<u>CONCEPT:</u> <u>INTERNAL ENERGY</u>

● **Internal Energy** (_____ or _____) is the total energy from all forms of kinetic and potential energy of a system.

  □ Internal Energy can be calculated as: _____ = _____ + _____

Internal Energy

The **Internal Energy** formula is used when we have the **heat** and **work** of a system.	This **work** formula is used when we have the **pressure** and **volume** of a system.
Internal Energy Formula	**Work: Pressure-Volume Formula**

$$\triangle E = q + w$$

□ $\triangle E$ = _____ in J or kJ.

□ q = _____ in J or kJ.

□ w = _____

$$w = -P\triangle V$$

□ **P** = Pressure in _____.

□ **V** = Volume in _____.

□ **1 L•atm** = _____ Joules.

  □ If work is given in **L×atm** then we must use the **conversion factor** to change units into **Joules**.

  □ **Enthalpy** (___) : The amount of heat released or absorbed during a chemical reaction. Sound familiar?

    □ At constant pressure, *enthalpy* and *heat* can be treated as the same variable: _____ = _____

EXAMPLE: What is in the internal energy of the system if the reaction is done at a constant pressure of 20.0 atm and the volume compresses from 10 L to 5 L while releasing 92.2 kJ of heat?

PRACTICE: An unknown gas expands in a container increasing the volume from 4.3 L to 8.2 L at a constant pressure of 931 mmHg. Calculate the internal energy of the system if the system absorbs 2.3 kJ of energy.

PRACTICE: A gas reaction is allowed to take place in a canister while submerged in water at a temperature of 25°C. The gas expands and does P-V work on the surroundings equal to 385 J. At the same time, the temperature of the water decreases to 20°C as the energy in the gas reaction reaches 364 J. What is the change in energy of the system?