LEARNING AS ONE NATION

Expanded Project

GC1 Q1_15

SHS LEARNING ACTIVITY

Name: _____ **Score/Mark:** _____

Grade and Section: _____ **Date:** _____

Strand: ☑ STEM ☐ ABM ☐ HUMSS ☐ ICT (*TVL Track*)

Subject: *General Chemistry 1*

Type of Activity: ☑ Concept Notes ☐ Skills: Exercise/Drill ☐ Illustration ☐ Performance Task ☐ Essay/Report ☐ Others: _____

Activity Title: **B-03. Measurements, Conversion of Units and Scientific Notation**

Learning Target: To solve measurement problems involving conversion of units using scientific notation

References: *(Author, Title, Pages)*
https://solarsystem.nasa.gov/missions/mars-climate-orbiter/in-depth/
https://en.wikipedia.org/wiki/Mars_Climate_Orbiter
M.D.A.D. Cadeliña, CVIF-DLP Learning Activities

On December 11, 1998, the US National Aeronautics and Space Administration (NASA) launched the Mars Climate Orbiter (MCO) to study the planet's climate, atmosphere, and surface. The main study mission was supposed to last for at least two years. However, on September 23, 1999, just when the MCO was supposed to go into orbit around Mars, all communication with it was cut off. Navigational error caused NASA to lose MCO as it broke out of the assigned trajectory. Investigation showed that error was due to the use of the English system of units by the engineering team for impulse calculations, while NASA used metric (SI) system. Conversion of units was not done. Total cost of the failed mission was USD 328 million.

Measurements should always be expressed in **correct units**. International standards are then followed in the conversion from one system of units to another. Since measurements can involve extremely large or small numbers, scientific notation is often used by scientists for efficiency. The Tables below show the SI unit prefixes of measurements.

Unit Prefix	Symbol	Exponential
exa	E	10^{18}
peta	P	10^{15}
tera	T	10^{12}
giga	G	10^{9}
mega	M	10^{6}
kilo	k	10^{3}
hecto	h	10^{2}
deka	da	10^{1}

Unit Prefix	Symbol	Exponential
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}
femto	f	10^{-15}
atto	a	10^{-18}

Example: Convert 54.6 centimeters (cm) to femtometers (fm). One way to do this is to note that multiplying any number by 1 does not change the number. Thus, since $\frac{1\text{ m}}{10^2\text{ cm}} = \frac{1\text{ cm}}{10^{-2}\text{ m}} = 1$ and $\frac{1\text{ fm}}{10^{-15}\text{ m}} = \frac{10^{15}\text{ fm}}{1\text{ m}} = 1$, we have,

$$54.6\text{ cm} = 54.6\,\cancel{\text{cm}} \times \frac{1\,\cancel{\text{m}}}{10^2\,\cancel{\text{cm}}} \times \frac{10^{15}\text{ fm}}{1\,\cancel{\text{m}}} = \mathbf{5.46 \times 10^{14}\text{ fm}}$$

Exercise: Convert the following units and show your solutions. Observe correct number of significant figures. Note the units and their symbols: second (s), liter (L), gram (g), and meter (m).

a) 146 kg = _____ mg

b) 690. GL = _____ mL

c) 2.00 Ps = _____ ps

d) 56. fm = _____ km

e) 53 Gg = _____ kg