10 ml, the volume raised is 30 ml.



Before After

Mass and weight both refer to how heavy something is, but mass and weight do not mean exactly the same thing. It is important to understand the difference.

The mass of an object is a measure of how much matter it contains. Mass is measured with a balance. The mass of an object always remains the same because it always contains the same amount of matter. If your mass is 70 kg on the Earth, your mass will still be 70 kg on the moon.

Weight is the gravitational force between an object and a planet or moon (something with enough mass to exert a considerable gravitational attraction). Weight can be measured with a spring scale. The weight of an object can change depending on its location (on top of a mountain, under the sea, or on another planet) because the force of attraction involves both the mass of the object being weighed and the gravitational force between the object and the planet it is on.

If you went to the moon (not a planet) you would weigh less than you do on Earth. Why? Because the moon has less mass than the Earth, so it has less gravitational force. What do you think your weight would be on Jupiter?

You often hear people use the words mass and weight to mean the same thing, but now you know the difference. From now on, we will use mass to describe the amount of matter in an object and weight when we refer to the force between objects.

Making a Density Column

Using a clear cup, you will determine the densities of some common liquids. You will be able to do this based on how the liquids interact. To do this, you will need some basic materials:

- Water
- Dark syrup
- Vegetable oil
- Other liquid that you will like to test, found in your home
- 4 Clear plastic cups
- Ruler
- Pencil

At the end of the activity you will be able to verify your observations by calculating the densities of each substance.

1. Using a rudimentary scale with a ruler and a pencil you will measure equal masses of the liquids. Place the ruler, flat side up on top of the pencil around the 15 cm mark.
2. Pour some water into one of the cups (about two fingers only), and place the cup on one end of the "balance".
3. Place an empty cup at the other end of the raised ruler. Carefully our syrup into the empty cup until the cup with water and the cup with syrup are balanced.
4. Repeat the same procedure with the cup of water and the other liquids. Do your best to try to balance out all the cups.
5. Do the volumes of each substance appear to be the same?

   The volumes should be different, since their masses are the same.

6. Which substance is occupying the most space (has the highest volume)?

   Depends on the observation.

7. Which substance occupies the least space (has the lowest volume)?

   Depends on the observation.

8. If all the substances are poured into the plastic cup one at a time, what do you think will happen? _____

   The liquids will separate according to their specific densities.

9. Which substance do you think will be on the very bottom? Explain (Remember they all have the same mass).

   Answers may vary, but syrup tends to be denser (1.4 g/ml). Therefore it will sink.

10. Which substance do you think will be on the very top? Explain.

    Answers may vary but oil tends to be less dense (0.9 g/ml)

11. Which substance do you think is the most dense? Least dense? (remember you measured the same amount of mass for each)

    Answers may vary, see explanation above.

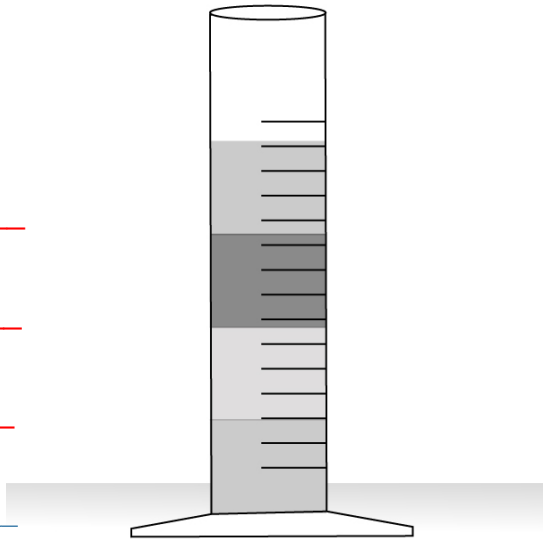
12. In the picture below, on the left side, write your predictions of the order in which the layers will stack if you were to pour them all in the same graduated cylinder.

