

Physical Science 01






Ticket Number 3401
6:50 P.M. – 10:00 P.M.
Mondays

Yes, we really stay till 10:00

We will take breaks around 8:30 for 15 minutes


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Some Ground Rules...

-  If you need to go to the bathroom, you do not need to ask for my permission.
-  Please set cell phones on vibrate.
-  Discussions are good (as long as they are related to the class). If they do not relate to the class, please go outside and talk.
-  If you do not want to be here, you can leave, don't worry it won't hurt my feelings.
-  If you do not understand something, please ask. Chances are that someone else does not understand also.

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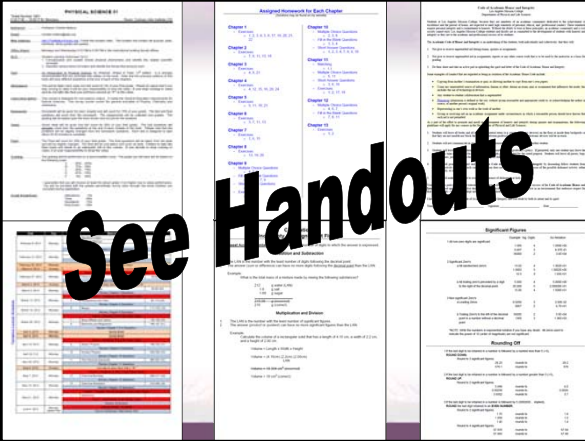
This course is designed for non-science majors. It meets the General Education requirements for Natural Sciences. This survey course covers the general principles of Physics, Chemistry and Astronomy.




Physical Science 01

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See Handouts




Physical Science 01

- Attendance:**
 - This will be taken each class and will count for 5% of your final grade.
 - Please be aware that if you stop coming to class it is your responsibility to drop the class.
-  If you just stop coming, you will receive an "F" in the class and that's not a good thing.

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- Homework:**
 - Homework will be given for each chapter and will count for 15% of your grade.
 - Homework will be collected and graded.
 - Homework is due one week after the lecture on the material
 - Late homework will be subject to a 20% late penalty.
 - Homework grading is based upon the work shown and not just for the answer



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- **Tests:**

- Seven tests will be given and will count for **50%** of your final grade.
- The test questions will primarily come from the homework questions assigned.
- Please note that the problems may be **slightly** different from the homework questions.



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1 | 7

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- **Final:**

- The Final will count for **30%** of your class grade.
- The final questions will be taken from the tests and will be slightly changed.
- The final will be cumulative (cover all of the tests.)
- Failure to take the final exam will result in an automatic fail in the course.



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1 | 8

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- **Grade Breakdown:**

Attendance	5%
Tests	50%
Homework	15%
Final Exam	30%
<hr/>	
Total	100%



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1 | 9

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- **Grading:**

- The grading will be performed on a semi-modified curve. The grade you will earn will be based on the following scale:

A	90% - 100%
B	75% - 89%
C	60% - 74%
D	45% - 59%
F	0% - 44%



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1 | 10

Physical Science 01

- **Text**

An Introduction to Physical Science, 12th Edition
James T. Shipman - Ohio University
Jerry D. Wilson - Lander College
Aaron W. Todd - Middle Tennessee State University
 ISBN-10: 0618935967 | ISBN-13: 9780618935963
 800 Pages Paperbound
 © 2009 Published



You will need it by next class meeting

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1 | 11

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- **Calculator**

Your calculator will be your best friend in this class!

We will be doing a lot of math in the beginning of the class. A scientific calculator will be invaluable for calculations.



Please note a scientific calculator is one which does exponents and exponential notation.

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1 | 12

Roster

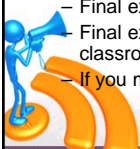
- The sign in sheet with who is enrolled in the class should be going around.
- If you want to add...
 - I can only have the maximum allowed by the Fire Marshall.
 - This is the number above the door.
 - If you add, you must have added at admissions by Thursday February 16th.
 - After that date, they will not allow any additions.
 - Even if you have an add slip dated prior to February 16th they will not let you add.

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Important Dates

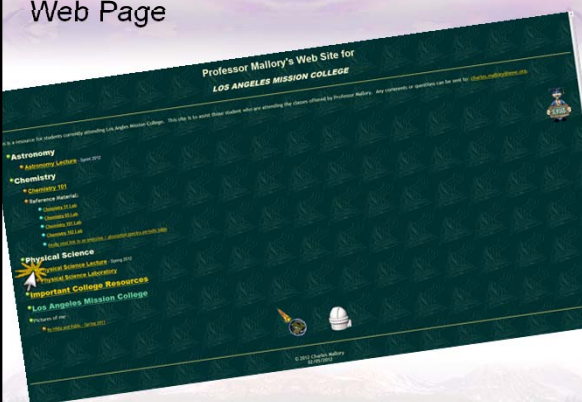
Important DATE!

