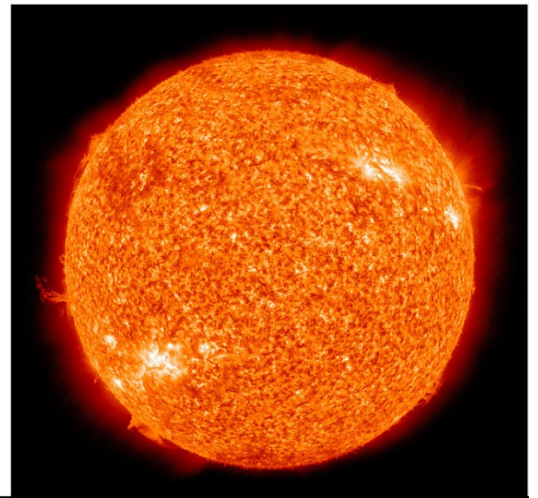


Scientific Notation



How old is the Universe?

13,860,000,000 years



How big is the Sun?

860000 miles

1,300,000 km

How far away is the Sun?

93000000 miles

130,000,000 km

What is the mass of the Sun?

~~200~~ 200,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000 kg

How small is DNA?

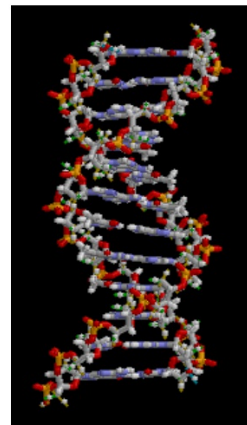
$\sim 0.000000002 \text{ m}$

2 nm

How small is a gold atom?

$\sim 0.00000000014 \text{ m}$

$1.4 \times 10^{-10} \text{ m} = 1.4 \text{ \AA}$



Scientific notation^{, note}: writing a number as **A x 10ⁿ**

A is a number between 1 and 10

For example: $2400 = 2.4 \times 10^3$

$$\begin{aligned} 2400 &= 2.4 \times 1000 \\ &= 2.4 \times 10^3 \end{aligned}$$

What about 62000?

$$62000 = \underline{6.2} \times 10^4$$

↓

$$6.2 \times 10,000$$

5600000000?

$$5600000000 = \underline{56} \times 10^8$$

$$56 \times 10^8$$

$$5.6 \times 10^1 \times 10^8 = 5.6 \times 10^9$$

Can you tell me a rule for changing a big number into scientific notation?

23,600,000,000,000

13 12 11 10 9 8 7 6 5 4 3 2 1

$$2.36 \times 10^{13}$$

Change the non-zero numbers to something between 0 and 10, then count all the numbers that are NOT the first number and make that the power.

What about 0.001?

$$0.001 = \underline{1} \times 10^{-3}$$

0.000035?

$$0.000035 = \underline{3.5} \times 10^{-5}$$

0.00000098?

$$0.00000098 = \underline{9.8} \times 10^{-7}$$

Can you tell me a rule for changing a *small* number into scientific notation?

0.0000005234

Change the non-zero numbers to something between 1 and 10, then count all the 0s (including before the .) That number is the power.

5.234×10^{-7}

Try on your own:

1. 352000000

2. 0.000020

3. 0.02

4. 20

5. 0.5

6. 200000

Go backwards: Change scientific notation to normal notation

For example: $2.3 \times 10^2 = 2.3 \times 100 = 230$

Try these:

1. 9.9×10^5

2. 8.2×10^{-4}

3. 3×10^{-1}

4. 8.0×10^0

5. 2.8×10^1

6. 5×10^3

Do now

1. 9800

2. 20

3. 0.000678

4. 20.23