Predict

Answer

may

vary



Observe

Answer

may

vary

13. Pour the liquids into one cup and wait for at least 5 minutes (maybe longer) for the liquids to differentiate.

14. Once the liquids have separated (differentiated), can you make a relation between each substance's location in the cup and its density?

Each substance position will depend on its density. The least dense material will differentiate to the top, while the denset material will differentiate to the bottom of the cup.

15. Complete the table below from your observations. Place the least dense liquid on the top and most dense liquid on the bottom of the table. Write the volume of each liquid from 1-4, where 4 represents the highest volume and 1 represents the lowest volume.

Substance	Mass	Volume of substance
Oil	same	3
Water	same	2
syrup	same	1
Depends on liquid used	same	

16. Which liquid(s) have a density greater than water?
All the liquids that sink below the water layer

17. Which liquid(s) have a density less than water?
All the liquids that float above the water layer

To verify your observations, you can perform a density calculation by dividing a given number to represent the mass of each substance by the estimated volume in the above table. Since the masses of each cup are supposed to be the same, you can "guess" a number to do the density calculation.

Example: Lets say that the masses of each cup and liquid was 60 grams. I will estimate the density of each liquid by performing the following calculation:

$D = \frac{m}{V} = \frac{60}{1} = 60$ for the liquid with the least volume.
$D = \frac{m}{V} = \frac{60}{4} = 15$ for the liquid with the most volume

If you had to measure 1 kg of water, do you think the volume it would occupy would be greater, smaller, or the same that you measured in the experiment above? _____

Answer should reflect understanding that density depends on both mass and volume. The predictable answer is that it would occupy a greater volume.

What will be the density of the 1 kg of water? Will it be greater, smaller, or the same as the density you measured above? (Remember what you read at the beginning of these activities).

The density of water will always be the same (1.0 g/ml), regardless of how much water is collected.

As you can see, density is an important physical property of matter. Substances can be classified by their density. It does not matter how much of the substance you have. The density of the substance will always be the same. One gram of gold has the same density as 100 kg of gold. The amount of gold does not matter. The substance is still gold. Imagine a wall made up of gold bricks. Each brick is solid gold. If the entire wall were placed in a huge tub of water, would it sink or float? What about if one brick of gold was put into the tub of water? How about a tiny gold ring? The gold always sinks because the density of gold is always greater than the density of water, even if it is just a little piece of gold.

ACTIVITY 3: PHASE CHANGES: MAKING ICE CREAM

Benchmarks:
SC.912.P.8.1: Differentiate among the four states of matter.

SC.912.P.8.2: Differentiate between physical and chemical properties and physical and chemical changes of matter.

SC.912.P.10.7: Distinguish between endothermic and exothermic chemical processes.

Students will:
- Investigate the effects of temperature change on phase changes
- Investigate the effects of changes in freezing point
- Utilize these concepts in making ice cream

Background Information:
In order to have a phase change in matter heat must be either gained or lost. Phase changes occur all around us in everyday life. For instance, ice melts when a drink is left in a room at normal temperature; conversely, water freezes when place in a really cold temperature (the freezer). In this experiment we see how heat is lost in order to change the milk from a liquid state to a solid state. This is also an example of a physical change in matter.

Students will also be able to observe how adding solute (ice cream salt) to a solvent (ice) changes the physical properties of that solvent. In this case the freezing point of the ice is lowered allowing for the milk to turn into ice cream.

The materials for this lab cost less than $4 per person.

Materials:
- 240 mL milk
- 45 mL sugar
- cups
- 80 mL ice cream
- salt
- 2.5 mL vanilla or chocolate flavoring
- 50 mL beaker
- 100 mL graduated cylinder
- ice
- 400 mL beaker
- 3.8 L zipper bag (gallon); freezer quality
- gloves
- 0.95 L zipper bag (quart); freezer quality
- dish towel
- spoons
- Celsius thermometer

Procedures:
1. Place a dishtowel over your work area. Keep your work on the towel.
2. Pour 240 mL milk, 45 mL sugar, and 2.5 mL vanilla or chocolate flavoring into the 0.95 L zipper bag. CAREFULLY seal the bag and shake up the mixture thoroughly.
3. Put this small zipper bag inside the much larger 3.8 L zipper bag.
4. In the 3.8 L bag add enough ice to cover the 0.95 L bag and add 80 mL of ice cream salt. Take the temperature of the ice: depends on the reading made by the student ^{o}C.
5. CAREFULLY SEAL THE BAG!
6. Put your gloves on and get ready to make a phase change!