- Deadline to add classes: Thursday Feb. 16th
- Deadline to drop and get all your \$\$ back Feb 21st
- Last day to drop w/o a "W": Sunday Mar. 4th
- Last day to drop w/ a "W": Sunday May 6th
- Final Exam: June 4th
 - 8:00 – 10:00 PM
 - Final exams are scheduled for two hours.
 - Final exams will be held in the regularly scheduled classroom.
 - If you miss the final, you will receive an "F" in the class.



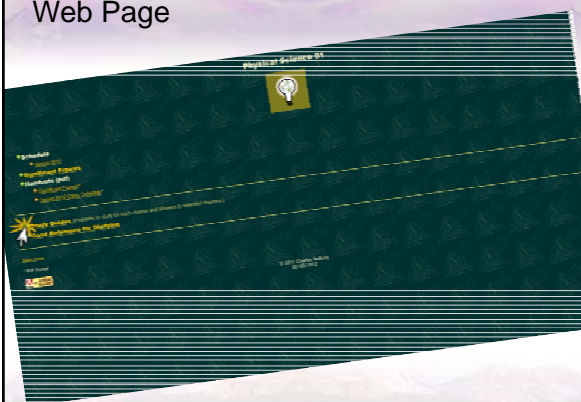
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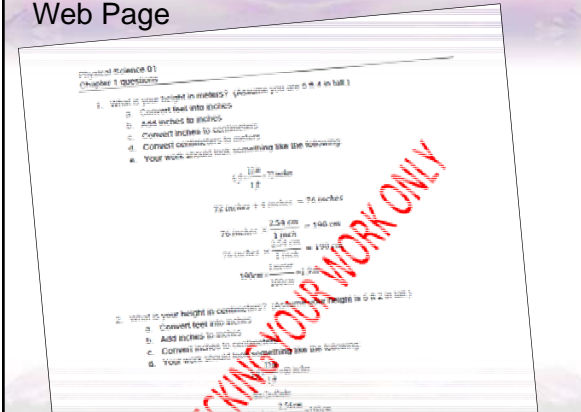
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Web Page



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Items to be covered today...


- ✓ Introduction to Physical Science
- ✓ Review of Syllabus
- ✓ Web: <http://themalloryfamily.net/>
- ✓ Basic Math
- ✓ **Significant Digits**
- ✓ Scientific Method



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You should now have...


- ✓ The class syllabus
- ✓ The sign in sheet
- ✓ Listing of homework problems
- ✓ The study guide for significant figures



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What is Science

- Understanding Science leads to an understanding of our environment.
- Science involves the measurement of our physical world.
- Understanding our environment demands the interpretation of accurate measurements (*i.e.*, data).
- Therefore, understanding measurement is essential to Science



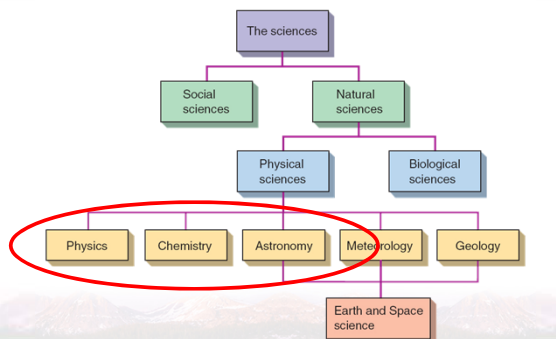
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What is Physical Science?

- Subset of the Natural Sciences, together with Biological Sciences
- Physical Sciences
 1. Physics (We cover) 😊
 2. Chemistry (We cover) 😊
 - ☹️ 3. Geology (Not covered)
 - ☹️ 4. Meteorology (Not covered)
 5. Astronomy (We cover) 😊
- The book covers the fundamentals of each of the five Physical Sciences.

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The Major Physical Sciences



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The New Stuff

Significant Digits

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SIGNIFICANT FIGURES

How long is the nail?



