

7th Grade Physical Science

Chapter 1

Ms. Liu

1

Scientific Method

- Scientific Method = how scientists explore
 - Observe
 - Question
 - Hypothesis
 - Test
 - Materials
 - Independent/Dependent/Controlled variables
 - Step-by-step procedure
 - Data in tables
 - Analyze
 - Conclusion
 - Report

12

Step 1: Ask a question

Step 2:

13

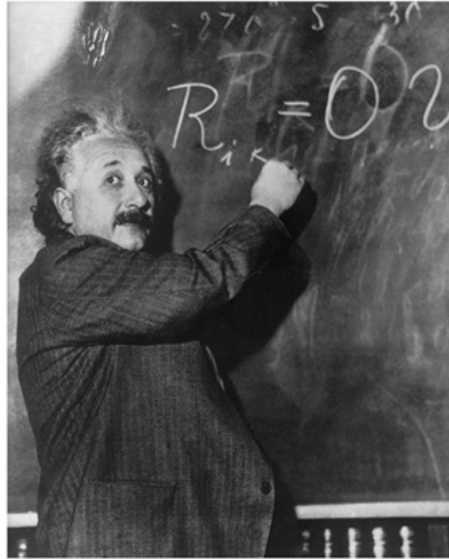
Step 1: Ask a question

Step 2: Guess the answer

- Scientific Hypothesis = an educated guess that is *testable*
 - It might be wrong. That's OK.
 - TESTABLE
- Scientific? Testable? Yes or no?
 - "Better stock market decisions are made when the planets Venus, Earth, and Mars are aligned."
 - "Intelligent life exists on other planets somewhere in the universe besides Earth."
 - Atoms are the smallest particles of matter that exist.
 - The Moon is made of Swiss cheese.
 - Outer space contains a kind of matter whose existence can't be detected or tested.
 - Albert Einstein was the greatest physicist of the 20th century.
- Q1) Write an example of a scientific and a nonscientific hypothesis.

14

No number of experiments can prove me right, but a single experiment can prove me wrong.



© 2010 Pearson Education, Inc.

15

Scientific Method

- Scientific Method = how scientists explore
 - Observe
 - Question
 - Hypothesis
 - Test
 - Materials
 - **Independent/Dependent/Controlled variables**
 - Step-by-step procedure
 - Data in tables
 - Analyze
 - Conclusion
 - Report

16

Variables

- Independent Variable:
 - something you change on purpose when you do your experiment.
 - “manipulated” or “input” variable
- Dependent Variable:
 - outcome of your experiment.
 - depends on and responds to changes in the input (independent variable).
 - Your hypothesis states how you think the dependent variable will respond to changes in the independent variable.
- Controlled Variable:
 - Other things can affect your experiment’s results
 - control these so that your experiment can be trusted.

17

Project Question	Independent Variable (Input, Manipulated)	Dependent Variable (Outcome, Responding)	Controlled Variable (Other variables that affect the outcome. These should stay the same)
1. What’s the best way to keep bananas fresh?	Temperature and amount of air	Freshness	• Ripeness at the beginning • Amount of light
2. Which drinking fountain has the safest water?	Location (amount of use)	Bacteria in the water	• Source of water to the drinking fountains • Can dogs reach the drinking fountain? • Exposure of fountains to outdoor environment
4. Which laundry detergent cleans best?	?	?	?

- Q2) Write an example of variables.

18

Scientific Method Review

- Steps
 - Observe
 - Question
 - Hypothesis
 - Test
 - Analyze
 - Conclusion
 - Report
- Independent Variable
- Dependent Variable
- Controlled Variable

19

1.3

- Model = representation of object or system
 - Physical model



- Mathematical model
 - Making waves!

$$\mathbf{E}(\mathbf{r}, t) = \frac{1}{s} \mathbf{E}_0 \cos(\omega t - \mathbf{k} \cdot \mathbf{r} + \phi_0)$$

- Conceptual model



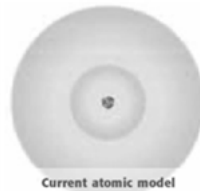
20

1.3 more models

- Model of sound waves. Explain?



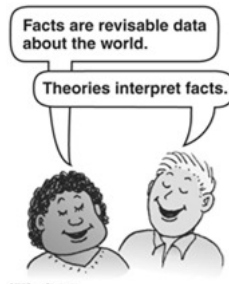
- Model of the atom. To “see” what you can’t see.



21

Facts, Theories, and Laws

- Facts: data about the world
- Hypothesis = educated guess that is...
- Law = a hypothesis tested over and over and never disproven
- Theory = the “why”: an interpretation of facts and hypotheses.



22

1.4 Measurements

- Measurement = standard of length, mass, time.
- The king's foot...

