Scientific Notation and Metrics

Writing in Scientific Notation

1) Move the decimal point to the right or left until you have a number that is greater than or equal to 1, but less than 10.

2) Count how many places you moved the decimal point. This number will become the absolute value of the exponent.

3) If you moved the decimal point to the left, the exponent will be positive.

4) If you moved the decimal point to the right, make the exponent negative.

Examples

Write the following numbers in scientific notation.

a. 1043

b. 2.5

c. 0.000495

Solutions

a. $1.043x10^{3}$

b. $2.5x10^{0}$

c. $4.95x10^{-4}$

a. The decimal is to the right of the 3. Move it **left 3** places.

b. This number is already greater than or equal to one and less than 10. Therefore, the decimal doesn't have to be moved and the **exponent** will be **0**

c. Move the decimal **right 4** places.

You Try It

1) Decide whether the number is in scientific notation. If not, tell why the number is not in correct scientific notation

$a.\quad 0.54x10^{3} \qquad b.\quad 2.2x10^{0.3} \qquad c.\quad 8.0x10^{5}$

2) Write the following numbers using scientific notation:

$a.\quad 7234 \qquad b.\quad 0.085 \qquad c.\quad 1.11$

3) Write the following numbers in decimal form:

$a.\quad 2.75x10^{-2} \qquad b.\quad 8.375x10^{6}$

4) Atoms are composed of protons, neutrons and electrons. If the mass of protons and neutrons are each 1.67×10^{-24} grams and an electron has a mass of 9.11×10^{-28} gram. Find the mass of an atom of silver which has 47 protons, 47 electrons, and 60 neutrons.

Problem 1

A. This number is not written correctly in scientific notation. The value of *c* is supposed to be greater than or equal to 1 and less than 10. Here, the value of *c* is less than 1.

B. This number is not correctly written using scientific notation because the power of 10 is supposed to be an integer. Thus, it can't be a fraction.

C. This number is correctly written using scientific notation

Problem 2

A. $7.234x10^{3}$

The decimal had to be moved left three places so the power of ten is positive 3.

B. $8.5x10^{-2}$

The decimal had to be moved to the right two places, so the power of ten is negative two.

C. $1.11x10^{0}$

The decimal does not need to be moved. Therefore, the power of ten is zero.

Problem 3

A. 0.0275

The decimal point had to be moved two places to the left because the power of ten was negative two.

B. 8375000

The decimal point had to be moved six places to the right because the power of ten was positive six

Problem 4

1) Find the mass of the protons.

$$(1.67x10^{-24})x47 = 7.849x10^{-23}$$

2) Find the mass of the neutrons.

$$\left(1.67x10^{-24}\right)x60 = 1.002x10^{-22}$$

3) Find the mass of the electrons.

$$\left(9.11x10^{-28}\right)x47 = 4.2817x10^{-26}$$

4) Add the values together from steps 1-3 to get the final answer.

$$1.79x10^{-22}\ grams$$

WHEN MULTIPLYING LIKE BASES, YOU ADD THE EXPONENTS

$$(a^n)(a^m) = a^{n+m}$$

FOR EXAMPLE:

$$(3^2)(3^5) = 3^{2+5} = 3^7$$

NOW YOU TRY:

$$(4^6)(4^4) = 4^{6+4} = 4^{10}$$

WHEN DIVIDING LIKE BASES, YOU SUBTRACT THE EXPONENTS.

$$\left(\frac{a^n}{a^m}\right) = a^{n-m}$$

FOR EXAMPLE:

$$\left(\frac{x^5}{x^3}\right) = x^{5-3} = x^2$$

NOW YOU TRY:

$$\left(\frac{x^{12}}{x^4}\right) = x^{12-4} = x^8$$

Metric System Prefix Table

Prefix	Symbol	Multiplication Factor	Power of 10
yotta	Y	1,000,000,000,000,000,000,000,000	+24
zetta	Z	1,000,000,000,000,000,000,000	+21
exa	E	1,000,000,000,000,000,000	+18
peta	P	1,000,000,000,000,000	+15
tera	T	1,000,000,000,000	+12
giga	G	1,000,000,000	+9
mega	M	1,000,000	+6
kilo	k	1,000	+3
hecto	h	100	+2
deka	da	10	+1
deci	d	0.1	-1
centi	c	0.01	-2
milli	m	0.001	-3
micro	µ	0.000,001	-6
nano	n	0.000,000,001	-9
pico	p	0.000,000,000,001	-12
femto	f	0,000,000,000,000,001	-15
atto	a	0,000,000,000,000,000,001	-18
zepto	z	0,000,000,000,000,000,000,001	-21
yocto	y	0,000,000,000,000,000,000,000,001	-24