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SIGNIFICANT FIGURE RULES

	Example	Sig. Digits	Sci-Notation
1 All non-zero digits are significant			
	1.589	4	1.589E+00
	0.897	3	8.97E-01
	36000	2	3.6E+04
2 Significant Zero's			
a All sandwiched zero's			
	13.02	4	1.302E+01
	1.0002	5	1.0002E+00
	10.5	3	1.05E+01
b All trailing zero's preceded by a digit to the right of the decimal point.			
	5.000	4	5.000E+00
	20.000	5	2.0000E+01
	15.00	4	1.500E+01
3 Non significant Zero's			
a Leading Zeros			
	0.0200	3	2.00E-02
	0067	2	6.7E+01
b Trailing Zero's to the left of the decimal point in a number without a decimal point			
	56000	2	5.6E+04
	1360	3	1.36E+03

*NOTE: Write the numbers in exponential notation if you have any doubt. All zeros used to indicate the power of 10 (order of magnitude) are not significant.

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Examples

- 12.6 to two significant digits 13
- 12.5 to two significant digits 12
- 13.5 to two significant digits 14
- 12.5001 to two significant digits 13
- 11.5001 to two significant digits 12
- 1000 to two significant digits 1.0×10^3

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The Senses



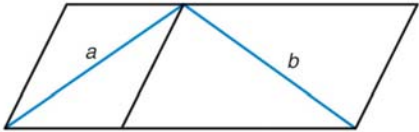




- Sight, Hearing, Smell, Taste, Touch
- Sight and Hearing provide the most information to our brains about our environment.
- Sensory Limitations – can be reduced by using measuring devices
- Instruments extend our ability to measure and learn about our environment.
- Our senses can also be deceived ->

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Some Optical Illusions

Deceive Visual Senses



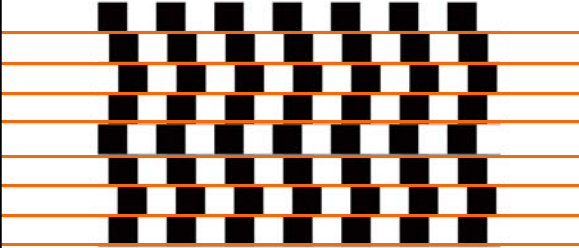
Is the diagonal line *b* longer than the diagonal line *a*?

Lines "a" and "b" are equal in length!

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Optical Illusions

Deceive Visual Senses

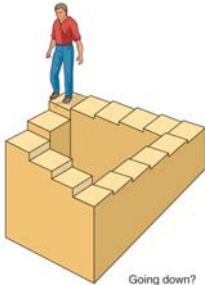


Are the horizontal lines parallel or do they slope?
The lines are all horizontal!

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Some Optical Illusions

Deceive Visual Senses

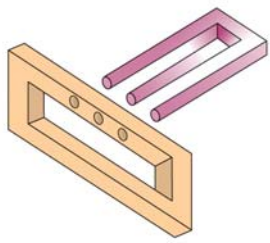


Going down?

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Some Optical Illusions

Deceive Visual Senses



Is something dimensionally wrong here?

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Scientific Method

- **Scientific Method** – general methods of observations, rules for reasoning, and making predictions
- Can be broken down into:
 - Observations & Measurements
 - Hypothesis
 - Experiments
 - Theory
 - Law

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The Scientific Method

- **Observations** (forming the question)
 - Idea / Thought
 - When a horse gallops, what is the minimum number of feet touching the ground at any one time?



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The Scientific Method

- **Observations** (forming the question)
 - Idea / Thought
 - When a horse gallops, what is the minimum number of feet touching the ground at any one time?
- **Hypothesis** (The guess)
 - Explain the observation, mathematically if possible
 - When the horse gallops, one foot is always touching the ground.

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The Scientific Method

- **Observations** (forming the question)
 - Idea / Thought
 - When a horse gallops, what is the minimum number of feet touching the ground at any one time?
- **Hypothesis** (The guess)
 - Explain the observation, mathematically if possible
 - When the horse gallops, all feet come off the ground.
- **Experimentation** (The Data)
 - By independent analysis to confirm hypothesis
 - Take pictures and analyze the pictures



Retest

Revise Hypothesis

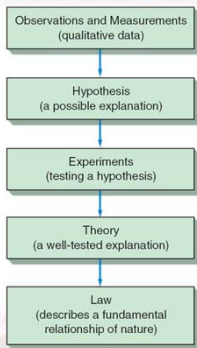
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The Scientific Method

- **Observations** (forming the question)
 - Idea / Thought
 - When a horse gallops, what is the minimum number of feet touching the ground at any one time?
- **Hypothesis** (The guess)
 - Explain the observation, mathematically if possible
 - When the horse gallops, all feet come off the ground.
- **Experimentation** (The Data)
 - By independent analysis to confirm hypothesis
 - Take pictures and analyze the pictures
- **Theory / Law** (accepted truth)
 - Proven over time
 - Verify by analyzing lots of horses over a sufficiency long period of time.