7. Take turns flipping the bag. Hold the bag by its corners. Keep the bag flipping over and over. Remember to keep the bag over the towel at all times. It should take 10 to 15 minutes to freeze. Take the temperature of the ice/water mixture again: depends on the reading made by the student ^{o}C.
8. When you have ice cream, take the smaller bag out and rinse it off with cold water. One partner needs to take the larger bag and it's contents to the trash bag. DO NOT DUMP IT DOWN THE SINK!!!
9. Dish out the ice cream equally into the cups, and ENJOY! (You may rinse the cup out and use it for water if you are thirsty.)
10. Please clean up your area. (Leave it neater than you found it.)

Student Questions:

1. What state of matter was the milk when you began?

Liquid

2. What state of matter was the milk when you were done?

Solid

3. In order to change the milk to a solid, what had to be removed?

Energy from the liquid, in order to slow down the movement of the molecules.

4. What happened to the energy that left the milk?

It was transferred to the ice.

5. Why was salt added to the ice?

The salt decreases the freezing point of the ice mixture and causes its temperature to drop.

6. If you had left out the sugar, would the ice cream have frozen faster or more slowly?

The sugar makes no difference to the reaction

7. How could you make your ice cream taste better?

Answers may vary. Add additional sweeteners.

8. Assuming the bag was not leaking, why did the outside of the bag become wet?

The cold surface of the bag decreased the temperature of air molecules touching it, causing the water molecules in the air to condense.

9. Why is salt spread on icy roads in the winter?

Salt breaks the crystal lattice of the ice. In order for the ice to maintain its atomic arrangement, the temperature drops (below 0 ^{o}C) If the outside temperature is higher, then the ice melts.

10. What would happen if you didn't add salt to the ice?

The temperature of the mixture would not drop below 0 ^{o}C and the milk would not freeze.

11. Why do ice cream makers have two containers, one of which fits inside the other?

To separate the chemical mixture (salt mixture) from the ice cream

Additional Resources:

- Online conversions, in order to convert metric system to standard or British system of measurement: http://www.onlineconversion.com/
- Pressure cookers: http://en.wikipedia.org/wiki/Pressure_cooking
- Boiling water in a vacuum: http://www.exo.net/~pauld/Mars/4snowflakes/martianwater.html
- Phases and phase changes: http://itl.chem.ufl.edu/2045_s00/lectures/lec_f.html
- Phases animation: http://www.harcourtschool.com/activity/states_of_matter/
- Physics of phase changes: http://hyperphysics.phy-astr.gsu.edu/hbase/thermo/phase.html

PARTS OF A LAB REPORT: A STEP-BY-STEP CHECKLIST

Good scientists reflect on their work by writing a lab report. A lab report is a recap of what a scientist investigated. It is made up of the following parts.

Title (underlined and on the top center of the page)

Benchmarks Covered:

- Your teacher should provide this information for you. It is a summary of the main concepts that you will learn about by carrying out the experiment.

Problem Statement:

- Identify the research question/problem and state it clearly.

Hypothesis(es):

- State the hypothesis carefully. Do not just guess; instead try to arrive at the hypothesis logically and, if appropriate, with a calculation.
- Write down your prediction as to how the independent variable will affect the dependent variable using an "if" - "then" – "because" statement.
  - ❖ If (state the independent variable) is (choose an action), then (state the dependent variable) will (choose an action), because (describe reason for event).

Materials and activity set up:

- Record precise details of all equipment used.
  - ❖ For example: a balance that measures with an accuracy of +/- 0.001 g.
- Record precise details of any chemicals used.
  - ❖ For example: (5 g of $CuSO_4 \cdot 5H_2O$ or 5 g of copper (II) sulfate pentahydrate).

