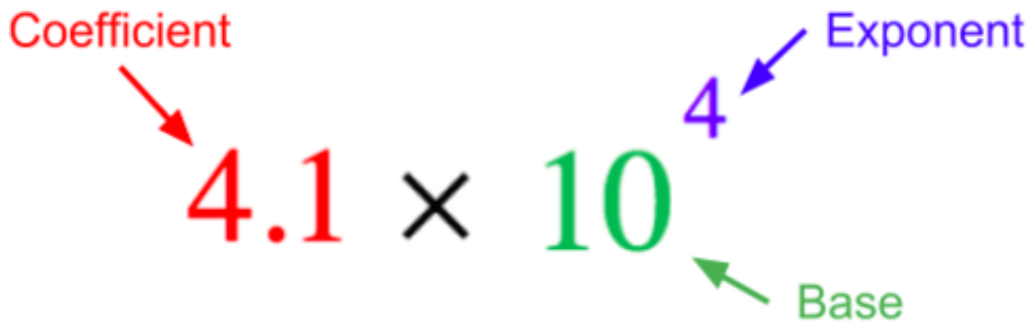
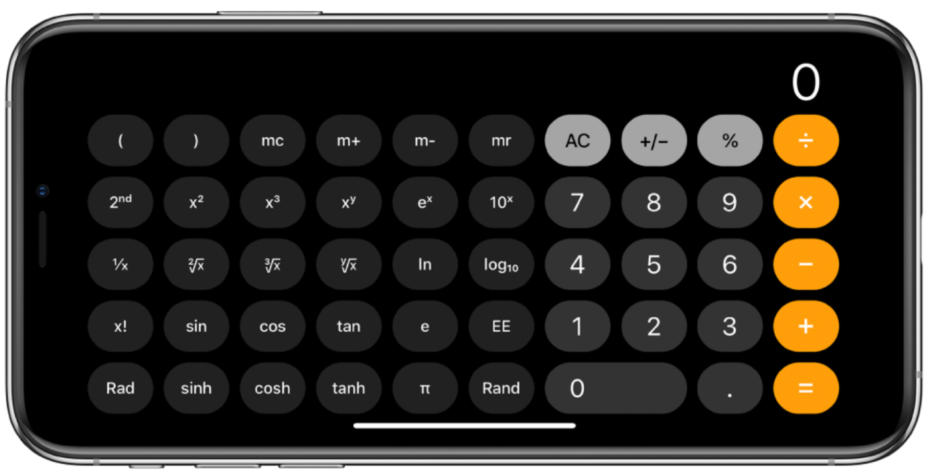
Scientific Notation for Radiation Measurement Units



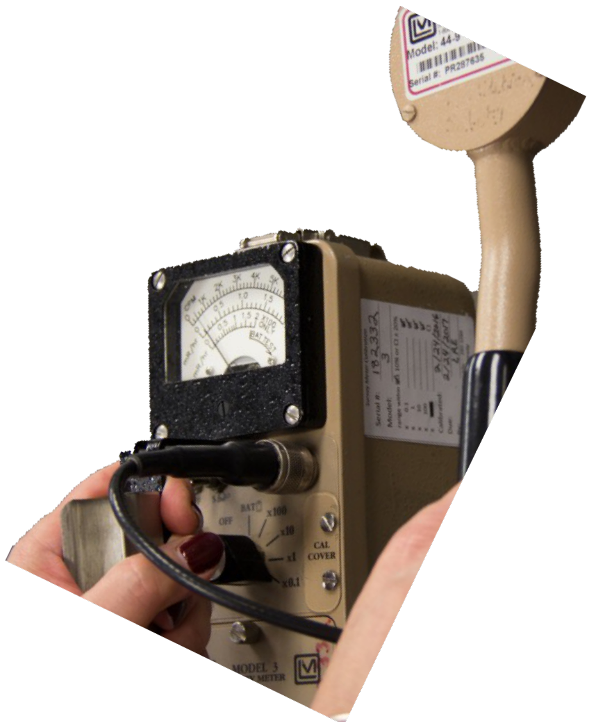


Unit Modifiers

Multiple of 10	Numerical Value	Prefix	Symbol
10^{12}	1,000,000,000,000	tera	T
10^{9}	1,000,000,000	giga	G
10^{6}	1,000,000	mega	M
10^{3}	1,000	kilo	K
10^{2}	100		
10^{1}	10		
10^{0}	1		
10^{-1}	.1	deci	D
10^{-2}	.01	centi	C
10^{-3}	.001	milli	m
10^{-6}	.000001	micro	µ
10^{-9}	.000000001	nano	n
10^{-12}	.000000000001	pico	p
10^{-15}	.000000000000001	femto	f

