



1.75
5

F21

35
100
thirky fin

Physical_Chemistry_2nd_YUGS_EV_ST



Name of a student زهراء علي بصير Signature [Signature] No. 113

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_i/n_T (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 °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.
 $a = 0.0341 \text{ L}^2 \text{ atm mol}^{-2}$; $b = 0.0237 \text{ L mol}^{-1}$. (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)

$$J = N/m^2 \cdot m$$

Q21

$T = ?$, $n = 5 \text{ mol}$, $V = 5 \times 10^{-3} \text{ m}^3$, $P = 80 \times 10^5 \text{ Pa}$

جسے قانون الغاز المثالی سے :-

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

$$T = \frac{80 \times 10^5 \text{ Pa} \times 5 \times 10^{-3} \text{ m}^3}{5 \text{ mol} \times 8.314 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}} \Rightarrow T = \frac{400 \times 10^7}{41.57} = 9756.0 \text{ K}$$

L.atm

$$Z = \frac{PV_m}{RT}$$

$$= \frac{80 \times 10^5}{8.314 \times 9756}$$

Q2 $\frac{10}{25}$

Q3/ $T_1 = 25^\circ\text{C}$, $T_2 = 45^\circ\text{C}$, $\Delta T = (45 - 25) = 20^\circ\text{C}$

$\Delta T_{(K)} = \Delta T_{(C)} + 273 \text{ K} = 20^\circ\text{C} + 273 \text{ K} = 293 \text{ K}$, $q = 1100 \text{ J}$, $n = \frac{m}{M} = \frac{5 \text{ g}}{27.8 \text{ g/mol}} = 1.85 \text{ mol}$

$$q_p = n C_p \Delta T \Rightarrow C_p = \frac{q_p}{n \Delta T}$$

$$1100 \text{ J} = 1.85 \text{ (mol)} \times 293 \text{ K} \times C_p$$

Q3 $\frac{5}{25}$

$$1100 \text{ J} = 542.05 \text{ (mol} \cdot \text{K)} \times C_p \Rightarrow C_p = \frac{1100 \text{ J}}{542.05 \text{ (mol} \cdot \text{K)}} = 2.029 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$$

$$C_p = \frac{q}{n \Delta T}$$

$$C_p = \frac{1100 \text{ J}}{5.0 \text{ g} \times 20 \text{ K}} = \frac{1100 \text{ J}}{100 \text{ g} \cdot \text{K}}$$

$$C_p = 11 \text{ J} \cdot \text{g}^{-1} \cdot \text{K}^{-1} = 110 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$$

?