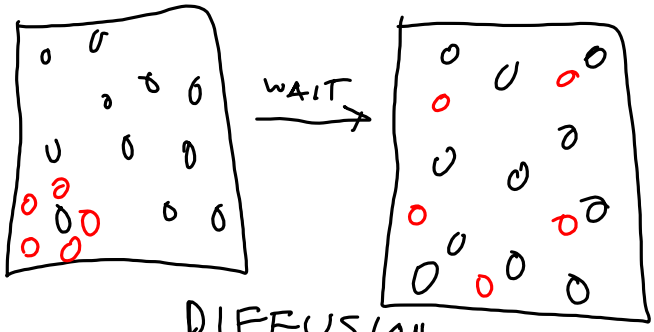
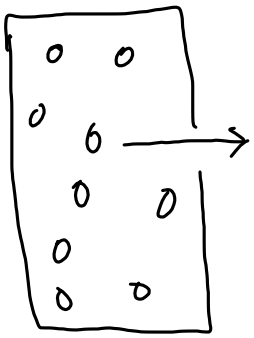
A steel tank having a volume of 9.318 L contains 8.975 g of O_2 and an unknown mass of N_2. The gas mixture exerts a pressure of 9.983 atm at 25.7 °C. What mass of N_2 is in the tank?



DIFFUSION



LARGE VOLUME

VACCUM

$T \propto \overline{KE} = \frac{1}{2} m \bar{v}^2$

(kelvin)

H_2 2.016

O_2 32.00

Graham's Law of Effusion

$$E.R. \propto \frac{1}{\sqrt{MWT}}$$

$$E.T. \propto \sqrt{MWT}$$

$$E.T. \propto K \cdot \sqrt{MWT}$$

$$K = f(P, T, A)$$

$$\frac{E.T._1}{E.T._2} = \frac{K \cdot \sqrt{MWT_1}}{K \cdot \sqrt{MWT_2}}$$

$$\frac{E.T._1}{E.T._2} = \frac{\sqrt{MWT_1}}{\sqrt{MWT_2}} = \sqrt{\frac{MWT_1}{MWT_2}}$$

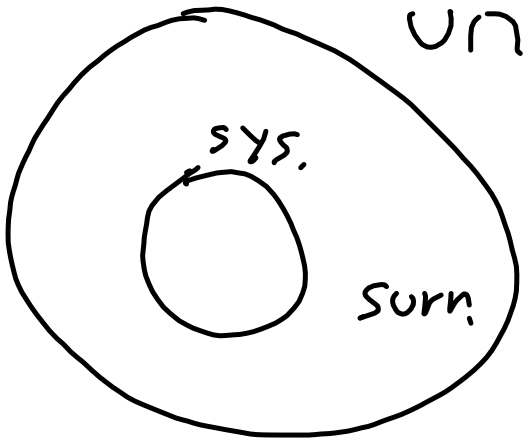
$$\frac{E.R._1}{E.R._2} = \sqrt{\frac{MWT_2}{MWT_1}}$$

If it takes 37.11 min for O_2 to effuse through a small hole in its container, how long would it take for CH_4 to effuse under the same conditions of temperature and pressure? (comparisons being for the same number of moles of effused gas.)

An unknown gas requires 60.0 min to effuse through a small hole in its container. Under the same conditions of temperature and pressure, helium (He) requires 30.0 min. (comparisons being for the same number of moles of effused gas).

What is the molecular weight of the unknown gas?