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The Scientific Method



```

    graph TD
      A[Observations and Measurements  
(qualitative data)] --> B[Hypothesis  
(a possible explanation)]
      B --> C[Experiments  
(testing a hypothesis)]
      C --> D[Theory  
(a well-tested explanation)]
      D --> E[Law  
(describes a fundamental  
relationship of nature)]
    
```

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Systems of Units

- Two major systems of units
- **British (English) system** – only used widely in the United States (miles, inches, pounds, seconds, etc.)
- **Metric system** – used throughout most of the world (kilometers, meters, grams, etc.)
- The U.S. “officially” adopted the metric system in 1893, but continues to use the British system.

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A Brief History of the United States Going Metric

1875	The Treaty of the Meter is signed by 17 nations, including the United States. This established a permanent body with the authority to set metric standards.
1893	The United States officially adopts the metric-system standards as basis for weights and measures (but continues to use British units).
1975	The Metric Conversion Act is enacted by Congress. It states, “The policy of the United States shall be to coordinate and plan the increasing use of the metric system in the United States and to establish a United States Metric Board to coordinate the voluntary conversion to the metric system.” (No mandatory requirements are imposed.)
1981-1982	The efforts of the Metric Board were largely ignored by the American public, and in 1982, the Board reported to Congress that it lacked the clear Congressional mandate necessary to bring about national metric conversion. In 1982, the Metric Board was dissolved and a Metric Program Office was established under the Department of Commerce that was to provide metric information and respond to queries on metrication.
1988	Recognizing the necessity of U.S. conformance with international trade, Congress includes new encouragement of U.S. metrication in the Omnibus Trade and Competitiveness Act of 1988. This designated the metric system as “the preferred system of weights and measures for United States trade and commerce.” It also required that by 1992, all federal and federal-aid agencies use the system in their procurements, grants, and other business activities.
First decade of the twenty-first century	Where are we now? You supply the answer.

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Units
- Length

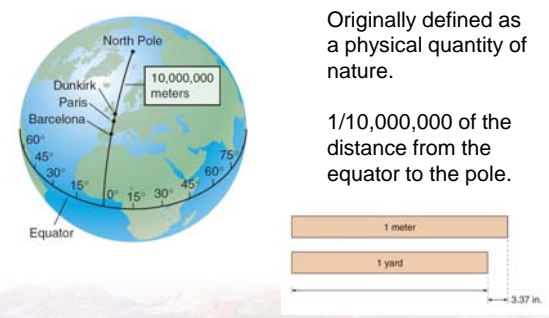
Length

- *The measurement of space in any direction*
- Space has three dimensions – length, width, and height.
- **Metric Standard Unit = Meter** (m), originally defined as 1/10,000,000 of distance from equator to north pole
- **British Standard Unit = Foot**, originally referenced to the human foot.

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Units
- Length: Meter

The Meter



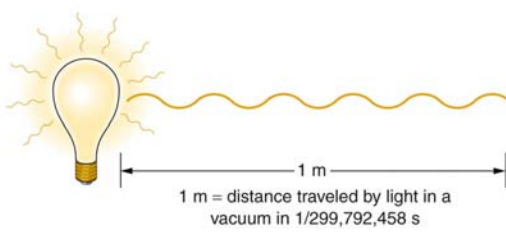
Originally defined as a physical quantity of nature.

1/10,000,000 of the distance from the equator to the pole.

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Units
- Length: Meter

The Meter



1 m = distance traveled by light in a vacuum in $1/299,792,458$ s

The meter is now defined by the distance light travels in a vacuum/time.

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Units
- Length: Meter
- Mass

Mass (metric)

- *The amount of matter an object contains*
- An object's mass is always constant
- Mass is a fundamental unit that will remain constant throughout the universe.
- **Metric Standard Unit = Kilogram (kg)** – originally defined as the amount of water in a 0.1m cube. Now referenced to a cylinder in Paris

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Units
- Length: Meter
- Mass: Kilogram

Kilogram Standard



U.S. Prototype #20 Kilogram, at NIST in Washington, D.C.
Actually – 0.999 999 961 kg of "the" standard in Paris

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Units
- Length: Meter
- Mass: Kilogram

