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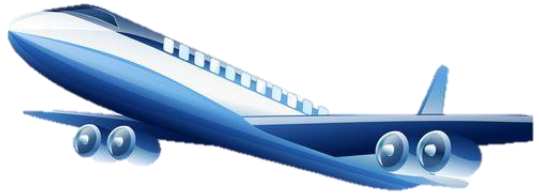
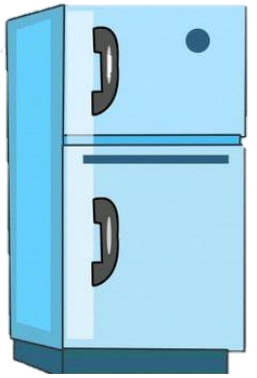
Physics 1

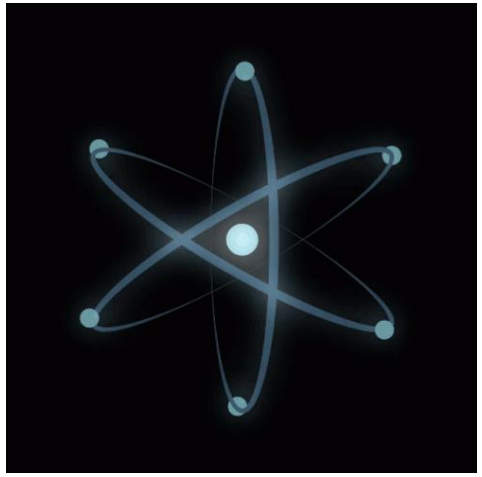
LOUAY KARAKER

What is physics?

HOW THINGS WORK?







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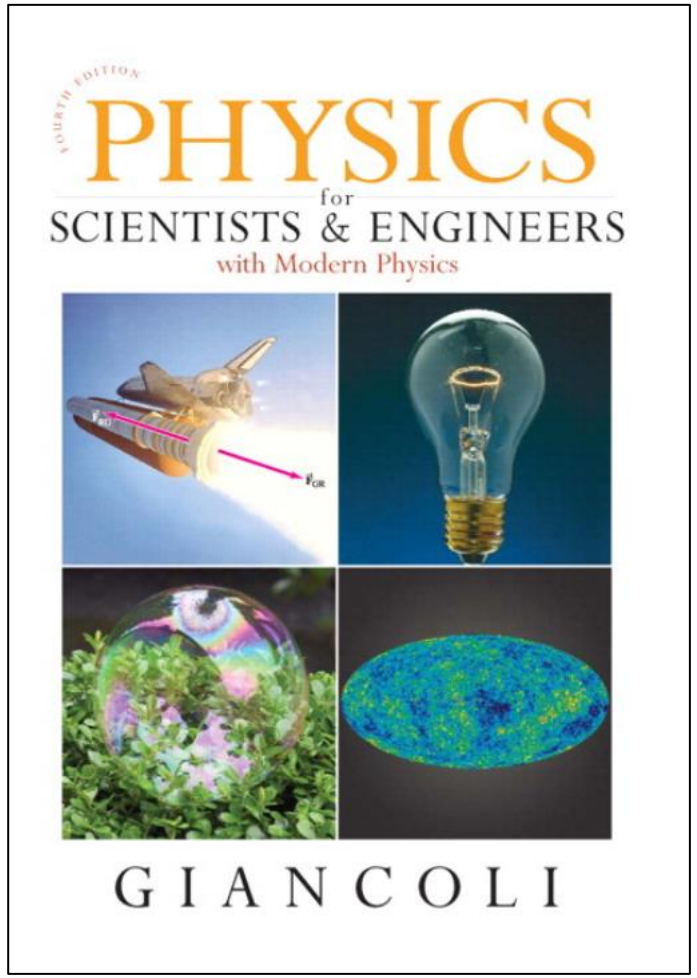

