

$\frac{V_i}{T_i} = \frac{V_f}{T_f}$
 IF N & P
 CONSTANT
 FIXED

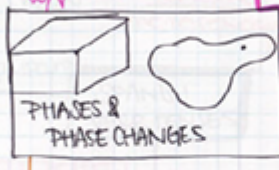
UNIVERSAL GAS CONSTANT (R)
 $R = N_A k = 8.314 \text{ J/K mol}$
 $P = nRT$
 $V = nRT/P$

CHARLES LAW
 CONSTANT PRESSURE

$m = M/N_A$
 $N = n N_A$
 $N_A = 6.02 \times 10^{23} \text{ molecules/mol}$

BOYLE'S LAW
 IF N & T CONSTANT
 $P_i V_i = P_f V_f$
 CURVES = ISOTHERMS
 VARIATION OF P w/ V

AVOGADRO'S NUMBER
 APPLICATION: APPROXIMATE BEHAVIOUR OF REAL GASES



PHASES & PHASE CHANGES

IDEAL GASES LITTLE TO NO INTERMOLECULAR INTERACTIONS
 NOT CONSISTENT IN NATURE

INTERNAL ENERGY OF IDEAL GAS
 $U = \frac{3}{2} nRT$

KINETIC THEORY

EQUATION OF STATE
 DEPENDS ON TEMPERATURE, NUMBER OF MOLECULES, VOLUME
 P = constant, V = fixed, T = variable
 P = variable, V = fixed, T = variable
 P = variable, V = variable, T = fixed
 Boltzmann constant $k = 1.38 \times 10^{-23} \text{ J/K}$

GAS MODEL OF A COLLECTION OF MOLECULES MOVING IN V (volume)
 STATES: EACH MOLECULE HAS MASS, MOMENTUM, BEHAVES

KINETIC ENERGY & TEMPERATURE
 $\frac{1}{2} m v^2 \text{ av} = \frac{3}{2} k_B T$

PRESSURE & KINETIC THEORY OF GASES
 PRESSURE
 $P = \frac{1}{3} \left(\frac{N}{V} \right) 2 m v^2 \text{ av} = \frac{2}{3} \left(\frac{N}{V} \right) \left(\frac{1}{2} m v^2 \text{ av} \right)$

MOLECULES ONLY INTERACT IN COLLISIONS
 Maxwell-Boltzmann

SPEED OF GAS MOLECULES
 $v_{rms} = \sqrt{\frac{3RT}{M}}$

GAS PRESSURE DIRECTLY PROPORTIONAL TO AVERAGE KINETIC ENERGY