Procedures:

- Do not copy the procedures from the lab manual or handout.
- Summarize the procedures that you implemented. Be sure to include critical steps.
- Give accurate and concise details about the apparatus and materials used.

Variables and Control Test:

- Identify the variables in the experiment. State those over which you have control. There are three types of variables:
  1. Independent variable (also known as the manipulated variable): The factor that can be changed by the investigator (the cause).
  2. Dependent variable (also known as the responding variable): The observable factor of an investigation that is the result or what happened when the independent variable was changed.
  3. Constant variable: The other identified independent variables in the investigation that are kept or remain the same during the investigation.

- Identify the control test. A control test is the separate experiment that serves as the standard for comparison to identify experimental effects and changes of the dependent variable resulting from changes made to the independent variable.

Data:

- Ensure that all data is recorded.
  - ❖ Pay particular attention to significant figures and make sure that all units are stated.
- Present your results clearly. Often it is better to use a table. Record all observations.
  - ❖ Include color changes, solubility changes, whether heat was evolved or taken in, etc.

Data Analysis:

- Analyze data and specify method used.
- If graphing data to look for common trend, be sure to properly format and label all aspects of the graph.

Results:

- Ensure that you have used your data correctly to produce the required result.
- Include any other errors or uncertainties that may affect the validity of your result.

Conclusion and Evaluation:

A conclusion statement answers the following seven questions in at least three paragraphs.

I. First Paragraph: Introduction

1. What was investigated?
   a) Describe the problem.
2. Was the hypothesis supported by the data?
   a) Compare your actual result to the expected result (either from the literature, textbook, or your hypothesis).
   b) Include a valid conclusion that relates to the initial problem or hypothesis.
3. What were your major findings?
   a) Did the findings support or not support the hypothesis as the solution to the restated problem?
   b) Calculate the percentage error from the expected value.

II. Middle Paragraphs: These paragraphs answer question 4 and discuss the major findings of the experiment, using data.

1. How did your findings compare with other researchers?
   a) Compare your result to other students' results in the class.
      - The body paragraphs support the introductory paragraph by elaborating on the different pieces of information that were collected as data that either supported or did not support the original hypothesis.

- Each finding needs its own sentence and relates back to supporting or not supporting the hypothesis.
- The number of body paragraphs you have will depend on how many different types of data were collected. They will always refer back to the findings in the first paragraph.

III. Last Paragraph: Conclusion

2. What possible explanations can you offer for your findings?
   a) Evaluate your method.
   b) State any assumptions that were made which may affect the result.
3. What recommendations do you have for further study and for improving the experiment?
   a) Comment on the limitations of the method chosen.
   b) Suggest how the method chosen could be improved to obtain more accurate and reliable results.
4. What are some possible applications of the experiment?
   a) How can this experiment or the findings of this experiment be used in the real world for the benefit of society?

POWER WRITING MODEL IN SCIENCE

1. Introductory Paragraph:

State the purpose of the experiment, what was set out to prove, and explain the reasoning behind the experiment. This is where the problem statement and the hypothesis are introduced. The problem statement introduces the problem you are trying to solve and the hypothesis describes the solution that you hope to obtain after the experimentation. (This section answers question 1: “What was investigated?”). Continue by providing relevant information supporting or not supporting the hypothesis (This section answers question 2: “Was the hypothesis supported or not supported by the data?”). This is how the rest of the sentences in the introductory paragraph are linked. They will describe the data that was collected and the major findings of the investigation (question 3) that supported or did not support the hypothesis as the solution to the restated problem.