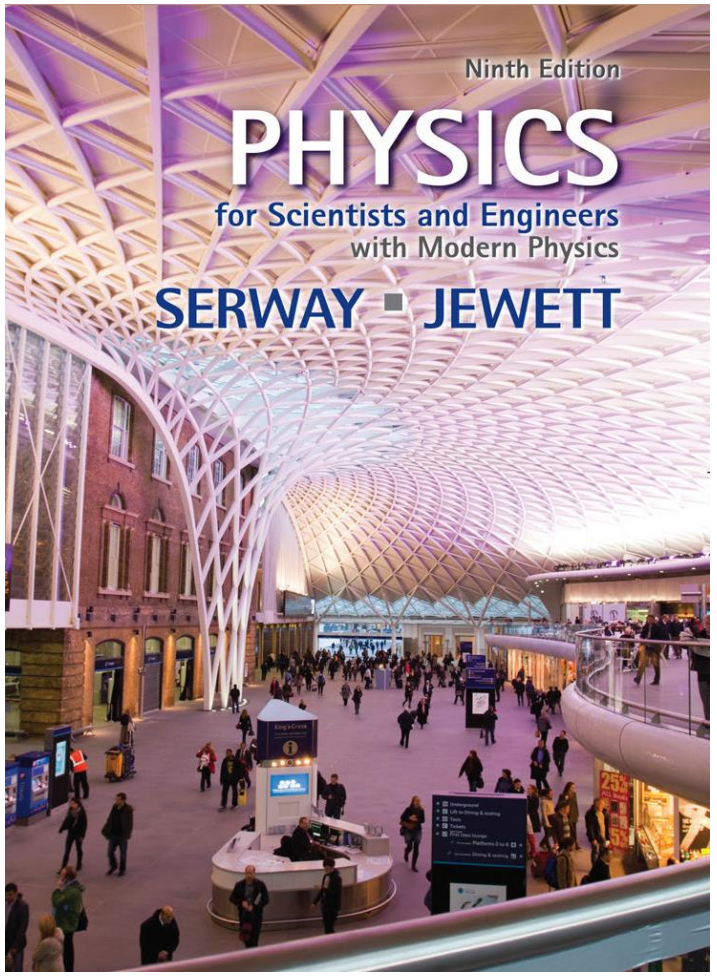

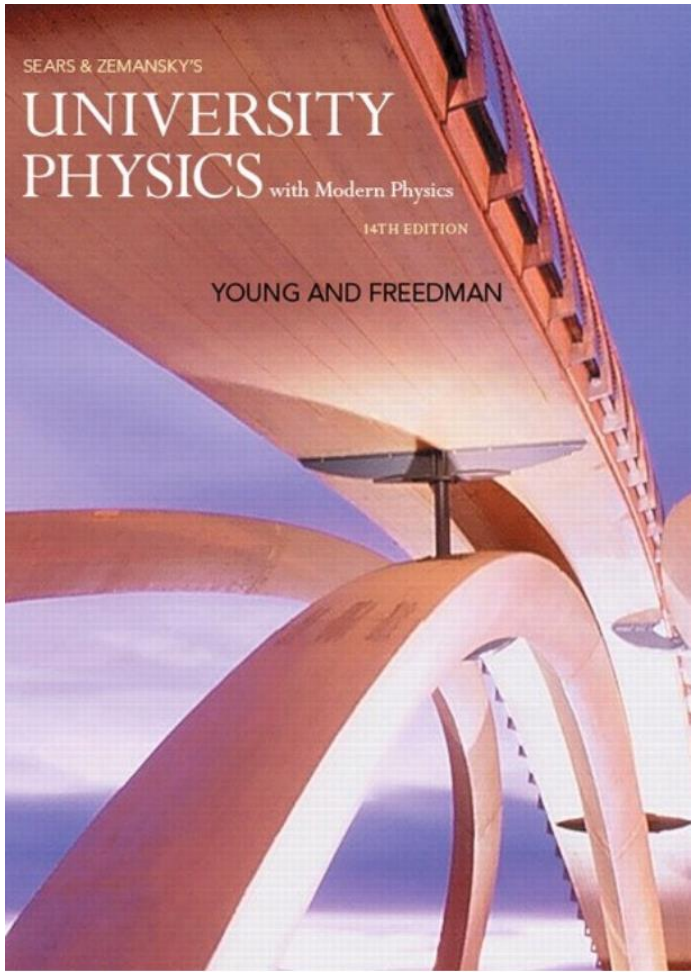

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❖ The study of physics can be divided into six main areas:

- **1.** Classical mechanic → physics I
- **2.** Relativity
- **3.** Thermodynamics
- **4.** Electromagnetism → physics II
- **5.** Optics
- **6.** Quantum mechanics

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Physics I

Physics and Measurement

Motion in One Dimension

Vectors

Motion in two Dimensions

The Laws of Motion

Circular Motion and Other Applications of Newton's Laws

Energy of a System

Conservation of Energy

Linear Momentum and Collisions

Rotation of a Rigid Object About a Fixed Axis

Angular Momentum

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Solving Physics Problems

- "I understand the concepts, but I just can't solve the problems."

In physics:

Understanding concepts = Being able to solve problems.

Problem-Solving Strategies

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Problem-Solving Strategies

1. Identify *the relevant concepts:*
   - ✓ Target variables of the problem
   - ✓ Known quantities
   - ✓ Algebraic expression or Numerical answer

$\{ x = ?$
$\{ v = 10\ m/s$
$\{ t = 10\ s$

$v = \frac{x}{t} \Rightarrow x = v \cdot t$

2. Set up *the problem:*
   - ✓ Equations that will be used to solve the problem and how it'll be used
   - ✓ The variables you have identified correlate exactly with those in the equations
   - ✓ Draw a sketch
   - ✓ Estimate what your results will be

   (If this seems challenging, don't worry—you'll get better with practice!)

