



Physical_Chemistry_2nd_YUGS_EV_ST



Name of a student _____ Signature _____ No. _____

Mustansiriyah University
Department of Chemistry

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

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)

$q = m C_m \Delta T$

$C_p = \frac{3}{2} R$

Thu_11-12-2025

Best wishes

Dr Abduljabbar I. R. Rushdi

Q 21

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

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Q295

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

$$P = \frac{nRT}{V - nb} - \frac{an^2}{V^2}$$

? \equiv units

$$80 = \frac{(5)(0.082)T}{(5) - (5)(0.0237)} - \frac{(0.0341)(5)^2}{(5)^2}$$

$$80 = \frac{(5) - (5)(0.0237)}{(0.41)} T - 0.0341$$

How?

$$\frac{(0.41)T}{4.8815} = 79.965 \Rightarrow T = 952 \text{ K}$$

~~$PV = nRT$~~

~~$T = \frac{PV}{nR} \Rightarrow T = \frac{(80)(5)}{(5)(0.082)} \Rightarrow T = 975 \text{ K}$~~

Q 31) $q = 1100 \text{ J}, m = 50 \text{ g}, M = 27 \text{ g mol}^{-1}, T_i = 25^\circ \text{C}; T_f = 45^\circ \text{C}$

$$q = m C_m \Delta T$$

$$1100 = 50 C_m \Delta T$$

$$T_i = 25^\circ \text{C} + 273 = 298 \text{ K}$$

$$T_f = 45^\circ \text{C} + 273 = 318 \text{ K}$$

$C_m = 440 \text{ cal/K}$

$$\Delta T = T_f - T_i$$

$$\Delta T = 318 - 298 = 20 \text{ K}$$

Q3 $\frac{10}{25}$

$$C_m = \frac{3R}{2}$$

$$C_p = \frac{3(0.082)}{2} \Rightarrow C_p = 0.123 \text{ cal/K}$$