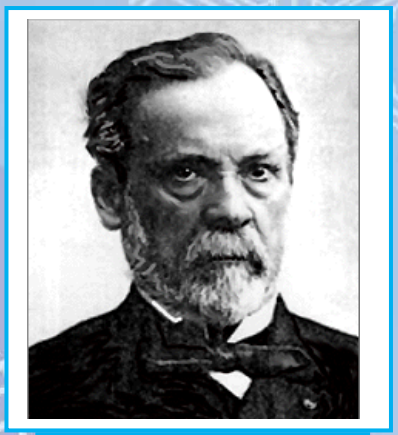
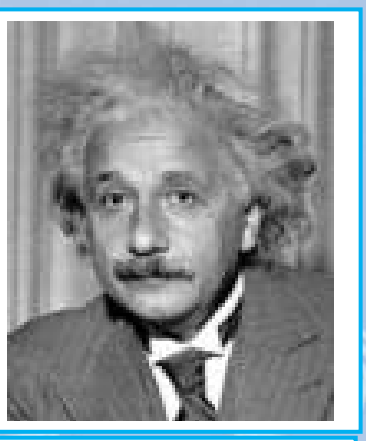
Sir Isaac Newton



Louis Pasteur



Albert Einstein

A SCIENCE Winter Inquiry Land

Grade 7

Winter 2011-2012

Miami-Dade County Public Schools
Curriculum & Instruction

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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 http://www.dadeschools.net/students.asp.

Safety First

Read through each activity before you try it. Adult supervision is important, especially with any of the activities that involve heat, chemicals or sharp instruments.
Also, make sure that you understand any safety precautions that may be necessary for these—or any—science activities. In particular, you should:

- Taste nothing without adult supervision;
- Wear goggles whenever something could splash, burn, or shatter and endanger eyes;
- Follow warnings on manufacturers' labels and instructions for toys and science kits;
- Avoid toxic or other dangerous substances;
- Avoid accidents; and
- Know what to do if an accident occurs.

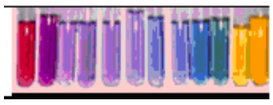
Enjoy!

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.



Exploring Acids and Bases

Adapted from: http://www.sciencefairprojects-ideas.com

Directions: Read through the activity. Next, complete the experimental design worksheet. Following the experimental design worksheet, conduct the experiment. Last, write your conclusion, using the questions as your guide.

Background: Acids are materials that have certain properties in common. **Bases** (also called alkalis) are other substances with a different set of properties. In these experiments, you will investigate some of these properties with materials that are found around your home. In addition, you will learn how chemists use the **pH scale** to describe acids and bases.

The most striking property of both acids and bases is their ability to change the color of certain vegetable materials. A common vegetable whose color responds to acids and bases is red cabbage.

Preparation for acid-base indicator:

Prepare an extract of red cabbage so you can investigate its color changes.

1. Place about 2 cups of red cabbage cut into 1-inch cubes into a blender.
2. Add about 1 cup of water and blend the mixture until the cabbage has been chopped into uniformly, tiny pieces.
3. Strain the mixture by pouring it through a strainer. This strained liquid, the red-cabbage extract, will be used for exploring acids and bases.

Let's see what effect an acid has on the color of the red cabbage extract.

4. Pour ½ cup of vinegar into a colorless drinking glass.
5. Add 1 teaspoon of red cabbage extract, stir the mixture, and note its color. What is the color of the mixture?
6. Record your answer in the data table.
7. The color of the cabbage extract with vinegar is the color the extract has when it is mixed with an acid. Save the mixture in this glass to use as a reference in the rest of the experiment.

Now test the properties of a solid, baking soda.

8. Place 1 teaspoon of baking soda in a glass and add ½ cup of water.
9. Stir the mixture until the baking soda has dissolved.
10. Add 1 teaspoon of red cabbage extract to the solution.
11. Write the color of the mixture in the data table

Baking soda is a base (alkali). The color of this mixture is the color of cabbage extract when it is mixed with a base. The color of cabbage extract indicates whether something mixed with it is an acid or a base. Cabbage extract can be called an **acid-base indicator**. Save the mixture in this second glass to use as a reference.

approximate pH:	2	4	6	8	10	12
color of extract:	red	purple	violet	blue	blue-green	green

Red cabbage extract can indicate whether a substance is an acid (like vinegar) or a base (like baking soda). It can also show how strong an acid or a base a substance is. Chemists use the **pH scale** to express how acidic (like an acid) or basic (like a base) a substance is. A pH value below 7 means that a substance is acidic, and the smaller the number, the more acidic it is. A pH value above 7 means that a substance is basic, and the larger the number, the more basic it is. Red cabbage extract has different colors at different pH values. These colors and approximate pH values are:

Use the instructions for testing vinegar and baking soda to test the pH of several other nearly colorless liquids, such as lemon-lime soft drink (Sprite or 7-Up) and lemon juice. Record your observations. Liquids that are white, such as milk, can be tested in the same way. You can also test solids that dissolve in water by following the instructions for baking soda (see page 2). This will also work with viscous liquids such as liquid detergents. Test other substances around the house, such as sugar, table salt, shampoo, conditioner, milk of magnesia, antacid tablets, and aspirin.

Material	**Extract color**	**Approximate pH**
Vinegar		
Baking Soda		
Sprite or 7-Up		
Lemon Juice		
Milk		
Liquid detergent		
Salt		
Sugar		
Milk of Magnesia		
Antacid tablet		
Aspirin		

CAUTION: Some household products can cause skin irritations. Do not allow these products to contact skin; rinse thoroughly with water if they do.

