



## P2 Review Midterm - study

Physics 2 (Trường Đại học Quốc tế, Đại học Quốc gia Thành phố Hồ Chí Minh)



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# PHYSICS 2: FLUID MECHANICS AND THERMODYNAMICS

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# Midterm Review

## Chapter 1: Fluid Mechanics

**density:**  $\rho = \frac{m}{V}$

**pressure:**  $p = \frac{F}{A}$

**fluids at rest:**  $p = p_0 + \rho gh$

absolute pressure

atmosphere pressure

gauge pressure

### **Pascal's law:**

$$\frac{F_i}{A_i} = \frac{F_0}{A_0}$$

### **Archimede's principal:**

$$F_b = \rho_{\text{fluid}} gV : \text{buoyant force}$$

### **Equation of continuity:**

$$A_1 v_1 = A_2 v_2 = \text{constant}$$

### **Bernoulli's equation:**

$$p_1 + \frac{1}{2} \rho v_1^2 + \rho g y_1 = p_2 + \frac{1}{2} \rho v_2^2 + \rho g y_2 = \text{constant}$$

## Chapter 2: Heat, Temperature and the First Law of Thermodynamics

### Temperature:

$$T(K) = T(C^0) + 273.15$$

### Thermal expansion:

- Linear expansion: (solids)

$$\Delta L = L \alpha \Delta T$$

- Area expansion: (solids)

$$\Delta A = A \alpha_A \Delta T; \alpha_A = 2\alpha$$

- Volume expansion: (solids and liquids)

$$\Delta V = V \beta \Delta T; \beta = 3\alpha$$

### **Heat capacity:**

$$Q = C \Delta T = C (T_f - T_i)$$

### **Specific capacity:**

$$Q = cm \Delta T = cm (T_f - T_i)$$

### **Latent heat:**

$$Q = Lm$$

## The first law of thermodynamics:

$$\Delta E_{\text{int}} = E_{\text{int},f} - E_{\text{int},i} = Q - W$$

Three special cases:

1. Adiabatic processes:

$$Q = 0 \Rightarrow \Delta E_{\text{int}} = -W$$

2. Constant-volume (isochoric) processes:

$$W = 0 \Rightarrow \Delta E_{\text{int}} = Q$$

3. Cyclical processes:

$$\Delta E_{\text{int}} = 0 \Rightarrow Q = W$$

- Work done by the gas:

- Expansion:  $W > 0$

- Compression:  $W < 0$

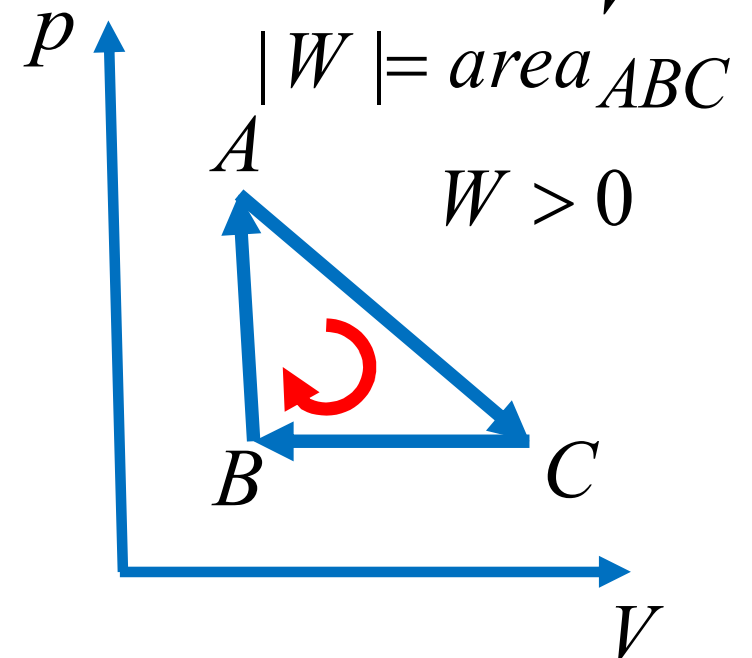
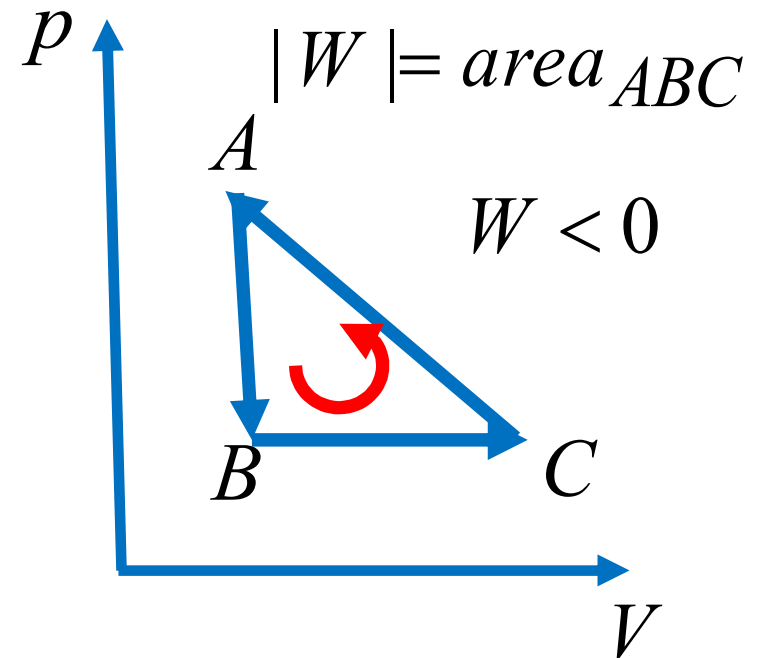
- Energy transferred as heat  $Q$ :

- Heat transferred to the gas  
(receiving energy as heat):

$$Q > 0$$

- Heat transferred from the gas  
(releasing energy as heat):

$$Q < 0$$





## Heat Transfer Mechanisms:

Conduction:

$$P_{\text{cond}} = \frac{Q}{t} = kA \frac{T_H - T_C}{L} \quad (\text{Unit: } \mathbf{W = J/s})$$

Steady-state:

$$P_{\text{cond}} = \frac{k_2 A (T_H - T_X)}{L_2} = \frac{k_1 A (T_X - T_C)}{L_1}$$

If the slab consists of n materials:

$$P_{\text{cond}} = \frac{A(T_H - T_C)}{\sum_{i=1}^n (L_i/k_i)}$$