3. Execute *the solution:*
   - ✓ Do the math

$x = 10 \cdot 10 = 100\ m$

4. Evaluate *your answer:*
   - ✓ Compare your answer with your estimates

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Physics & Measurement

Experimental observations
&
Quantitative measurements

Numbers & Units

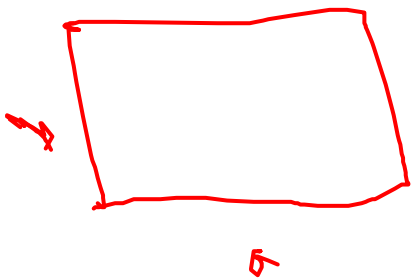
Physical Quantities

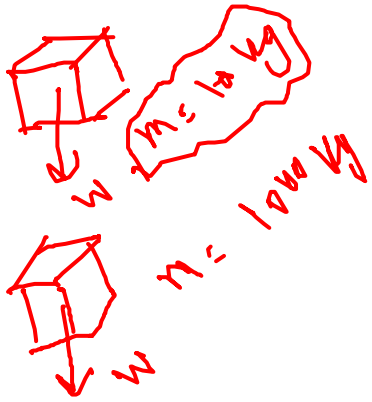
Basic Physical Quantities

- Time — [T]
- Length — [L]
- Mass — [M]

$W = m \cdot g$

$g = 9.8$





Derived Physical Quantities

$V = \frac{x}{t} = \frac{[L]}{[T]}$

$a = \frac{[L]}{[T]^2}$

$A = a \cdot b = [L] \cdot [L]$

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Unit Systems

- International System, or SI

L (m) T (s) M (kg)

- The British System (U.S. customary units)

L (ft) T (s) M (lb)

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Conversion of Units:

Sometimes it is necessary to convert units from one measurement system to another.

Factors between SI and U.S. customary units of length are as follows:

1 mile = 1609 m = 1.609 km

1 ft = 0.3048 m = 30.48 cm

1 m = 39.37 in = 3.281 ft

1 in = 0.0254 m = 2.54 cm

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Table 1.4 Prefixes for Powers of Ten

Power	Prefix	Abbreviation
10^{-24}	yocto	y
10^{-21}	zepto	z
10^{-18}	atto	a
10^{-15}	femto	f
10^{-12}	pico	p
10^{-9}	nano	n
10^{-6}	micro	μ
10^{-3}	milli	m
10^{-2}	centi	c
10^{-1}	deci	d

Power	Prefix	Abbreviation
10^{3}	kilo	k
10^{6}	mega	M
10^{9}	giga	G
10^{12}	tera	T
10^{15}	peta	P
10^{18}	exa	E
10^{21}	zetta	Z
10^{24}	yotta	Y

$15\ pm = 15 \times 10^{-12}\ m$

$5\ m = 5 \times 10^{+3}\ mm$

$5 \times 10^{3}\ m = 5 \times 10^{3} \times 10^{-6}\ Mm$

$= 5 \times 10^{-3}\ Mm$

$1\ kg = 1000\ g$

10^{3}

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Important notes:

- ✓ All units in the problem should be in the same system.
- ✓ Need to know conversion.
- ✓ Only quantities with same units can be added or subtracted.

Example 1:

- This expression: 50 m + 12 cm = ? Yields:
  a) 5012 cm ✓
  b) 50.12 cm ✗
  c) 5012 m ✗
  d) 5.012 m ✗

$50 \times 10^{2} + 12 = 5000 + 12 = 5012$ cm ✓

$50 + 12 \times 10^{-2} = 50 + 0.12 = 50.12$ m

- This expression: 50 cm x 12 kg = ? Yields:
  a) 0.6 m.kg ✗
  b) 600 cm.kg ✓
  c) 60000 cm.g ✗
  d) All of above ✗

$50 \times 10^{-2} \times 12 = 600 \times 10^{-2} = 6$ m.kg

$50 \times 12 = 600$ cm.kg

$50 \times 12 \times 10^{3} = 600 \times 10^{3} = 600000$ cm.g

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Example 2:

- On an interstate highway in a rural region of Wyoming, a car is traveling at a speed of 38.0 m/s. Is the driver exceeding the speed limit of 75.0 mi/h?

1 mile = 1609 m = 1.609 km
1 ft = 0.3048 m = 30.48 cm
1 m = 39.37 in = 3.281 ft
1 in = 0.0254 m = 2.54 cm

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THANK YOU