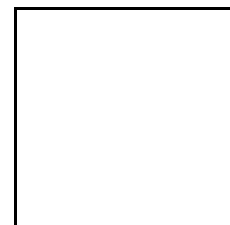


COVER SHEET - EXAM 1



SEAT #

DATA:

$$1 \text{ kJ} = 10^3 \text{ J}$$
$$k = 1.38 \times 10^{-23} \text{ J/K}$$
$$\log_{10} A^x = x \log_{10} A$$
$$\log_{10} A/B = \log_{10} A - \log_{10} B$$

$$R = 8.31 \text{ J/mol}\cdot\text{K}$$
$$N_A = 6.022 \times 10^{23} \text{ particles/mole}$$
$$\log_{10} AB = \log_{10} A + \log_{10} B$$
$$\text{If } y = \log_{10} N, N = 10^y$$

EQUATIONS:

$$T(\text{K}) = T(^{\circ}\text{C}) + 273$$

$$PV = NkT$$

$$PV = nRT$$

$$n = \frac{N}{N_A} = \frac{m}{M}$$

$$\Delta U = \frac{3}{2} nR\Delta T \quad (\text{ideal monatomic gas})$$

First Law of Thermodynamics

$$\Delta U = Q - W$$

Processes

(a) Isochoric: $W = 0$

(b) Isothermal: $W = nRT \ln \frac{V_2}{V_1}$

(c) Isobaric: $W = P(V_2 - V_1)$

(d) Adiabatic (monatomic ideal gas):

$$W = \frac{3}{2} nR(T_1 - T_2)$$

Heat Engine Efficiency

$$e_{\text{actual}} = \frac{W_{\text{net}}}{Q_{\text{added}}}$$

$$e_{\text{Carnot}} = 1 - \frac{T_C}{T_H}$$

$$\text{COP} = \frac{Q_{\text{out}}}{W_{\text{NET}}}$$

Carnot Cycle

$$\frac{Q_H}{Q_C} = \frac{T_H}{T_C}$$

$$v = \lambda f = \frac{\lambda}{T}$$

$$f = \frac{1}{T}$$

$$v_{\text{string}} = \sqrt{\frac{T}{\rho}}$$

$$\rho = \frac{m}{L}$$

Sound

$$v_{\text{gas}} = \sqrt{\frac{\gamma kT}{m}} = \sqrt{\frac{\gamma P}{\rho}}$$

For spherically uniform (isotropic) sound radiation

$$I_{AV} = \frac{P_{AV}}{4\pi r^2}$$

$$d\beta = 10 \log_{10} \frac{I}{I_0}$$

or comparing one sound of intensity I_1 to another of intensity I_2

$$d\beta = 10 \log_{10} \frac{I_1}{I_2}$$

where

$$I_0 = 1.0 \times 10^{-12} \text{ W / m}^2$$

Doppler Effect

$$f_o = f_s \left(\frac{v \pm v_o}{v \mp v_s} \right)$$