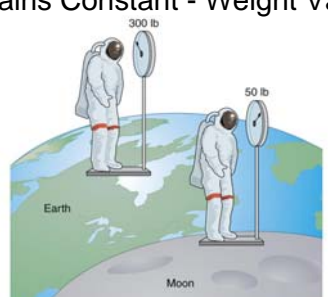
Mass (British)

- **British Standard Unit = Slug** (rarely used)
- We use the **Pound (lb.)**
- The pound is actually not a unit of mass, but rather of weight, related to gravitational attraction (depends on where the object is!)
- Object: Earth = 1lb. → Moon = 1/6lb.
- In fact, the weight of an object will vary slightly depending on where it is on earth (higher altitude → less weight)

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Units
- Length: Meter
- Mass: Kilogram

Mass is a Fundamental Quantity and Remains Constant - Weight Varies



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Units
- Length: Meter
- Mass: Kilogram
- Time: Second

Time

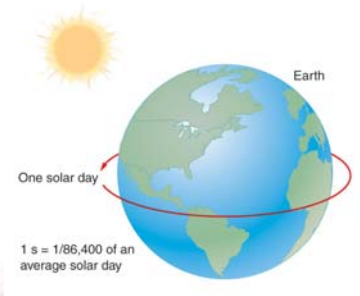
- **Time** - the continuous, forward flowing of events
- Time has only one direction → forward
- **Second (s)** – the standard unit in both the metric and British systems
- Originally 1/86,400 of a solar day
- Now based on the vibration of the Cs^{133} atom (Atomic Clock)

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Units
- Length: Meter
- Mass: Kilogram
- Time: Second

A Second of Time

Originally defined as a fraction of the average solar day.



One solar day

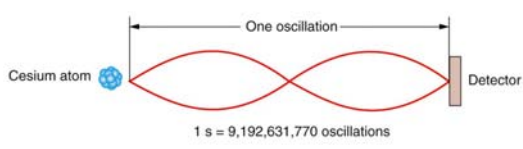
1 s = 1/86,400 of an average solar day

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Units
- Length: Meter
- Mass: Kilogram
- Time: Second

A Second of Time

Defined by the radiation frequency of the Cs¹³³ atom



One oscillation

Cesium atom

Detector

1 s = 9,192,631,770 oscillations

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Units
- Length: Meter
- Mass: Kilogram
- Time: Second

Metric System

- Uses acronym "mks system" from standard units of length, mass, and time – meter, kilogram, second
- It is a decimal (base-10) system – this is much better than the British system
- Administered by -- Bureau International des Poids et Mesures (BIPM) in Paris
- International System of Units (SI)
- Contains seven base units

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Units
- Length: Meter
- Mass: Kilogram
- Time: Second

Modern Metric System (SI)

- The fundamental units are a choice of seven well-defined units which by convention are regarded as dimensionally independent:
 - meter, m (length)
 - kilogram, kg (mass)
 - second, s (time)
 - ampere, A (electrical current)
 - kelvin, K (temperature)
 - mole, mol (amount of a substance)

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Break Time

Please be back by 8:45 P.M.



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Powers-of-10 Notation (Scientific Notation)

- Many numbers are very large or very small – it is more convenient to express them in 'powers-of-10' notation
- 1,000,000 = 10x10x10x10x10x10 = 10⁶

$$\frac{1}{1,000,000} = \frac{1}{10^6} = 0.000001 = 10^{-6}$$

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Scientific Notation

- The distance to the sun can be expressed many ways:
 - 93,000,000 miles
 - 93×10^6 miles
 - 9.3×10^7 miles
 - 0.93×10^8 miles
- All four are correct, but 9.3×10^7 miles is the preferred format.

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Section 1.7 1 | 55

Rules for Scientific Notation

- The exponent, or power-of-10, is **increased** by one for every place the decimal point is shifted to the **left**.
 - $360,000 = 3.6 \times 10^5$
- The exponent, or power-of-10, is **decreased** by one for every place the decimal point is shifted to the **right**.
 - $0.0694 = 6.94 \times 10^{-2}$

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Section 1.7 1 | 56

Base-10 → Convenient

- Easy expression and conversion
- Metric examples vs. *British examples*
 - 1 kilometer = 1000 meters
 - 1 mile = 5280 feet
 - 1 meter = 100 centimeters
 - 1 yard = 3 feet or 36 inches
 - 1 liter = 1000 milliliters
 - 1 quart = 32 ounces or 2 pints
 - 1 gallon = 128 ounces

