1. SCIENTIFIC NOTATION

CH30S UNIT 1 WIEBE

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SCIENTIFIC VALUES IN SCIENTIFIC NOTATION

Name	Symbol	Value
Universal gravitational constant	G	6.67×10^{-11} N•m²/kg²
Acceleration due to gravity	g	9.81 m/s²
Speed of light in a vacuum	c	3.00×10^{8} m/s
Speed of sound in air at STP		3.31×10^{2} m/s
Mass of Earth		5.98×10^{24} kg
Mass of the Moon		7.35×10^{22} kg
Mean radius of Earth		6.37×10^{6} m
Mean radius of the Moon		1.74×10^{6} m
Mean distance – Earth to the Moon		3.84×10^{8} m
Mean distance – Earth to the Sun		1.50×10^{11} m
Rest mass of the electron	m_e	9.11×10^{-31} kg
Rest mass of the proton	m_p	1.67×10^{-27} kg
Rest mass of the neutron	m_n	1.67×10^{-27} kg

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DEALING WITH MEASUREMENTS

In chemistry, we deal with some very LARGE numbers:

1 mole = 602000000000000000000000

We also deal with some very SMALL numbers:

Mass of an electron = 0.00000000000000000000000000000091 kg

DEALING WITH MEASUREMENTS

Imagine the difficulty of calculating the mass of 1 mole of electrons!

0.00000000000000000000000000000091 kg
x 602000000000000000000000

????????????????????????????????????

SCIENTIFIC NOTATION

A method of representing very large or very small numbers in the form:

$$M \times 10^n$$

- M is a number between 1 and 10
- n is an integer

WRITING NUMBERS IN SCIENTIFIC NOTATION

Step #1: Insert an understood decimal point

Step #2: Decide where the decimal must end up so that one non-zero number is to its left

Step #3: Count how many places you bounce the decimal point

Step #4: Re-write in the form $M \times 10^n$

If moving the decimal makes the number smaller, then the exponent gets larger.

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EXAMPLE #1

5732 grams

If moving the decimal makes the number smaller, then the exponent gets larger.

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EXAMPLE #2

0.0050 m

If moving the decimal makes the number larger, then the exponent gets smaller.

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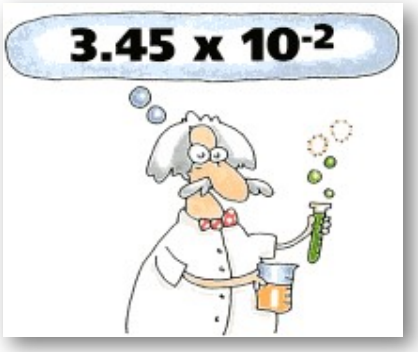
CALCULATIONS IN SCIENTIFIC NOTATION

When multiplying and dividing two numbers in scientific notation, always do it in THREE STEPS!

1. Front numbers
2. Exponents
3. Units



$$(1.0 \times 10^{5}\ kg)(1.0 \times 10^{-2}\ kg)$$

MULTIPLYING SCIENTIFIC NOTATION

EXAMPLE #1

$$(3.0 \times 10^{5} cm)\ (2.0 \times 10^{4} cm)$$

DIVIDING SCIENTIFIC NOTATION

EXAMPLE #2

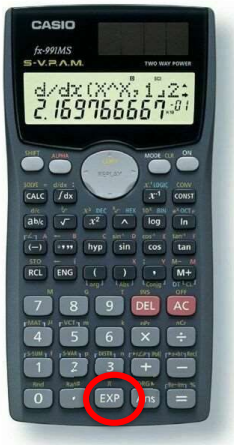
$$\frac{(9 \times 10^{7}\ kg)}{(3 \times 10^{3}\ s)}$$

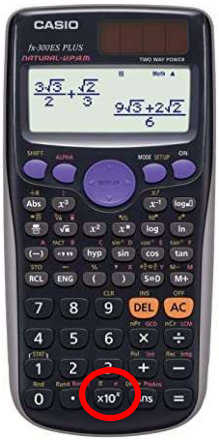
DIVIDING SCIENTIFIC NOTATION

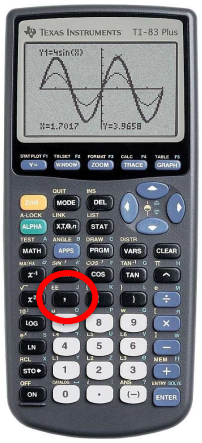
EXAMPLE #3

$$\frac{(4 \times 10^{-3}\ s)}{(1 \times 10^{-5}\ s)}$$

SCIENTIFIC NOTATION ON YOUR CALCULATOR







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CHALLENGE!

1 mole of anything:
600000000000000000000000

Mass of an electron
0.000000000000000000000000000000090 kg

HOW MANY KILOGRAMS WOULD 1 MOLE OF ELECTRONS WEIGH?

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