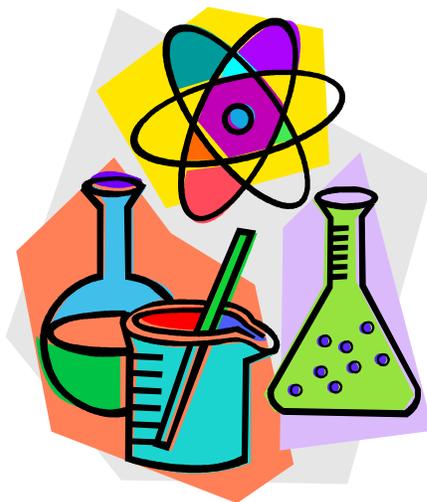


Acid Rain Research Notebook



Key

Review of Scientific Method

Steps:

1. *Observation and description*
2. *Creation of a hypothesis*
3. *Make a prediction*
4. *Experimentation to test the prediction*
5. *Repeat steps 3 and 4*

Bean Sprout Experiment

What is pH?

The measure of acidity

What is the pH of an acid? $<$ $>$ 7 (circle the correct symbol)

The pH of normal rain is 5.6. Is this an acid? *yes*

Record the pH levels for the various solutions of water and vinegar.*

- pH level: 7 ½ cup of water (only) ~ **solution 1**
 4 ½ cup of water + 1/3 cup of vinegar ~ **solution 2**
 3 ½ cup of water + ½ cup of vinegar ~ **solution 3**
 2 ½ cup of vinegar ~ **solution 4**

**Teachers may vary the amount of water and/or vinegar in each solution.
(Keep in mind that no 2 experiments are the same and pH levels may vary; all
experimental data given in this experiment is an approximation.)*

Which solution do you predict will make the plants grow fastest? (hypothesis)

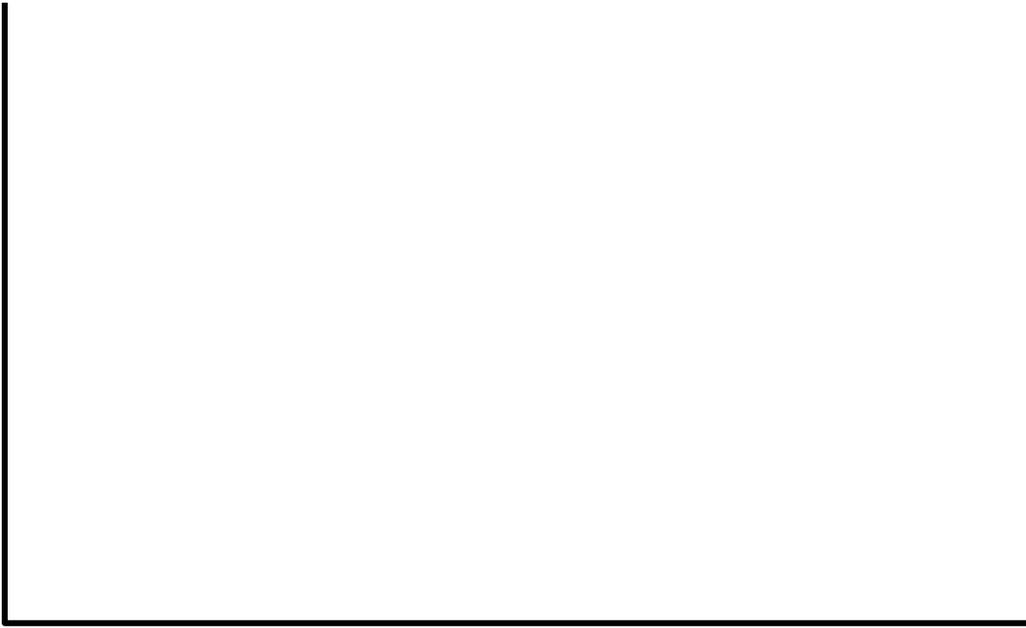
There is no correct answer to this question; students are to give their opinion.

Record plant growth over the next 2-3 weeks, measure growth every 2 or 3 days (your team should decide how often). Use the centimeter portion of a ruler for measurements.

Solution:	1	2	3	4	Solution:	1	2	3	4
Day 1	_____	_____	_____	_____	Day 8	_____	_____	_____	_____
Day 3	_____	_____	_____	_____	Day 10	_____	_____	_____	_____
Day 5	_____	_____	_____	_____	Day 12	_____	_____	_____	_____

Create a chart to show the growth of bean spouts in various solutions.

