SELF-ASSESSMENT - MODULE 3-2: States of Matter

I. Define the following terms:

A. Matter: **MATTER IS ANYTHING THAT OCCUPIES SPACE (HAS VOLUME) AND HAS MASS (WEIGHT).**
B. Van Der Waals Forces: **STRONG ATTRACTIVE FORCES BETWEEN ATOMS.**
C. Physical Change: **A CHANGE WHICH DOES NOT ALTER THE CHEMICAL COMPOSITION OF A SUBSTANCE. A NEW SUBSTANCE IS NEVER FORMED**.
D. Chemical Change: **A CHEMICAL CHANGE IS THE RESULT OF A CHEMICAL REACTION WHICH ALTERS THE COMPOSITION OF A SUBSTANCE. THE ORIGINAL SUBSTANCE BECOMES TRANSFORMED INTO ONE OR MORE NEW SUBSTANCES WITH DISTINCT DIFFERENT PROPERTIES AND COMPOSITION.**
E. Melting Point: **THE TEMPERATURE AT WHICH A SOLID CHANGES TO A LIQUID.**
F. Freezing Point: **THE TEMPERATURE AT WHICH A LIQUID CHANGES TO A SOLID**.
G. Boiling Point: **THE TEMPERATURE AT WHICH A LIQUID CHANGES TO A GAS**
H. Latent Heat of Fusion: **THE HEAT REQUIRED TO CHANGE A SUBSTANCE FROM A SOLID (ICE) TO A LIQUID (WATER) OR VICE VERSA.**
I. Latent Heat of Vaporization: **THE HEAT REQUIRED TO CHANGE A SUBSTANCE FROM A LIQUID (WATER) TO A GAS (STEAM) OR VICE VERSA**.
J. Condensation: **CHANGE OF STATE FROM A GAS TO A LIQUID.**
K. Evaporation: **THE CHANGE IN STATE OF A SUBSTANCE FROM ITS LIQUID TO ITS GASEOUS FORM OCCURRING BELOW ITS BOILING POINT.**
L. Vapor: **SUBSTANCE IN THE GASEOUS FORM THAT IS NORMALLY A LIQUID AT ROOM TEMPERATURE.**
M. Sublimation: **THE CHANGE DIRECTLY FROM THE SOLID TO THE GASEOUS STATE WITHOUT BECOMING A LIQUID.**
N. Mass: **THE QUANTITY OF MATTER CONTAINED IN AN OBJECT.**
O. Weight: **THE GRAVITATIONAL FORCE PULLING THE BODY TOWARD THE CENTER OF THE EARTH.**
P. Gravity: **THE NATURAL FORCE OF ATTRACTION EXERTED BY A CELESTIAL BODY, SUCH AS EARTH, UPON OBJECTS AT OR NEAR ITS SURFACE, TENDING TO DRAW THEM TOWARD THE CENTER OF THE BODY.**
Q. Density: **THE AMOUNT OF MASS PER UNIT VOLUME (MASS / VOLUME).**
R. Specific gravity: **COMPARISON OF ONE SUBSTANCES DENSITY AGAINST A STANDARD SUCH AS WATER (1.0 G/L)**
S. Volume: **SPACE OCCUPIED BY MATTER MEASURED WITH A CALIBRATED INSTRUMENT (E.G., BURETTE, PIPETTE, CUP, SPOON)**
T. Temperature: **MEASUREMENT OF MOLECULAR ACTIVITY.**

II. List the state of matter for each of the following:

A. Dry Ice: **SUBLIMATION**
B. A piece of shale: **SOLID**
C. Butter on the table: **SOLID LEADING TO LIQUID IF LEFT OUT**
D. The contents of a container of helium: **GAS**
E. Lake Superior: **LIQUID**

III. Calculate the following densities:

A. 1 liter of Argon: $\frac{1\,gmw}{22.4\,L} = \frac{40\,g}{22.4\,L} = 1.79\,g/L$

B. 3 mL of water: $\frac{1\,gmw}{3\,mL} = \frac{18\,g}{3\,mL} = 6\,g/L$

C. 24 L of Carbon Dioxide:

$\frac{1\,gmw}{22.4\,L} = \frac{44\,g}{22.3\,L} = 1.97\,g/L$, *$CO_2$ is the only gas with which we use 22.3 rather than 22.4.*

D. 5 L of Air (only include top four constituents) :

$$Density\ Air\left(D_{AIR}\right) = \frac{\left(FN_2 \times gmw\ N_2\right) + \left(FO_2 \times gmw\ O_2\right) + \left(FCO_2 \times gmw\ CO_2\right) + \left(FAr \times gmw\ Ar\right)}{22.4\,L}$$

$$D_{Air} = \frac{\left(0.78 \times 28g\right) + \left(0.21 \times 32g\right) + \left(0.0003 \times 44g\right) + \left(.0093 \times 40g\right)}{22.4\,L}$$

$$D_{Air} = \frac{21.84g + 6.72g + 0.013g + 0.372g}{22.4L} = \frac{28.945g}{22.4L} = 1.29\,g/L$$