

Section
1-1

HOLT PHYSICS

Concept Review

What is Physics?

1. Which areas of physics deal with the following?
 - a. how fast things move Mechanics
 - b. how the shape of a cave affects an echo Vibrations & waves
 - c. which sunglasses are best for cutting the glare on a ski slope optics
 - d. how the cooling system in a refrigerator works Thermodynamics
 - e. what lightning is electricity
 - f. how energy is produced by the sun nuclear physics

2. Laws governing speed limits on highways are determined by a majority vote by citizens of a state or their representatives. Compare this democratic procedure to the way scientific laws are established with regard to the following questions. Explain your reasoning.

- a. Can scientific laws be changed by a vote?

No, Scientists use evidence to support or disprove scientific arguments

- b. Can the speed of light be legislated?

No, Speed of light is determined in nature. We can only measure it.

- c. Can scientists from other countries change what physicists in the United States think?

Yes, by sharing their scientific arguments.

Section
1-2

HOLT PHYSICS
Math Skills

Measurements in Experiments

Power	Prefix	Abbreviation
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

Power	Prefix	Abbreviation
10 ⁻¹	deci-	d
10 ¹	deka-	da
10 ³	kilo-	k
10 ⁶	mega-	M
10 ⁹	giga-	G
10 ¹²	tera-	T
10 ¹⁵	peta-	P
10 ¹⁸	exa-	E

- How many picoseconds are there in 1 Ms? $\frac{1 \text{ Ms}}{1} \left(\frac{1 \times 10^6 \text{ s}}{1 \text{ Ms}} \right) \left(\frac{1 \times 10^{12} \text{ ps}}{1 \text{ s}} \right) = 1 \times 10^{18} \text{ ps}$
- How many micrograms make 1 kg? $\frac{1 \text{ kg}}{1} \left(\frac{1000 \text{ g}}{1 \text{ kg}} \right) \left(\frac{1 \times 10^6 \text{ μg}}{1 \text{ g}} \right) = 1 \times 10^9 \text{ μg}$
- How many nanometers are there in 1 cm? $\frac{1 \text{ cm}}{1} \left(\frac{1 \times 10^7 \text{ nm}}{1 \text{ cm}} \right) = 1 \times 10^7 \text{ nm}$
- Rewrite the following quantities in scientific notation without prefixes.
 - 3582 gigabytes $\frac{3582 \text{ gigabytes}}{1} \left(\frac{1 \times 10^9 \text{ bytes}}{1 \text{ gigabyte}} \right) = 3.582 \times 10^{12} \text{ bytes}$
 - 0.0009231 milliwatts $\frac{0.0009231 \text{ mW}}{1} \left(\frac{1 \times 10^{-3} \text{ W}}{1 \text{ mW}} \right) = 9.231 \times 10^{-7} \text{ watts}$
 - 53657 nanoseconds $\frac{53657 \text{ ns}}{1} \left(\frac{1 \text{ sec}}{1 \times 10^9 \text{ ns}} \right) = 5.3657 \times 10^{-5} \text{ s}$
 - 5.32 milligrams $\frac{5.32 \text{ mg}}{1} \left(\frac{1 \text{ g}}{1000 \text{ mg}} \right) = 5.32 \times 10^{-3} \text{ g}$
 - 88900 megahertz $\frac{88900 \text{ MHz}}{1} \left(\frac{1 \times 10^6 \text{ Hz}}{1 \text{ MHz}} \right) = 8.89 \times 10^{10} \text{ Hz}$
 - 0.00000083 centimeters $\frac{8.3 \times 10^{-7} \text{ cm}}{1} \left(\frac{1 \text{ m}}{100 \text{ cm}} \right) = 8.3 \times 10^{-9} \text{ m}$
- Rewrite the following quantities in units with SI prefixes.
 - 36582472 g $\frac{36.582472 \text{ Mg}}{1}$
 - 0.000000452 m $\frac{4.52 \times 10^{-7} \text{ m}}{1} \left(\frac{1 \times 10^9 \text{ nm}}{1 \text{ m}} \right) = 452 \text{ nm}$
 - 53236 V $\frac{53236 \text{ V}}{1} \left(\frac{1 \text{ kV}}{1000 \text{ V}} \right) = 53.236 \text{ kV}$
 - $4.62 \times 10^{-3} \text{ s}$ $\frac{4.62 \times 10^{-3} \text{ s}}{1} \left(\frac{1000 \text{ ms}}{1 \text{ s}} \right) = 4.62 \text{ ms}$
- Express the measurement 4.29478416 kg with 8, 6, 4, and 2 significant figures.

<u>8 sig fig</u>	<u>4.2947842 kg</u>	<u>4 sig fig</u>	<u>4.295 kg</u>
<u>6 sig fig</u>	<u>4.29478 kg</u>	<u>2 sig fig</u>	<u>4.3 kg</u>

HRW material copyrighted under notice appearing earlier in this book.

Section
1-3

HOLT PHYSICS
Math Skills

The Language of Physics

1. Calculate the following products and quotients without using a calculator.

- a. $(3.0 \times 10^5) \times (2.0 \times 10^3)$ 6.0×10^8
- b. $(3.0 \times 10^5) \div (2.0 \times 10^3)$ 1.5×10^2
- c. $(3.0 \times 10^2) \div (2.0 \times 10^5)$ 1.5×10^{-3}
- d. $(3.0 \times 10^{-2}) \times (2.0 \times 10^5)$ 6.0×10^3
- e. $(3.0 \times 10^{-2}) \div (2.0 \times 10^{-5})$ $1.5 \times 10^{-2 - (-5)} \Rightarrow 1.5 \times 10^3$
- f. $(3.0 \times 10^{-2}) \times (2.0 \times 10^{-5})$ $6.0 \times 10^{-2 + (-5)} \Rightarrow 6.0 \times 10^{-7}$

2. Round off the following numbers to one figure.

- a. 3.7×10^5 4×10^5
- b. 6.1×10^5 6×10^5
- c. 8.2×10^{-9} 8×10^{-9}
- d. 0.000067 7×10^{-5}
- e. 7439262 7×10^6
- f. 0.0006739 7×10^{-4}

3. Find the order of magnitude of the following results without using a calculator.

- a. 97×192 10^4
- b. $96.8639 \div 883.3525$ 10^{-1}

* Estimate the width and height in centimeters of a half-gallon milk container. Show your assumptions and your work.

* Use your numbers to obtain a rough estimate of the volume of milk in a half-gallon container. _____

* The volume of a half-gallon is about 1890 cm^3 . How close was your estimate? _____