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Section 1.5 1 | 57

Commonly Used Prefixes

- Mega, M**
 - 10^6 or 1,000,000 times
- Kilo, k**
 - 10^3 or 1,000 times
- Centi, c**
 - 10^{-2} or 1/100th
- Milli, m**
 - 10^{-3} or 1/1000th

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Section 1.5 1 | 58

Units
- Length: Meter
- Mass: Kilogram
- Time: Second
- Volume: Liter

Liter – Nonstandard Metric Unit

- Liter** – volume of liquid in a 0.1m (10 cm) cube ($10\text{cm} \times 10\text{cm} \times 10\text{cm} = 1000 \text{ cm}^3$)
- A liter of pure water has a mass of 1 kg or 1000 grams.
- Therefore, 1 cubic cm (cc) of water has a mass of 1 gram.
- By definition 1 liter = 1000 milliliters (ml)
- So, 1 ml = 1 cc = 1 g of pure water.
- 1 ml = 1 cc for all liquids, but other liquids do not have a mass of 1 g

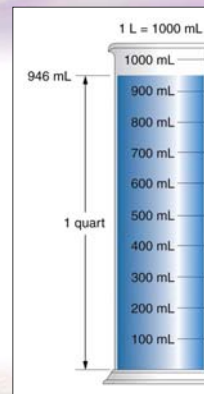
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Section 1.5 1 | 59

Units
- Length: Meter
- Mass: Kilogram
- Time: Second
- Volume: Liter

Liter & Quart

- A Liter is slightly more than a quart.
 - 1 quart = .946 liter
 - 1 liter = 1.06 quart



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Section 1.5 1 | 60

Units
 - Length: Meter
 - Mass: Kilogram
 - Time: Second
 - Volume: Liter

The Kilogram

- (1 kg = 2.2046 lb on earth)
- The amount of water in a 0.10m (10 cm) cube (0.10m³)

1 cm³ = 1 mL 1 L = 1000 cm³ = 1000 mL
 (1 g = 1 cm³ of water)

1 kg = 1000 cm³ water
 (1000 cm³ = 10 cm × 10 cm × 10 cm)

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MEASUREMENTS / SI UNITS

SI Base Units

Quantity Measured	Units	Symbol
⇒ Length	Meter	m
⇒ Mass	Kilogram	kg
⇒ Time	Seconds	s
⇒ Temperature	Kelvin	K
Electric current	Ampere	A
Amount of substance	Mole	mol
Intensity of light	Candela	cd

Derived Units

Quantity Measured	Units	Symbol
⇒ Volume	Liter	L
⇒ Density	grams/cc	g/cm ³

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Conversion of Units

EACH BOUNCE OF THE DECIMAL TO THE RIGHT MAKES THE UNIT TEN TIMES BIGGER...
 ... AND EACH DECIMAL PLACE HAS A NAME.

0.001.000

milli- centi- deci- one unit deka- hecto- kilo-

SI PREFIXES

Prefixes	Symbol	Multiplying factor
mega-	M	1,000,000
kilo-	k	1000
centi-	c	0.01
milli-	m	0.001
micro-	μ	0.000,001

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SIGNIFICANT FIGURES

Multiplication and Division

- The LAN is the number with the least number of significant figures.
- The answer (*product or quotient*) can have no more significant figures than the LAN.

Example |
 Calculate the volume of a rectangular solid that has a length of 4.16 cm, a width of 2.2 cm, and a height of 2.00 cm.

Volume = Length x Width x Height
 Volume = (4.16cm) (2.2cm) (2.00cm)
 LAN

Volume = 18.304 cm³ (*incorrect*)
 Volume = 18 cm³ (*correct*)

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Examples

2 x 3 = 6
 12 x 3 = 40
 12 x 12 = 140
 102 x 3 = 300
 100 x 100 = 10,000
 1 / 2 = 0.5

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SIGNIFICANT FIGURES

The **Least Accurate Number (LAN)** determines the number of digits to which the answer is expressed.

Addition and Subtraction

- The LAN is the number with the least number of digits following the decimal point.
- The answer (*sum or difference*) can have no more digits *following the decimal point* than the LAN.

Example:
 What is the total mass of a mixture made by mixing the following substances?

212 g water (LAN)
 1.8 g salt
 1.88 g sugar

215.98 g (*incorrect*)
 216 g (*correct*)

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Examples

$$12 + 10 = 20$$

$$100 + 1 = 100$$

$$12.3125783 + 1 = 13$$

$$14 + 10 = 20$$

$$60.0 + 10.001 = 70.0$$

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1 | 67

SIGNIFICANT FIGURES

Rounding Off

1 If the last digit to be retained in a number is followed by a number less than 5 (<5),

ROUND DOWN.

