



Physical_Chemistry_2nd_YUGS_EV_ST



Name of a student _____ Signature _____ No. _____

Mustansiriyah University
Department of Chemistry

1st SEM-2025_Bologna_Process
Mid_Exam_Class_A_Paper_A

Q1: Circle the right answer for all of the following

(50 Marks)

1: liquefaction of the gas means which of the following?

- (a) $Z = 1$
- (b) $Z > 1$
- (c) $Z < 1$
- (d) $Z \neq 1$

2: In the van der Waals equation, what is the correct formula for the volume of the gas?

- (a) n/nT
- (b) V
- (c) V/m
- (d) V/n

3: If a gas has polar particles, then the difference between the volume of this gas is:

- (a) $V_{Real} > V_{Perfect}$
- (b) $V_{Real} < V_{Perfect}$
- (c) $V_{Real} = V_{Perfect}$
- (d) $V_{Real} \neq V_{Perfect}$

4: It can classify the type of reaction within adiabatic process as:

- (a) reversible
- (b) isobaric
- (c) isothermal
- (d) free expansion

5: If it is required to measure the work done in an isochoric process, the value of work will be:

- (a) zero
- (b) one
- (c) two
- (d) three

6: In a completely insulated system, the work done is in contact with which of the following?

- (a) gas
- (b) system
- (c) surrounding
- (d) pressure

7: When the internal pressure of the system is equal to atmospheric pressure, the actual value will be:

- (a) zero
- (b) one
- (c) two
- (d) three

8: During an isothermal reversible process, the change in temperature of the system is?

- (a) variable
- (b) equal to zero
- (c) $25^{\circ}C$
- (d) constant

9: Heat capacity is extensive property while molar heat capacity is _____ property:

- (a) proportional
- (b) intensive
- (c) extensive
- (d) direct

10: When $\Delta H = \text{zero}$, the process is:

- (a) isobaric
- (b) isochoric
- (c) isothermal
- (d) adiabatic

Q2: Using van der Waals equation, calculate the temperature of 5.0 mol of an unknown gas in a 5.0 L container at 80 bar. Compare this temperature with the value obtained from the ideal gas equation.

$a = 0.0341 \text{ L}^2 \text{ atm mol}^{-2}$; $b = 0.0237 \text{ L mol}^{-1}$. $R = 8.314 \text{ L}\cdot\text{atm}/\text{mol}\cdot\text{K}$ (25 Marks)

Q3: 1100 J of heat energy was applied to (50 g, 27 g mol⁻¹) of aluminum metal. The temperature increased from 25 °C to 45 °C. Calculate $C_{p,m}$ of aluminum. (25 Marks)

02

حسب قانون فانر

$$P(V - nb) = \alpha RT \text{ Wrong eq!}$$

$n = 5 \text{ mol}$
 $V = 5 \text{ L}$
 $P = 80 \text{ bar}$
 $a = 0.0341 \text{ L}^2 \cdot \text{atm} \cdot \text{mol}^{-2}$

$$T = \frac{P(V - nb)}{\alpha RT}$$

$b = 0.0237 \text{ L} \cdot \text{mol}^{-1}$

نحول الباري من bar الى atm

$P = 80 \text{ bar} \rightarrow 80 \text{ atm}$

$1 \text{ bar} = 1 \text{ atm}$

$R = 8.314 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$

$$T = \frac{80 \text{ atm} (25 \text{ L} - 25 \text{ mol} \times 0.0237 \text{ L} \cdot \text{mol}^{-1})}{0.0341 \text{ L}^2 \cdot \text{atm} \cdot \text{mol}^{-2} \times 8.314 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}}$$

$$T = \frac{80 (25 - 0.5925)}{0.2835 \text{ K}^{-1}}$$

$$T = \frac{80 (24.4)}{0.2835 \text{ K}^{-1}} \Rightarrow \frac{1952}{0.2835 \text{ K}^{-1}} = 689 \text{ K}^{-1}$$

$Q_2 = \frac{10}{25}$

$$PV = nRT \rightarrow T = \frac{PV}{nR}$$

حسب الغاز المثالي
 نحول الباري الى atm

$$T = \frac{80 \text{ atm} \times 5 \text{ L}}{5 \text{ mol} \times 8.314 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}}$$

$1 \text{ bar} = 1 \text{ atm}$
 $80 \text{ bar} = 80 \text{ atm}$

$$T = \frac{400}{4.1570} = 96 \text{ K}$$

$Q_3 = \frac{20}{25}$

$$Q_p = n C_{p,m} \Delta T$$

$$Q_p = \frac{wt \cdot g}{mwt \cdot \text{g} \cdot \text{mol}^{-1}} \times C_{p,m} \Delta T$$

$q = 1100 \text{ J}$

$wt = 50 \text{ g}$

$mwt = 27 \text{ g} \cdot \text{mol}^{-1}$

$$C_{p,m} = \frac{Q_p}{\frac{wt}{mwt} \times \Delta T}$$

$T_1 = 25^\circ \text{C}$

$T_2 = 45^\circ \text{C}$

$$C_{p,m} = \frac{1100 \text{ J}}{\frac{50 \text{ g}}{27 \text{ g} \cdot \text{mol}^{-1}} \times 293 \text{ K}}$$

$\Delta T = T_2 - T_1$

$\Delta T = 45^\circ \text{C} - 25^\circ \text{C}$

$\Delta T = 20^\circ \text{C}$

$C_{p,m} = 2.029 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$

نحول الى K
 $\Delta T_K = \frac{20^\circ \text{C} + 273 \text{ K}}{293 \text{ K}}$