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_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/

$T_K = ?$, $n = 5\,mol$, $V = 5\,L$, $P = 80\,bar$, $a = 0.0341\,L^2 atm\,mol^{-1}$, $b = 0.0237\,L\,mol^{-1}$

$$T = \frac{n_{(mol)} * R_{(L\,atm/mol\cdot K)} * P_{(bar)}}{a_{(L^2 atm\,mol^{-1})} * n^2_{(mol)}} * \frac{n_{(mol)} * b_{(L\,mol^{-1})}}{V_{(L)}}$$

$$T = \frac{(5\,mol) * (0.082\,L\,atm/mol\cdot K)(80\,bar)}{(0.0341\,L^2 atm\,mol^{-1}) * (25\,mol)} * \frac{(5\,mol) * (0.0237\,L/mol)}{(5\,L)}$$

$$T = \frac{(P + a\frac{n^2}{V^2})(V - nb)}{nR}$$

Q2 10/25

$$T_c = \frac{32.8}{0.85} * \frac{0.118}{5} \Rightarrow T = 38.5 * 0.023$$

$T_c = 0.88C$

$T = 0.88K$

wrong eq!

$$T = \frac{P_{(bar)} * R_{(L\,atm/mol\cdot K)} * V_{(L)}}{n_{(mol)}} \Rightarrow T = \frac{(80\,bar) * (0.082\,L\,atm/mol\cdot K) * (5\,L)}{5\,(L)}$$

$T = 0.88K \rightarrow T_{(K)} = T_{(C)} + 273 \Rightarrow T_{(K)} = 279\,K$

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

$q = 1100\,J$, $m = 50g$, $M = 27\,g\,mol^{-1}$, $T_1 = 25C$, $T_2 = 45C°$

$T_1 = 25°C + 273 \Rightarrow T_1K = 298K$, $T_2 = 45°C + 273 \Rightarrow T_2K = 318K$

$\Delta T_K = T_{2K} - T_{1K}$

$\Delta T_K = 318K - 298K$

$\Delta T_K = 20K$

$$C_{p,m} = \frac{q_{(J)} * n_{(mol)} * \Delta T_K}{}$$

$$= \frac{(1100\,J) * (1.85\,mol) * (20K)}{}$$

$C_{p,m} = 407$

$C_{p,m} = \frac{q}{n\Delta T}$ (التعويض المباشر في القانون خاطئ)

$$n = \frac{m}{M}$$

Q3 10/25

$$n = \frac{50g}{27g/mol^{-1}}$$

$n = 1.85\,mol$