2. Body Paragraphs:

The body paragraphs support the introductory paragraph by elaborating on the different pieces of information that were collected as data that either supported or did not support the original hypothesis. Using terms such as “as a matter of fact” or “for example” and “not only but also” for successive sentences is useful. Each finding needs its own sentence and relates back to supporting or not supporting the hypothesis. The body paragraphs may include Question 4, which describes how the findings compared with other researchers or groups investigating the same problem. The number of body paragraphs you have will depend on how many different types of data were collected. They will always refer back to the findings in the first paragraph. The concluding sentence can begin with a term such as “clearly” which would be followed by the statement that is true (support or non support) for the entire paragraph as it relates to the hypothesis. The commentary can include some inferences (opinions) although the major inferences should be reserved for the concluding paragraph.

3. Concluding Paragraph:

The concluding paragraph contains the major commentary about the problem statement and the hypothesis in the first paragraph of the conclusion. This is where question 5, what possible explanations can you offer for your findings? can be answered. The paragraph should also include answers to questions 6 and 7 that include what recommendations do you have for further study and for improving the experiment and some possible applications of the experiment? At the end of the paragraph the problem statement and hypothesis (introduction and thesis) is restated more specifically with an abbreviated version of the explanation of the findings to summarize the conclusion.

Questions and Examples:

Questions	Examples
1. What was investigated? (Describe the problem statement)	The relationship between the age of compost used in soil and the growth, health, and quality of the leaves of tomato plants were investigated.
2. Was the hypothesis supported by the data?	The data appears to support the hypothesis that the growth, health, and leaf quality of tomato plants would improve increasing the age of compost mixed with soil.
3. What were the major findings?	As the age of the compost increased the health, quality of the leaves, and the mean height of the tomato plants increased. The mean height of plants grown in soil with compost aged for six months was greater than the control group, with plants exhibiting similar health. More plants grown in soil with one month-old compost exhibited poor leaf quality than in the control.
4. How did your findings compare with other researchers?	No similar studies were found relating the age of compost to the growth of tomato plants.
5. What possible explanations can you offer for your findings?	As the compost decomposes, nutrients needed by the plant may be released thereby improving the growth of the plant.
6. What recommendations do you have for further study and for improving the experiment?	This experiment could be repeated with an increased number different ages of compost. Measurements of soil temperature may help to understand what is happening to the compost.
7. What are some possible applications of the experiment?	The use of compost aged for longer than six months will improve the growth of tomato plants.

II. Laboratory Report Writing Form (Template)

Title

FSSS (Strands, Standards, Benchmarks): _____

_____

Science Concept (s): (Background information) _____

_____

_____

_____

Problem Statement: (Can be written as a question) _____

_____

_____

Hypothesis (es): (explanation to the Problem statement – should be written as an IF – THEN – BECAUSE statement) _____

_____

_____

Procedures: (as many as needed)

1. _____
2. _____
3. _____
4. _____
5. _____

Variables: _____

_____

Independent (Manipulated) Variable: (if not comparative or observational investigation) _____

