

PH111-01 General Physics with Calculus I

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Text: "Fundamentals of Physics", 11th edition

Course information located on the Canvas website: canvas.uah.edu

All course homework is worked online with WileyPlus. Full text and Assignments are found under Canvas/Assignments. **Caution, only one Wiley Tab may be open at any given time in your browser.**

WileyPlus help site is found under Modules. The help people are great!

Radio Frequency for ResponseCard NXT/QT/QT2 clickers is: **59**

We will use clickers for exams and for **class quizzes starting Friday!**

[See our site on Canvas for more information](#)

Chapter 1 Background, Measurements, etc.

Physics descriptions

PH111 — length, mass, time

⇒ speed, velocity, force, Energy ...

Specific meanings in physics

Chps. 1-15 cover a group of problems called
Mechanics

The International System of Units (SI)*

TABLE 1

The SI Base Units

Quantity	Name	Symbol	Definition
length	meter	m	"... the length of the path traveled by light in vacuum in 1/299,792,458 of a second." (1983)
mass	kilogram	kg	"... this prototype [a certain platinum-iridium cylinder] shall henceforth be considered to be the unit of mass." (1889)
time	second	s	"... the duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium-133 atom." (1967)
electric current	ampere	A	"... that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross section, and placed 1 meter apart in vacuum, would produce between these conductors a force equal to 2×10^{-7} newton per meter of length." (1946)
thermodynamic temperature	kelvin	K	"... the fraction 1/273.16 of the thermodynamic temperature of the triple point of water." (1967)
amount of substance	mole	mol	"... the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon-12." (1971)
luminous intensity	candela	cd	"... the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540×10^{12} hertz and that has a radiant intensity in that direction of 1/683 watt per steradian." (1979)

Mass units and conversions

Prefixes for SI Units

Factor	Prefix ^a	Symbol
10^{24}	yotta-	Y
10^{21}	zetta-	Z
10^{18}	exa-	E
10^{15}	peta-	P
10^{12}	tera-	T
10^9	giga-	G
10^6	mega-	M
10^3	kilo-	k
10^2	hecto-	h
10^1	deka-	da
10^{-1}	deci-	d
10^{-2}	centi-	c
10^{-3}	milli-	m
10^{-6}	micro-	μ
10^{-9}	nano-	n
10^{-12}	pico-	p
10^{-15}	femto-	f
10^{-18}	atto-	a
10^{-21}	zepto-	z
10^{-24}	yocto-	y

^aThe most frequently used prefixes are shown in bold type.

Bold-faced are most important!

Important Book Data

Appendix page A-1: SI units

Appendix page A-2: Combinations of units

Appendix page A-3: Fundamental constants

Appendix page A-5: Conversion Factors

Appendix page A-9: Math/Trig/Calculus

mass is in kg, not grams

length in meters

time in seconds

atomic mass units, amu's or u's

Appendix B
@ bottom

$$1 e^- \text{ mass} = 9.1 \times 10^{-31} \text{ kg}$$

12 amu's = mass of C^{12} atom

Mass \neq Weight (chp 5)

Length

	cm	METER	km	in.	ft	mi
1 centimeter = 1		10^{-2}	10^{-5}	0.3937	3.281×10^{-2}	6.214×10^{-6}
1 METER = 100		1	10^{-3}	39.37	3.281	6.214×10^{-4}
1 kilometer = 10^5		1000	1	3.937×10^4	3281	0.6214
1 inch = 2.540		2.540×10^{-2}	2.540×10^{-5}	1	8.333×10^{-2}	1.578×10^{-5}
1 foot = 30.48		0.3048	3.048×10^{-4}	12	1	1.894×10^{-4}
1 mile = 1.609×10^5		1609	1.609	6.336×10^4	5280	1
1 angström = 10^{-10} m		1 fermi = 10^{-15} m		1 fathom = 6 ft		1 rod = 16.5 ft
1 nautical mile = 1852 m		1 light-year = 9.461×10^{12} km		1 Bohr radius = 5.292×10^{-11} m		1 mil = 10^{-3} in.
= 1.151 miles = 6076 ft		1 parsec = 3.084×10^{13} km		1 yard = 3 ft		1 nm = 10^{-9} m

Conversion Example

Convert $23.5 \times 10^{-11} \text{ s}$ to nanoseconds

$$23.5 \times 10^{-11} \cancel{\text{s}} \left(\frac{1 \times 10^9 \text{ ns}}{1 \cancel{\text{s}}} \right) = 23.5 \times 10^{-2} \text{ ns}$$

$$0.235 \text{ ns}$$

$$\left(\frac{1 \text{ ns}}{1 \times 10^{-9} \text{ s}} \right) \quad \text{or} \quad 235 \text{ ps}$$

Another Conversion Example

$$55 \text{ mph} \rightarrow \text{m/s}$$

$$55 \frac{\text{miles}}{\text{hour}} \left(\frac{1.609 \text{ km}}{1 \text{ mile}} \right) \left(\frac{1000 \text{ m}}{1 \text{ km}} \right) \left(\frac{1 \text{ hr}}{3600 \text{ s}} \right)$$

$$\text{OR}$$

$$\left(\frac{1 \text{ m}}{10^{-3} \text{ km}} \right)$$

$$\frac{55(1.609)(1000)}{3600} \frac{\text{m}}{\text{s}} = 24.6 \text{ m/s}$$

Significant Digits Example

Suppose variables a, b, c

Find answer $x = \frac{ab}{c}$

$$\left. \begin{array}{l} \text{let } a = 7.00 \\ b = 3.50 \\ c = 2.75 \end{array} \right\}$$

$$x = 8.909090 \dots \Rightarrow 8.91$$

$$\text{if change } a \Rightarrow 7.0 \rightarrow x = 8.909090 \dots \Rightarrow 8.9$$

$$\text{if change } a \Rightarrow 7 \rightarrow x = 8.909090 \dots \Rightarrow 9$$