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 ≠ 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 ΔH = 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 L^2 atm mol^{-2}; b = 0.0237 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)**

Thu_11-12-2025 Best wishes Dr Abduljabbar I. R. Rushdi

80 Pa = 80 atm

Q1 /

① $p = \frac{nRT}{(V-ab)} - \frac{a n^2}{V^2} \Rightarrow 800\,atm = \frac{5\,mol \times 0.082\,T_K}{(5-0.034)\,L} - \frac{5(0.427)^2}{(5)^2}$ $L^2 atm\,mol^{-2}$

? ≡ units

$80_{atm} = \frac{0.41\ \frac{L\cdot atm}{K}\ T_K}{5? - 8.0817 \times 10^{-4}} - \frac{5.81 \times 10^{-3}}{25?}$

Q2 ✓

$80_{atm} = 0.08\,T_K - 2.324 \times 10^{-4}$

$\frac{80.0}{0.08} = \frac{0.08}{0.08} T_K$

$T_K = 1000.0\,K$

② $PV = nRT$

$(80)(5)_{atm\,L} = 5?(0.082\ \frac{L\cdot atm}{mol\cdot K})\,T_K$

$T_K = \frac{400\ atm\,L}{0.4\ \frac{L\cdot atm}{K}}$

$T_K = 978.6\,K$

Q2 / $q_P = n C_{P,m} \Delta T$ $n = \frac{50?}{27?} = 1.85\,mol$

$C_{P,m} = \frac{1100\,J}{37\,mol\cdot K} = 29.7\,J\cdot mol^{-1}K^{-1}$

$T_i = 25 + 273$
$= 298\,K$

$\Delta T = 318\,K - 298\,K$
$= 20\,K$

$T_f = 45 + 273$
$= 318\,K$

Q3 20/25