_____

Dependent (Responding) Variable: _____

_____

Variables Held Constant: _____

Number of Trials: _____

Control Test: _____

Data: (Tables, Charts, etc.) _____

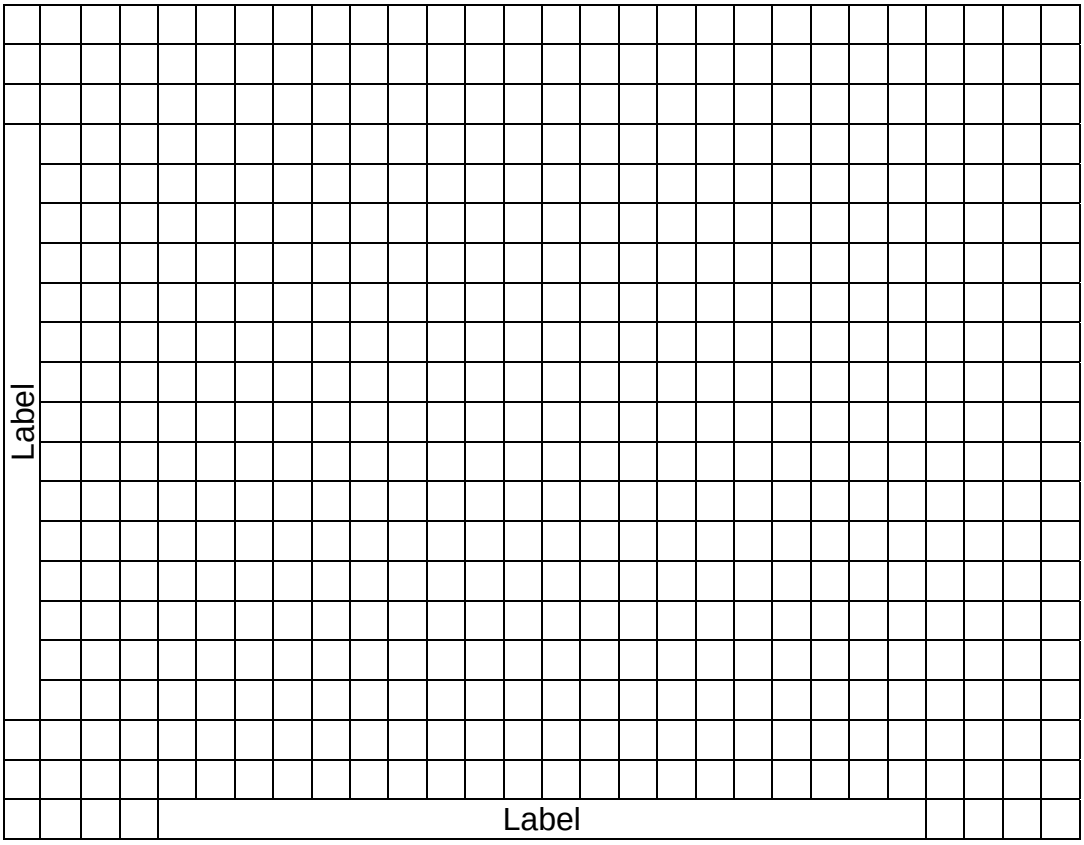
_____

_____

_____

Data Analysis and Interpretation of data: (Graph and/or written description of results)

Title



_____

_____

_____

Conclusions: (Use Seven Question Conclusion Form)

References: (Bibliography, Interviews, etc.)

Use additional pages if necessary

ANTI-DISCRIMINATION POLICY
Federal and State Laws

The School Board of Miami-Dade County, Florida adheres to a policy of nondiscrimination in employment and educational programs/activities and strives affirmatively to provide equal opportunity for all as required by law:

Title VI of the Civil Rights Act of 1964 - prohibits discrimination on the basis of race, color, religion, or national origin.

Title VII of the Civil Rights Act of 1964, as amended - prohibits discrimination in employment on the basis of race, color, religion, gender, or national origin.

Title IX of the Educational Amendments of 1972 - prohibits discrimination on the basis of gender.

Age Discrimination in Employment Act of 1967 (ADEA), as amended - prohibits discrimination on the basis of age with respect to individuals who are at least 40.

The Equal Pay Act of 1963, as amended - prohibits gender discrimination in payment of wages to women and men performing substantially equal work in the same establishment.

Section 504 of the Rehabilitation Act of 1973 - prohibits discrimination against the disabled.

Americans with Disabilities Act of 1990 (ADA) - prohibits discrimination against individuals with disabilities in employment, public service, public accommodations and telecommunications.

The Family and Medical Leave Act of 1993 (FMLA) - requires covered employers to provide up to 12 weeks of unpaid, job-protected leave to “eligible” employees for certain family and medical reasons.

The Pregnancy Discrimination Act of 1978 - prohibits discrimination in employment on the basis of pregnancy, childbirth, or related medical conditions.

Florida Educational Equity Act (FEEA) - prohibits discrimination on the basis of race, gender, national origin, marital status, or handicap against a student or employee.

Florida Civil Rights Act of 1992 - secures for all individuals within the state freedom from discrimination because of race, color, religion, sex, national origin, age, handicap, or marital status.

Veterans are provided re-employment rights in accordance with P.L. 93-508 (Federal Law) and Section 295.07 (Florida Statutes), which stipulates categorical preferences for employment.

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