RADIATION SOLUTIONS

Common Modifiers Used in Radiation Measurement



R: Roentgen base unit for radiation exposure

mR: milli-Roentgen *(one thousandth of a Roentgen)*
µR/h: micro Roentgen per hour *(one millionth of a Roentgen)*
mR/h: milli-Roentgen per hour (exposure rate)

Rem: Rem base unit for radiation dose

mRem: milli-Rem *(one thousandth of a Rem)*
mRem/h: milli-Rem per hour (dose rate)

Sv: Sievert base unit for radiation dose

mSv: milli-Sievert *(one thousandth of a Sievert)*
mSv/h: milli-Sievert per hour (dose rate)

Ci: Curie base unit for radiation activity (radioactivity)

pCi: pico-curie *(one trillionth of a curie)*
nCi: nano-curie (one billionth of a curie)
µCi: micro-curie *(one millionth of a curie)*
mCi: milli-curie *(one thousandth of a curie)*

Scientific Notation Review

SCIENTIFIC NOTATION USES BASE 10

1 X 10 (= 10)

or

10^1

EXPONENT

EXPONENT

10 X 10 (= 100)

or

10^2 (= 10 X 10 = 100)

RADIATION SOLUTIONS

Exponential Form

POSITIVE NUMBERS

- 10 = 10^1 (one zero in 10)
- 100 = 10^2 (two zeroes in one-hundred)
- 1,000 = 10^3 (three zeroes in one-thousand)
- 10,000 = 10^4 (four zeroes in ten-thousand)
- 100,000 = 10^5 (five zeroes in one-hundred-thousand)

NEGATIVE NUMBERS

- .1 – 10^{-1} (decimal one place to the left)
- .01 = 10^{-2} (decimal two places to the left)
- .001 = 10^{-3} (decimal three places to the left)

Scientific Notation - Multiplication

$$100 \times 1{,}000 = 100{,}000$$

or

$$10^2 \times 10^3 = 10^5$$

$$X^a \bullet X^b = Z^{(a+b)}$$

(using the convention that A • A represents multiplication)

RADIATION SOLUTIONS

Scientific Notation- Division

$$X^a / X^b = Z^{(a-b)}$$

$$1{,}000 / 100 =$$

$$10^3 / 10^2 =$$

$$10^{(3-2)} = 10^1$$

$$= 10$$

Scientific Notation Mixed Numbers

RADIATION SOLUTIONS

Positive Exponents

1,200	56,000	1,800,000
1.2 X 1000	5.6 X 10000	1.8 X 1,000,000
1.2×10^{3}	5.6×10^{4}	1.8×10^{6}

Negative Exponents

0.034	0.00056	0.0000012
move decimal two places to the right	move decimal four places to the right	move decimal six places to the right
3.4×10^{-2}	5.6×10^{-4}	1.2×10^{-6}

Scientific Notation Mixed Numbers

1200.0 X 0.034 Example Problem

$= 1.2 \times 10^3 \quad X \quad 3.4\ 10^{-2}$

1. Convert to scientific notation

$= 1.2\ X\ 3.4 \quad X \quad (10^3 \times 10^{-2})$

2. Multiple the coefficient numbers then add the exponents

$= 4.08\ X\ 10^1$

3. Write out result of multiplying the coefficient numbers and apply the derived exponent to the base 10

$= 40.8$

1. Convert back to real number

Scientific notation is a great way to work radiation unit problems covering a very wide numerical span.

This completes this section.
Proceed to the next one when you are ready.

RADIATION
SOLUTIONS