Bean Sprout Growth Chart



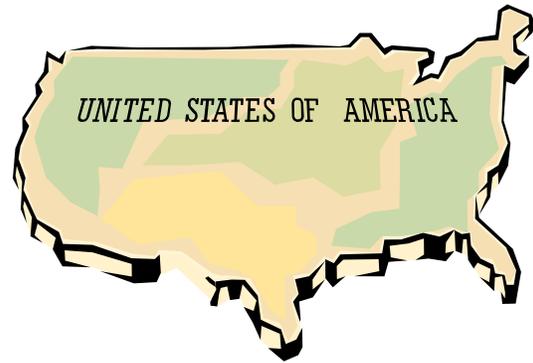
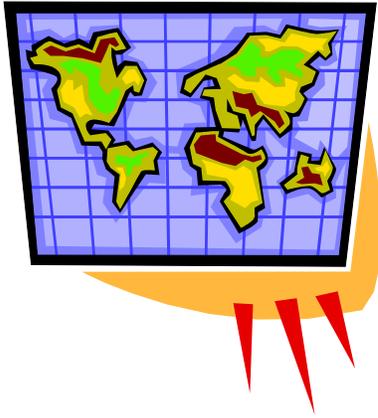
Which solution was the best for plant growth? *Water only*

Was this the same as your hypothesis? (*student response*)

This sheet is to be completed on the Museum Tour

Government Response to Events and Problems

As you tour the Museum, look for examples of each type of response.



Foreign Policy: (define)

Plans or actions of government affecting a country's relations with other countries

Examples: (list)

Support for a unified Germany
The Cold War
The Vietnam War
Supporting free elections in Nicaragua
NATO
UN
Operation Just Cause
The Gulf War
Support to end the Apartheid in South Africa

These are just a few examples

Domestic Policy: (define)

Plans or actions of government affecting a country's internal affairs (the everyday lives of citizens and their communities)

Examples: (list)

The Clean Air Act
National Energy Strategy
Omnibus Water Bill
NAFTA
The Financial Institution Reform, Recovery and Enforcement Act
America 2000
Child Care Assistance Act
Illegal Immigration
Pollution of the Environment

These are just a few examples

Acid Rain??

Based on the primary source Clean Air Act Options (1989)

Definition (see Background):

Acid Rain: a phenomenon which occurs when sulfur dioxide (SO₂) and Nitrogen Oxide (NO_x) emissions undergo a chemical transformation in the atmosphere and return to earth as acid rain, fog or particles

Source (see second paragraph Sources of Acid):

The burning of fossil fuels by electric utilities, various and widely dispersed industrial sources and transportation sources (cars, planes, trains, buses, etc.)

75 % Utility companies (electric utilities)

20 % Factories (industrial sources)

5 % Cars & Trucks (transportation sources)

Check the response sheet to see if your team has correctly defined acid rain.

Now look at the table and graph. Which country has the highest levels of emissions? *U.S.A.* Is this a domestic or foreign policy issue? *domestic*

Government Policy

Look at the newspaper article “America Repaying Debt to Damaged Environment” to answer questions 1 - 4.

1. Name one example (from 1st paragraph) that shows the level of pollution in the United States before the first Earth Day.
A polluted American river caught fire, cities were blanketed in clouds of industrial air pollution and raw sewage was discharged directly in to rivers
2. What is the government’s plan regarding acid rain (page 2, column 3, paragraph 3)?
The Clean Air Initiative: bring 100 or more cities that have failed to meet national standards for carbon monoxide and ozone regulations in to compliance
3. In the last column of this article, what character does the author use to remind the reader of the importance of trees?
The Lorax, from Dr. Seuss
4. Who is the author of this article?
President George Bush, 41

Look at the memo to William Reilly dated 11-2 “near Iowa”.

5. Who is the note at the top from? *President George Bush, 41*
6. Do they support the Clean Air Act? *YES*
7. What is this person willing to do? *Sign the Clean Air Act in to law*
8. Why would this person’s actions be important?
Without the signature of the President, that Act would not be passed in to law

Water Sample Test

Test the various levels of pH for each of the following solutions to rank pH levels.

Based on your classroom experiments, what occurs to plants raised in a high pH (acid) environment? *They do not grow well or they die*

Hypothesis: Which solution will have the highest pH level? (*Student answer*)
Create a chart to rank your results.

Solution	pH level
Soda water	8
Clear white vinegar (mix 1 cup vinegar with 1 cup soda water)	3
Tomato juice	4
Orange juice	4
Tap water	8
Water sample (rain water)	8

(All values are approximations; values actually recorded during an experiment may vary.)

Levels of pH in various solutions