Round to 3 significant figures:

28.23	rounds to	28.2
578.1	rounds to	578

2 If the last digit to be retained in a number is followed by a number greater than 5 (>5),

ROUND UP.

Round to 2 significant figures:

5.998	rounds to	6.0
0.00258	rounds to	0.0026
3.8502	rounds to	3.7

3 If the last digit to be retained in a number is followed by 5 (0000000... implied),

ROUND the last digit retained to an EVEN NUMBER.

Round to 2 significant figures:

1.75	rounds to	1.8
1.050	rounds to	1.0
1.45	rounds to	1.4

Round to 4 significant figures:

67.835	rounds to	67.84
67.885	rounds to	67.88

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1 | 68

Physical Science

Jeopardy

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1 | 69

Good Night!!



Physical Science 01

Chapter 1, continue

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1 | 71

Derived Units and Conversion Factors

(This is the stuff we will be doing a lot of)

- It is difficult to make all measurements with only the 7 fundamental units.
- Derived units are therefore used, these are multiples/combinations of fundamental units.
- We've already used derived units Volume \rightarrow length³, m³, cm³
- Area \rightarrow length², m², ft², etc.
- Speed \rightarrow length/time, m/s, miles/hour, etc.

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Section 1.6 1 | 72

Density

- Density (d) = mass per unit volume
- $d = m/v$ [or m/length^3 (since $v = \text{length}^3$)]
- How “compact” a substance is
- Typical Units used – g/cm^3 , kg/m^3
- $\text{Al} = 2.7 \text{ g}/\text{cm}^3$, $\text{Fe} = 7.8 \text{ g}/\text{cm}^3$, $\text{Au} = 19.3 \text{ g}/\text{cm}^3$
- Average for solid earth = $5.5 \text{ g}/\text{cm}^3$

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Section 1.6 1 | 73

Liquid Densities

(Ways to measure density)

- Hydrometer – a weighted glass bulb
- The higher the hydrometer floats the greater the density of the liquid
- Pure water = $1 \text{ g}/\text{cm}^3$
- Seawater = $1.025 \text{ g}/\text{cm}^3$
- Urine = 1.015 to $1.030 \text{ g}/\text{cm}^3$
- Hydrometers are used to ‘test’ antifreeze in car radiators – actually measuring the density of the liquid

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Section 1.6 1 | 74

Measuring Liquid Density

- The denser the liquid the higher the hydrometer floats.



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Section 1.6 1 | 75

Unit Combinations

(We will be doing this later in the class, don't worry yet)

- When a combination of units becomes complex and frequently used –
- It is given a name
 - newton (N) = $\text{kg} \times \text{m}/\text{s}^2$
 - joule (J) = $\text{kg} \times \text{m}^2/\text{s}^2$
 - watt (W) = $\text{kg} \times \text{m}^2/\text{s}^3$

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Section 1.6 1 | 76

Conversion Factors

(Important Stuff)

- Relates one unit to another unit
- Convert British to Metric (1 in \rightarrow cm)
- Convert units within system (1 kg \rightarrow g)
- We use “conversion factors” – many are listed on inside back cover of book
- 1 inch is equivalent to 2.54 centimeters
- Therefore “1 in = 2.54 cm” is our conversion factor for inches & centimeters

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Section 1.6 1 | 77

Easy Conversion Example

- *Question: How many centimeters are there in 65 inches?*
- Since 1 in = 2.54 cm \rightarrow $\frac{1 \text{ inch}}{2.54 \text{ cm}} = 1$
- Or $\frac{2.54 \text{ cm}}{1 \text{ in}} = 1$
- $65 \text{ in.} \times \frac{2.54 \text{ cm}}{1 \text{ in}} = 165 \text{ cm}$ (the inches cancel out!!)

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Section 1.6 1 | 78

Steps to Convert

- **Step 1** - Choose/Use a Conversion Factor, generally can be looked up.
- **Step 2** - Arrange the Conversion Factor into the appropriate form, so that unwanted units cancel out.

$$\frac{1 \text{ inch}}{2.54 \text{ cm}} \quad \text{or} \quad \frac{2.54 \text{ cm}}{1 \text{ inch}} \quad \text{for example}$$

- **Step 3** - Multiply or Divide to calculate answer.
- **Use common sense** - anticipate answer!