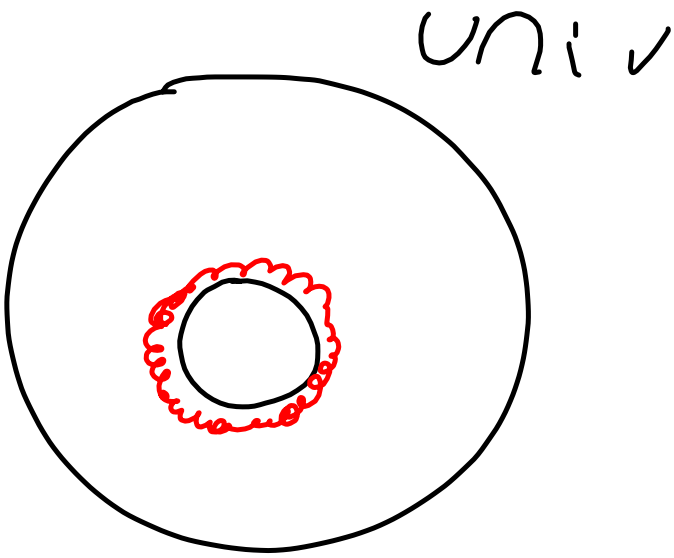
THERMOCHEMISTRY



Open system - can exchange both matter and energy with the surroundings.

Closed system - can exchange energy but not matter, with the surroundings.

Isolated system - Exchanges neither matter nor energy with the surroundings.

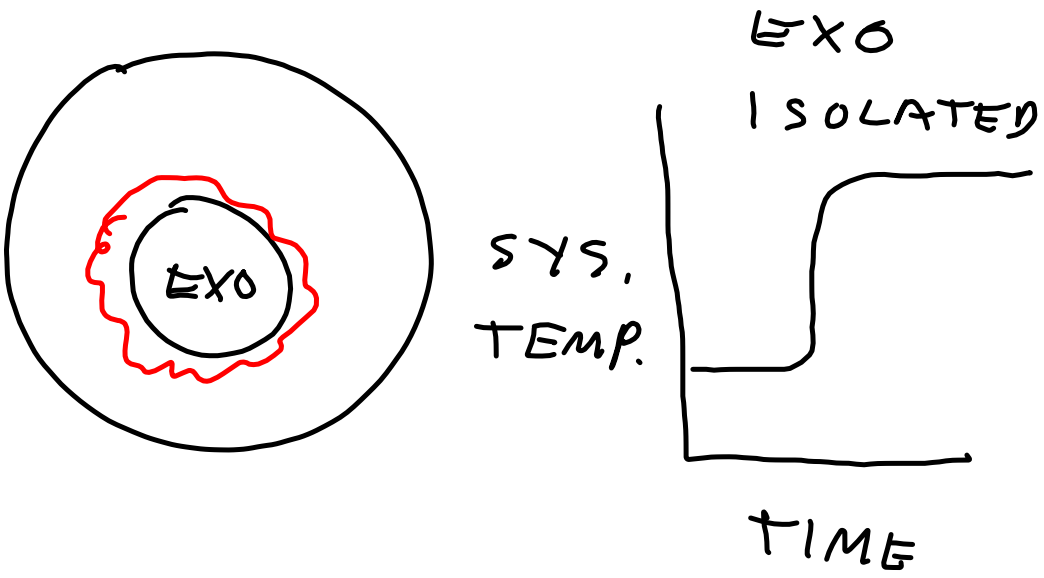


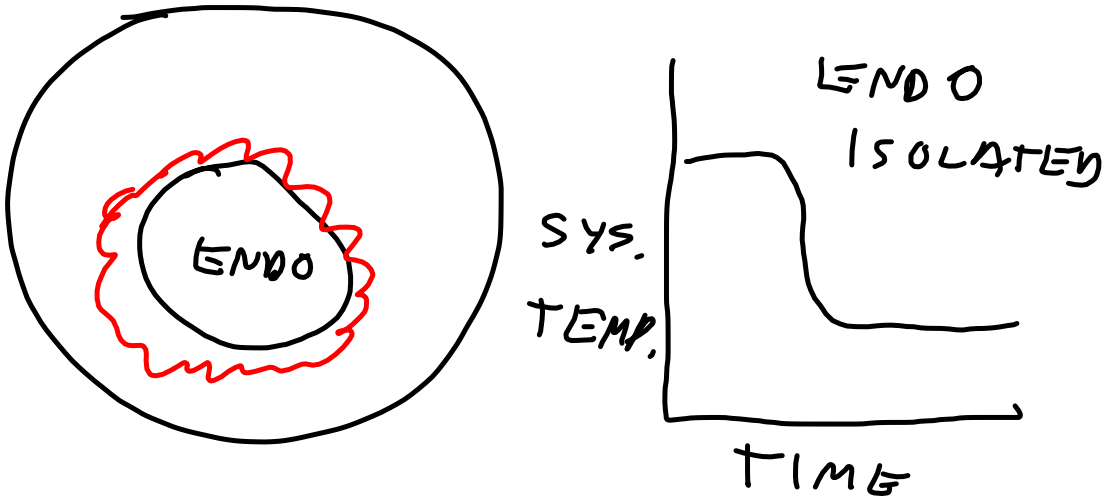
Chemical reactions can be:

