



# Scientific Method

- 1. Stating a **problem** - something is considered a problem if its solution is not obvious. Some crucial information is missing. Solving the problem involves finding this **missing** information.



# Scientific Method

- 2. **Collecting** information on the problem -- the more you know about the problem the more **precisely** you can state the problem and the less time you will waste looking for solutions.



### 3. Making a **hypothesis**-

- a. Use what you know about the problem to **predict** a solution and try it.



### 3. Making a hypothesis-

- b. Look for **patterns** that will help you make predictions about the problem.



### 3. Making a hypothesis-

- c. Make a **model**, or a representation, of what you're working with.
- d. Break the problem **down** into smaller, simpler problems.



## Scientific Method

- **4. Performing an experiment** - design an experiment that will provide a means for you to make a solid **conclusion** about your hypothesis



# Scientific Method

- 5. Make a **conclusion** - a solid conclusion is related to the hypothesis and based on the **results** of a well designed experiment.



# Experimental Design Concepts

- A science experiment is designed so that only **ONE** variable is being tested at a time.





# Experimental Design Concepts

- A **VARIABLE** is something that is changed to study how this change affects the time being studied.



# Experimental Design Concepts

- By changing only one variable, when you make your conclusion you can be assured that it is only that one variable that is causing the **EFFECT**.



# Experimental Design Concepts

- Independent variable (IV) - the variable that is purposely **CHANGED** by the experimenter.



# Experimental Design Concepts

- Dependent variable (**DV**) - the variable that responds and is the variable **MEASURED.**



# Experimental Design Concepts

- Constant (C) - all factors that are kept the **SAME** during the experiment.



# Experimental Design Concepts

- **CONTROL** - the standard to compare the experimental effect against.



# Experimental Design Concepts

- Repeated trials - the **NUMBER** of objects/organisms undergoing treatment for each value of the independent variable, or the number of **TIMES** the experiment is repeated.

# Scenario #1

<b>IV:</b>	Types of Orange juice		
<b>Treatment:</b>			
<b>Trials:</b>			
<b>DV:</b>			
<b>Constants:</b>			



# Scenario #1

<b>IV:</b> Types of Orange Juice			
<b>Treatment:</b>	Fresh	Frozen	bottled
<b>Trials:</b>			
<b>DV:</b>			
<b>Constants:</b>			

# Scenario #1

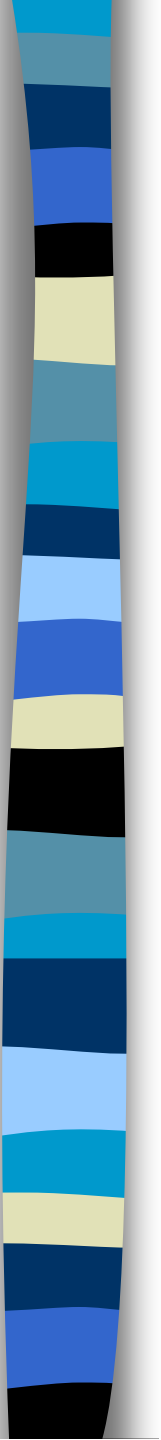
<b>IV:</b>	Types of orange Juice		
<b>Treatment:</b>	Fresh	frozen	bottled
<b>Trials:</b>	1	1	1
<b>DV:</b>			
<b>Constants:</b>			

# Scenario #1

<b>IV:</b>	Types of orange Juice		
<b>Treatment:</b>	Fresh	frozen	bottled
<b>Trials:</b>	1	1	1
<b>DV:</b>	Amount of Vitamin C	mg/100 ml	
<b>Constants:</b>			

# Scenario #1

<b>IV:</b>	Types of orange Juice		
<b>Treatment:</b>	Fresh	frozen	bottled
<b>Trials:</b>	1	1	1
<b>DV:</b>	Amount of Vitamin C		
<b>Constants:</b>	100 mL of OJ, same procedure		





# Science

- A process through which nature is studied, discovered, and understood.
- All areas of science involve posing **INQUIRIES** (questions) about nature.



# Processes of Science

- Observing
- Organizing data
- Measuring
- Analyzing data
- Collecting data
- Hypothesizing
- Experimenting
- Communicating



# Terms and Definitions

- Theory -- The most probable **EXPLANATION** based on the best available **EVIDENCE**.
  - Example:





# Terms and Definitions

- Facts -- Data or **EVIDENCE** that can be **OBSERVED** repeatedly
  - Example:



# Terms and Definitions

- Inference -- A **CONCLUSION** drawn on the basis of **FACTS**
  - Example:



# Terms and Definitions

- Hypothesis -- An **EDUCATED** guess – a **TESTABLE** statement
  - Example:



# Terms and Definitions

- Law -- A general statement that **DESCRIBES** or explains a wide variety of **PHENOMENON**
  - Example:



# Terms and Definitions

- Superstition -- A **BELIEF** that is **NOT** based on evidence
  - Example:

# Scenario #2

**IV:** Type of Metal

**Treatment:**

**Trials:**

**DV:**

**Constants:**


# Scenario #2

**IV:**

Type of Metal

**Treatment:**

Iron

Aluminum

Magnesium

Lead

**Trials:**

**DV:**

**Constants:**

# Scenario #2

**IV:**

Type of Metal

**Treatment:**

Iron

Aluminum

Magnesium

Lead

**Trials:**

1 Nail

1 Nail

1 Nail

1 Nail

**DV:**

**Constants:**



# Scenario #2

**IV:**

Type of Metal

**Treatment:**

Iron

Aluminum

Magnesium

Lead

**Trials:**

1 Nail

1 Nail

1 Nail

1 Nail

**DV:**

Amount of Rust (small, med., large) color of water

**Constants:**

## Scenario #2

**IV:**

Type of Metal

**Treatment:**

Iron

Aluminum

Magnesium

Lead

**Trials:**

1 Nail

1 Nail

1 Nail

1 Nail

**DV:**

Amount of Rust (small, med., large) color of water

**Constants:**

same water, same type of nail, equal amounts of metal, 5 days

# Scenario #3

**IV:** Type of Perfume

**Treatment:**

**Trials:**

**DV:**

**Constants:**


# Scenario #3

**IV:**

Type of Perfume

**Treatment:**

A

B

C

D

**Trials:**

**DV:**

**Constants:**

# Scenario #3

**IV:**

Type of Perfume

**Treatment:**

A

B

C

D

**Trials:**

1 test

1 test

1 test

1 test

**DV:**

**Constants:**

# Scenario #3

<b>IV:</b>	Type of Perfume			
<b>Treatment:</b>	A	B	C	D
<b>Trials:</b>	1 test	1 test	1 test	1 test
<b>DV:</b>	Number of bees emerging, behavior observations			
<b>Constants:</b>				

# Scenario #3

**IV:** Type of Perfume

**Treatment:**

A

B

C

D

**Trials:**

1 test

1 test

1 test

1 test

**DV:** Number of bees emerging, behavior observations

**Constants:** Same day, weather conditions, same bees, 30 min. interval, amnt. of perfume, distance from hive