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50 km/h → ?? mi/h

- How fast in mi/h is 50 km/h?
- Conversion Factor is 1km/h=0.621mi/h

$$50 \text{ km/h} \times \frac{0.621 \text{ mi/h}}{1 \text{ km/h}} = 31.05 \text{ mi/h}$$

Starting Value Conversion Factor Result

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50 km/h → ?? mi/h

$$50 \text{ km/h} \times \frac{0.621 \text{ mi/h}}{1 \text{ km/h}} = 31.05 \text{ mi/h}$$

Starting Value Conversion Factor Result

http://themalloryfamily.net Section 1.6 1 | 81

50 mi/h → ?? km/h

- Either Conversion Factor can be used:
- 1km/h = 0.621mi/h or 1mi/h = 1.61km/h
- How fast in km/h is 50 mi/h?

$$50 \text{ mi/h} \times \frac{1 \text{ km/h}}{0.621 \text{ mi/h}} = 80.5 \text{ km/h}$$

$$50 \text{ mi/h} \times \frac{1.61 \text{ km/h}}{1 \text{ mi/h}} = 80.5 \text{ km/h}$$

Starting Value Conversion Factor Same Result

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50 mi/h → ?? km/h

$$50 \text{ mi/h} \times \frac{1 \text{ km/h}}{0.621 \text{ mi/h}} = 80.5 \text{ km/h}$$

$$50 \text{ mi/h} \times \frac{1.61 \text{ km/h}}{1 \text{ mi/h}} = 80.5 \text{ km/h}$$

Starting Value Conversion Factor Same Result

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Multi-Step Conversion No Problem!

- 22 inches = ?? Meters
- Inches → centimeters → meters

$$22 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ m}}{100 \text{ cm}} = 0.56 \text{ m}$$

Starting Value Conv. Factor #1 Conv. Factor #2 Result
in → cm cm → m

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Multi-Step Conversion No Problem!

$$22 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ m}}{100 \text{ cm}} = 0.56 \text{ m}$$

Starting Value Conv. Factor #1 Conv. Factor #2 Result

in → *cm* *cm* → *m*

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Section 1.6 1 | 85

Problem Solving

- **Read** the problem, and **identify** the chapter principle that applies to it. **Write** down the given quantities w/ units. Make a sketch.
- **Determine** what is wanted – write it down.
- Check the **units**, and make **conversions** if necessary.
- Survey **equations** – use appropriate one.
- Do the **math**, using appropriate **units**, round off, and adjust number of **significant figures**.

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Section 1.7 1 | 86

Equations that you need for Chapter 1

- Density: $d = m/V$

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Section 1.7 1 | 87

Questions...

1. What is your height in meters? (Assume you are 6 ft 4 in tall.)
2. What is your height in centimeters? (Assume your height is 5 ft 2 in tall.)
3. What is the volume of a liter in mm³?
4. Show that 1 cubic meter contains 1,000L
5. Water is sold in half-liter bottles. What is the mass in kilograms and in grams of the water in such a full bottle?
6. A rectangle container measuring 10 cm x 20 cm x 25 cm is filled with water. What is the mass of this volume in water in kilograms and in grams?
17. Compute the density in g/cm³ of a piece of metal that has a mass of 0.500 kg and a volume of 63 cm³.
19. Round off the following numbers to two significant figures:
 1. 65.61
 2. 0.00208
 3. 9438
 4. 0.000344

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1 | 88

Questions...

20. Round off the following numbers to three significant figures
 1. 0.009995
 2. 644.73
 3. 0.010599
 4. 8429.55
21. Round off the following numbers to three significant figures:
 1. 0.9996
 2. 7384.38
 3. 0.01789
 4. 47.645
22. Round off the following numbers to four significant figures:
 1. 3.1415926
 2. 0.00690745
 3. 483.5960
 4. 0.0234973

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1 | 89

Notes...

- Please make sure that you hand in your Code of Academic Honor and Integrity.
- Please make sure you sign in.
 - According to the college, you may be dropped if you miss more than one week worth of material.
- I will periodically send out messages through the email you provide to the campus.
 - If you have not provided an email address to the campus, you will not received these messages
 - You may subscribe to email notifications if the campus is closed for any reason (i.e. fire) from the campus website.

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1 | 90

Next Meeting...

- ✓ Homework due next week!!! (Chapter 1)
- ✓ Study the problems at the end of chapter 1.
 - Exercises 1, 2, 3, 4, 5, 6, 17, 19, 20, 21, 22
- ✓ Review your notes
 - And the posted lecture notes – If you want them, please let me know.
- ✓ Remember you new equation
 - $d=m/V$

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1 | 91