Exothermic - releases heat

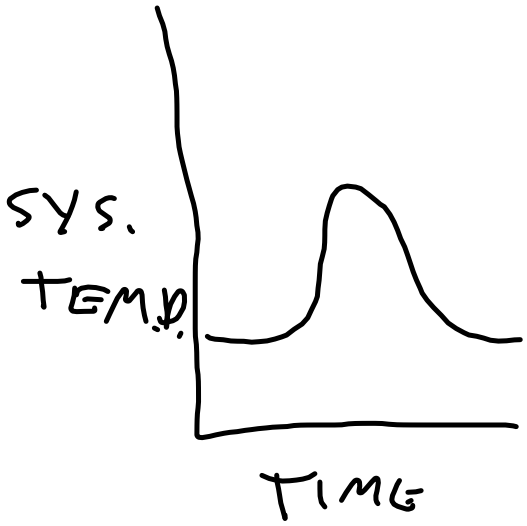
Endothermic - absorbs heat

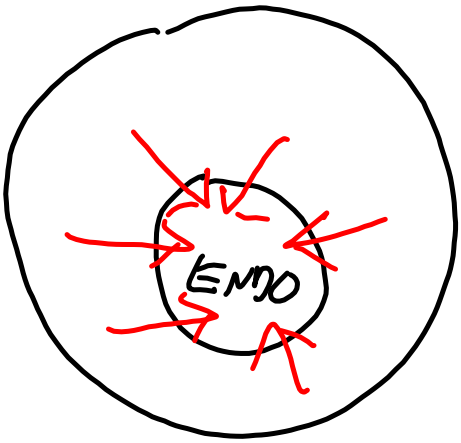
Neither (rare)

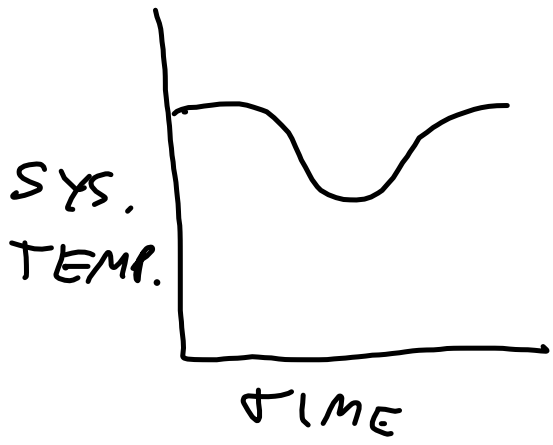

EXO
ISOLATED
EXO
SYS.
TEMP.
TIME

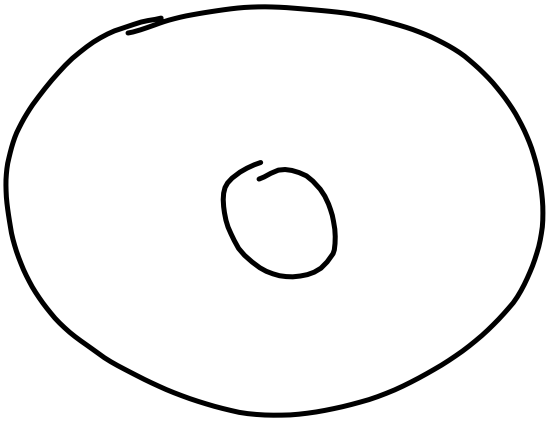

ENDO
ENDO
ISOLATED
SYS.
TEMP.
TIME


EXO


SYS.
TEMP.
TIME


ENDO


SYS.
TEMP.
TIME




LIGHT
ENDO ON
EXO
SYS.
TEMP.
TIME