Physical_Chemistry_2nd_YUGS_EV_ST

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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 ^oC (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 ^oC to 45 ^oC. Calculate $C_{p,m}$ of aluminum. **(25 Marks)**

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

Q2/ $T=?$, $n=5.0\ mol$, $V=5.0\ L$, $P=80\ bar$, $a=0.0341\ L^2.atm\ mol^{-2}$, $b=0.0237\ L/mol$

$PV = nRT$

$80\ atm \times 5\ L = 5\ mol \times 8.314\ L.atm/mol.K \times T$ (0.082)

$400 = 41.57\ K \times T \div 41.57$

$T = \frac{400}{41.57} = 9.622\ K$

$(P + \frac{an^2}{V^2})(V - nb) = nRT$ (n)

$(80\ atm + \frac{0.0341\ L^2.atm/mol^2 \times 5\ mol}{25\ L^2})(5\ L - 5\ mol \times 0.0237\ L/mol) = 5\ mol \times 8.314\ J/mol.K \times T$

$(80 + \frac{0.1705}{25})(5 - 0.1185) = 5 \times 8.314\ K \times T$

$8.8682 \times 4.8815 = 41.57\ K \times T \Rightarrow$

$43.3 = 41.57\ K \times T$

$T = \frac{43.3}{41.57} = 1.041\ K$

Q3/ $n = \frac{m}{M_w + g/mol} = \frac{50.2}{27} = 1.85\ g$, $T_1 = 25°C + 273 = 298\ K$, $T_2 = 45°C + 273 = 318\ K$

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

$q = n C_m \Delta T$

$1100\ J = 1.85\ g\ C_m\ (20\ K)$

$C_s = \frac{1100\ J}{37\ mol/K} = 29.72\ J\ mol^{-1}.K^{-1}$