

## Information for the Quiz on Ch. T1, T2, and T3

### Things You Must Know

- (1) 0<sup>th</sup> Law of Thermodynamics
- (2) 1<sup>st</sup> Law of Thermodynamics
- (3) Gas processes

### Potential Useful Information

$$dU = mc \, dT$$

$$PV = Nk_B T$$

$$U = \frac{f}{2} Nk_B T$$

$$K_{\text{avg}} = \frac{1}{2} m \left[ v^2 \right]_{\text{avg}} = \frac{3}{2} k_B T \quad v_{\text{rms}} = \sqrt{\left[ v^2 \right]_{\text{avg}}}$$

$$dW = -PdV$$

adiabatic:

$$TV^{\gamma-1} = \text{constant}$$

$$PV^{\gamma} = \text{constant}$$

### Physical Constants and Data

$$k_B = 1.38 \times 10^{-23} \text{ J/K} = 8.62 \times 10^{-5} \text{ eV/K}$$

$$1 \text{ eV} = 1.602 \times 10^{-19} \text{ J}$$

$$N_A = 6.02 \times 10^{23} \text{ molecules/mole}$$

$$m_{\text{proton}} \approx m_{\text{neutron}} \approx 1.7 \times 10^{-27} \text{ kg}$$

Avogadro's number of nucleons (protons and/or neutrons) has a mass of about 1 g

$$\gamma = 5/3 \text{ (for monatomic gas)}$$

$$\gamma = 7/5 \text{ (for diatomic gas)}$$

a monatomic gas has 3 degrees of freedom; a diatomic gas has 5 degrees of freedom

specific heat of water = 4186 J/(kg·K)

latent heat of melting ice = 333 kJ/kg