KING SAUD UNIVERSITY. DEPARTMENT OF PHYSICS

THERMAL AND STATISTICAL PHYSICS H.W №2

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PROBLEM (1)

2 moles of monoatomic gas expanded from 2 cm^3 to 7 cm^3 , if the initial temperature was 50^oC.

1. Calculate the final **pressure** if the expansion was **isothermal**.
2. Calculate the final **temperature** if the expansion was **adiabatic**.
3. Draw a P-V diagram for the two processes above.

PROBLEM (2)

An ideal gas pressure was decreased from $6 \times 10^5 Pa$ at $T_i = 40°C$ to $2 \times 10^5 Pa$, keeping the volume constant.

1. Draw a $P - V$ diagram.
2. what is the work done on the system.
3. Calculate the heat exchange.

PROBLEM (3)

Show that the work is not a function of state.
Hint: Use a simple thermodynamic cycle.

PROBLEM (4)

0.5 moles of O_2 gas having specific heat of $0.919(kJ/(kgK))$ at $T_1 = 40°C$ is mixed with 0.7 moles of Propane C_3H_8 gas having a specific heat of$1.67(kJ/(kgK))$ at $T_2 = 25°C$ at adiabatic conditions. What is the temperature of the mixture at equilibrium ?

PROBLEM (5)

A special kind of gas that obeys the Van der Waal's gas equation:

$$\left(p + \frac{n^2 a}{V^2}\right)(V - nb) = nRT$$

Where a and b are constants What is the work done expanding the gas isothermally from V_1 to V_2 ?

PROBLEM (6)

2 moles of ice at $-5°C$ was melted, then the resulting water was heated to $30°C$. Calculate ΔQ and determine whether it is given or extracted from the system .

PROBLEM (7)

An amount of water vapour at 100° was condensed to $250ml$ of water at the same temperature, find ΔQ and determine whether it is given or extracted from the system .

PROBLEM (8)

Show that the energy of the ideal gas depends only on its temperature.

PROBLEM (9)

An ideal gas was compressed from $100l$ at $T_i = 30°C$ to $20l$, keeping the pressure constant.

1. Draw a $P - V$ diagram.
2. what is the work done on the system.
3. Calculate the heat exchange, internal energy and enthalpy change of this process.