Reflecting on your observations:

Directions: Write your observations within a three-paragraph format. Answer questions 1 and 2 in the introduction paragraph, include data in the body paragraph, and questions 3-5 in the conclusion paragraph.

1. What was investigated? Include the identification of the test (independent) variable(s) and the outcome (dependent) variable(s)? (Describe the problem statement)
2. What were the major findings?
3. What possible explanations can you offer for your findings?
4. What recommendations do you have for further study and for improving the experiment?
5. What are some possible applications of the experiment?

Benchmark(s):
SC.7.N.1.4 Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment

Cluster: Nature of Science

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Happy New Year!
The Origins of and Science behind Fireworks

Adapted from: http://people.howstuffworks.com/fireworks.htm

Follow the directions on the *Anticipation Guide* that accompanies the reading selection:

Directions (before reading): Before reading the text, read each statement and decide on your own if you agree or disagree with it. Place a check in either column 1 or 2. Then work with a family member or friend to discuss your answers. Next, number the paragraphs of the text.

Directions (after reading): After reading, answer the questions again by placing a check in either column 3 or 4. Be prepared to support your views from the information in the text.

Anticipation Guide

Statement	1 Agree Before	2 Disagree Before	3 Agree After	4 Disagree After
1. Fireworks are fairly new and were invented in the United States				
2. Noble Gases are frequently used in fireworks because of their ability to glow.				
3. Fireworks contain several elements that are metals.				
4. Metals increase the explosion in fireworks.				
5. Through chemical reactions, sparklers form bright light and firecrackers explode.				
6. Pyrotechnics is the science of materials capable of undergoing self-contained and self-sustained exothermic chemical reactions for the production of heat, light, gas, smoke and/or sound.				

Benchmark(s):
SC.7.N.2.1 Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.

Content Cluster: Physical and Chemical Sciences

Fireworks Reading Selection

http://people.howstuffworks.com/fireworks.htm

If you have ever been to an aerial fireworks show at an amusement park, baseball game, Fourth of July celebration or on New Year's Eve, then you know that fireworks have a special and beautiful magic all their own -- a good show is absolutely amazing.

Have you ever wondered how this magic works? What is launched into the sky to make these beautiful displays? In this article, you will learn all about firecrackers, sparklers and aerial fireworks.

Firecrackers and Sparklers

Just about everyone in the United States has some personal experience with fireworks, either from Fourth of July or New Years Eve celebrations. For example, you have probably seen both sparklers and firecrackers. It turns out that if you understand these two pyrotechnic devices, then you are well on your way to understanding aerial fireworks. The sparkler demonstrates how to get bright, sparkling light from a firework, and the firecracker shows how to create an explosion.

Firecrackers have been around for hundreds of years. They consist of either black powder (also known as gunpowder) or flash powder in a tight paper tube with a fuse to light the powder. Black powder contains charcoal, sulfur and potassium nitrate. A composition used in a firecracker might have aluminum instead of or in addition to charcoal in order to brighten the explosion.

Sparklers are very different from firecrackers. A sparkler burns over a long period of time (up to a minute) and produces extremely bright and showery light. Sparklers are often referred to as "snowball sparklers" because of the ball of sparks that surrounds the burning portion of the sparkler. If you look at Patent #3,862,865: Sparkler composition, you can see that a sparkler consists of several different compounds:

A fuel
An oxidizer
Iron or steel powder
A binder

Potassium nitrate is a very common oxidizer. The fuel is charcoal and sulfur, as in black powder. The binder can be sugar or starch. Mixed with water, these chemicals form a slurry that can be coated on a wire (by dipping) or poured into a tube. Once it dries, you have a sparkler. When you light it, the sparkler burns from one end to the other. The fuel and oxidizer are proportioned, along with the other chemicals, so that the sparkler burns slowly rather than exploding like a firecracker.

It is very common for fireworks to contain aluminum, iron, steel, zinc or magnesium dust in order to create bright, shimmering sparks. The metal flakes heat up until they are incandescent and shine brightly or, at a high enough temperature, actually burn. A variety of chemicals can be added to create colors.

Bending Light

Source: http://www.billnye.com/for-kids-teachers/home-demos/

Can you send a light beam through a water stream?

What You Need:

1. a strong flashlight
2. an empty soda can

What you do:

1. Take the empty soda can and have an adult poke a hole in the side of the can near the bottom with a strong sharp pencil.
2. Ask your adult to make sure any sharp edges at the hole are pushed into the can so it's safe for you to put your finger on the hole.
3. Fill the can with water, holding your finger over the hole. Turn out the overhead lights and stand over a sink.
4. Put a flashlight over the top of the can, and take your finger off the hole.
5. Where the water stream lands, you'll see a beam of light.
6. Sketch what you believe happened and write a statement describing what happened to the light inside the can.

What's Happening?

The light from the flashlight bends and follows the water out of the hole in the can. The inside of the can and the surface of the water stream act like mirrors to reflect the beam of light. The light bounces around inside the water, and follows it wherever it flows.

Sketch

Description of what is happening to the light:

_____

_____

_____

_____

_____

_____

Benchmark(s):
SC.7.P.10.2 Observe and explain that light can be reflected, refracted, and/or absorbed.

Content Cluster: Physical Science

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:

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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.

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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.

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Revised 9/2008