23

1.4 SI Units

- SI unit = *Système international*
(International System of Units)

	SI Unit	What is it?
Length		
Mass		
Time		
Temperature		
Volume		
Liter		

24

1.4 SI Units

- SI unit = *Système international*
(International System of Units)

	SI Unit	What is it?
Length	meter (m)	
Mass	kilogram (kg)	how much matter/stuff
Time	second (s)	how long you wait
Temperature	kelvin (K)	how hot/cold
Volume	solid: cubic meter (m ³) liquid: liter (L)	how much space

25

Liquid Volume: Liter

- 1000 L = 1m³
- 1 mL = 1cm³

26

Prefixes

Stands for	Prefix	Prefix symbol	An example?
10^{-12}	pico	p	
10^{-9}	nano	n	
10^{-6}	micro	μ	
10^{-3}	milli	m	
10^{-2}	centi	c	
10^1	deka	da	
10^3	kilo	k	
10^6	mega	M	
10^9	giga	G	
10^{12}	tera	T	

27

Prefixes

Stands for	Prefix	Prefix symbol	An example?
10^{-12}	pico	p	
10^{-9}	nano	n	nanotechnology
10^{-6}	micro	μ	microscope
10^{-3}	milli	m	millimeter (mm)
10^{-2}	centi	c	centimeter (cm)
10^1	deka	da	
10^3	kilo	k	kilogram (kg)
10^6	mega	M	Megabyte (MB)
10^9	giga	G	Gigabyte (GB)
10^{12}	tera	T	terahertz (THz)

28

Dimensional Analysis

- Speed

$$\text{speed} = \frac{\text{length}}{\text{time}} \Rightarrow \text{unit} = \frac{?}{?}$$

- Density = how squished

$$\rho = \frac{\text{mass}}{\text{volume}} \Rightarrow \text{unit} = \frac{?}{?}$$

29

Conversion of Units

- 5 cm = _____ m (Hint: 100cm = 1m)
- 200 g = _____ kg (Hint 1000 g = 1 kg)
- 3 m = _____ μm (Hint: 1,000,000 μm = 1 m)
- 70 oops = _____ guglags (Hint: 2 guglags = 5 oops)

30

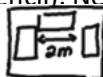
Chapter 1 Packet:

- Ch. 1 Vocabulary + notes (in notebook)
- Pg. 19 #8, 9
- Pg. 27 #2, 7
- Crossword Puzzle
- Exploring the Unseen Lab

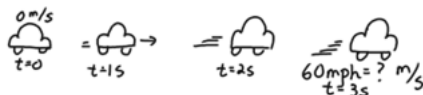
31

Homework #1: SI Unit Poster

- Make measurements using SI units and draw diagrams.
- Please color and use pen/marker (not pencil). Neatness counts. Use A3 paper.
- Examples:
 1. Bird's-eye map of your room: Measure and label the length of your desk, wall, etc in meters. At least 10 measurements total. They should include at least 3 different types of SI units. Try to draw your diagrams to scale.



2A) Car goes from 0~60mph in 2 seconds. Convert to m/s. Show the work for at least 3 conversions.



2B) Recipe Ingredients: flour = how many cups = 250 mL = ____ kg. 
 soup = how fluid ounces = ____ liters
 1 ounce = 28 g = ____ kg

Show the work for at least 3 conversions.

3) Show how to make one complicated conversion that includes at least 3 unit conversion factors.

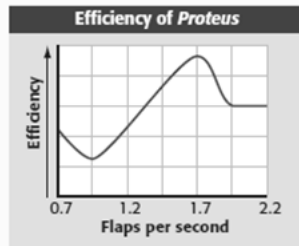
32

$$1 \text{ m}^3 \cdot \left(\frac{1000 \text{ L}}{1 \text{ m}^3} \right) \cdot \left(\frac{1 \text{ m}}{1000 \text{ mm}} \right) \cdot \left(\frac{1 \text{ L}}{1000 \text{ mL}} \right) = 1000 \text{ L}$$

$$1 \text{ ft} / \text{h} \cdot \left(\frac{1 \text{ m}}{3.3 \text{ ft}} \right) \cdot \left(\frac{1 \text{ h}}{60 \text{ min}} \right) \cdot \left(\frac{1 \text{ min}}{60 \text{ s}} \right) = 0.000084 \text{ ft/s}$$

Interpreting Graphics

Use the graph below to answer the questions that follow.



8. At what number of flaps per second is *Proteus* most efficient? least efficient?
9. At approximately what point does the efficiency appear neither to increase nor to decrease?

Understanding Key Ideas

2. Which SI unit would you use to express the height of your desk?

a. kilogram	c. meter
b. gram	d. liter

7. **Applying Concepts** To find the area of a rectangle, multiply the length by the width. Why is area called a *derived quantity*?