Physical Chemistry_Chpt_One_Properties of Gases

Name of a student ---------- Signature ---------- No. ----------

University of Mustansiriyah — **1st Semester-2021**

Department of Chemistry — **1st Exam-Repeat_1**

Q1: Circle the right answer for all of the following: **(50 points)**

1: Calculate the weight of C_2H_4 gas (26 g mol^{-1}) in a 10000 Cm^3 cylinder at 1520 mmHg and 90 ^oC.
Answer: a) 17.47 g^{-1} mol^{-1} b) 17.47 g^{-1} c) 17.47 mol d) 17.47 g e) 17.47 mg

2: When $V_{Real} > V_{Perfect}$, this means that the gas is:
Answer: a) perfect b) noble c) real d) heavy

3: The difference between real and ideal gas equation, that the ideal gas equation is not interested in?
Answer: a) p_{gas} & n_{gas} b) $V_{container}$ & $p_{attraction}$ c) V_{gas} & $p_{attraction}$ d) T_{gas} & p_{gas}

4: Calculate the density of C_2H_4 is placed in a 50000 Cm^3 container at 760 torr and 273 K.
Answer: a) 1.16 g^{-1} L^{-1} b) 1.16 g^{-1} L c) 1.16 g L^{-1} d) 1.16 mg L^{-1}

5: Graham's law studies the ---------- of the gas.
Answer: a) flow b) collision c) diffusion d) effusion

6: The right formula of the Dalton's law is?
Answer: a) $p_i = \chi_i \sum p_i$ b) $p_i = \chi_i \sum p_T$ c) $p_T = \chi_i \sum p_i$ d) $p_i = \chi_T p_T$

7: The law of Corresponding states is an evidence that the gas is?
Answer: a) real b) ideal c) expanded d) compressed e) heavy

8: The total mol fractions of atmospheric pressure of air is equal to?
Answer: a) zero b) one c) two d) three

9: A gas occupies 30 × 10^{-3} m^3 at 75 ^oC and 76 CmHg pressure. What would be its volume at STP?
Answer: a) 23.5 dm^3 b) 23.5 m^2 c) 23.5 L^{-1} d) 23.5 m^{-3}

10: When the value of Z > 1 this means the dominated forces are:
Answer: a) attraction b) van der Waal c) repulsion d) compression

Q2: The following data have been observed for 5000 mg of unknown gas at 0 ^oC. Calculate the best value of the molar mass of this gas, and what is it? **(25 points)**

$p/10^5$ Pa	0.75	0.60	0.25
V/dm^3	9.33	11.60	27.50

Q3: A perfect gas undergoes isothermal compression, which reduces its volume by 1.80 dm^3. The p_f and V_f of the gas are 197 atm and 2.14 dm^3, respectively. Calculate the $p_{original}$ of the gas in (a) bar, (b) torr. (25 points)

Sun_28/11/2021 **With best my wishes** **Dr Abduljabbar I. R. Rushdi**

Q 2

$m = 5000\ mg$

$m = \frac{5000\ mg}{1000\ mg}$

$m = 5\ g$

$M = ?$

$R = 0.082\ \frac{L.atm}{mol.K}$

$T = 0 + 273$

$T = 273\ K$

$P = 0.75\ Pa$ $\quad 10^5\ Pa = 1\ atm$

$P = \frac{0.75\ Pa}{101.325\ Pa}$

$P = 7.402 \times 10^{-3}\ atm$

$V = 9.33\ dm^3$

$1\ L = 1\ dm^3 \rightarrow = \frac{9.33\ dm^3}{1\ dm^3}$

$V = 9.33\ L$

$PV = \frac{m}{M} RT$

$7.402 \times 10^{-3}\ atm \times 9.33\ L = \frac{5\ g}{M} \times 0.082\ \frac{L.atm}{mol.K} \times 273\ K$

$M = \frac{5\ g \times 0.082\ \frac{L.atm}{mol.K} \times 273\ K}{7.402 \times 10^{-3}\ atm \times 9.33\ L}$

$M = 141.1 \simeq 141.08\ g.mol$

2)

$P = 0.60\ Pa$

$P = \frac{0.60\ Pa}{101.325\ Pa}$

$P = 5.922\ atm$

$V = 11.60\ dm^3$

$1\ L = 1\ dm^3$

$\frac{11.60\ dm^3}{1\ dm^3}$

$V = 11.60\ L$

$PV = \frac{m}{M} RT$

$5.922\ atm \times 11.60\ L = \frac{5\ g}{M} \times 0.082\ \frac{L.atm}{mol.K} \times 273$

$M = \frac{5\ g \times 0.082\ \frac{L.atm}{mol.K} \times 273\ K}{5.922\ atm \times 11.60\ L}$

$M = 218.99 \simeq 218.9893\ g.mol$

3)

$P = 0.25\ Pa$

$P = \frac{0.25\ Pa}{101.325\ Pa}$

$P = 2.467 \simeq 2.47\ atm$

$V = 27.50\ dm^3$

$1\ L = 1\ dm^3$

$V = \frac{27.50\ dm^3}{1\ dm^3}$

$V = 27.50\ L$

$PV = \frac{m}{M} RT$

$2.47\ atm \times 27.50\ L = \frac{5\ g}{M} \times 0.082\ \frac{L.atm}{mol.K} \times 273\ K$

$M = \frac{5\ g \times 0.082\ \frac{L.atm}{mol.K} \times 273\ K}{2.47\ atm \times 27.50}$

$M = 1.25 \simeq 1.246\ g.mol$

Q2 15/25

Q3/ $U_1 = 1.80\ dm^3 \rightarrow 1\ L = \frac{1.80\ dm^3}{1\ dm^3}$

$V = 1.80\ L$

$U_2 = 2.14\ dm^3 \rightarrow 1\ L = \frac{2.14\ dm^3}{dm^3}$

$V = 2.14\ L$

Q3 10/25

$P_1 V_1 = P_2 V_2$

$P_1 \times 1.80\ L = 1.97\ atm \times 2.14\ L$

$P_2 = \frac{1.97\ atm \times 2.14\ L}{\quad} \rightarrow P = 234.2 \times 10^{-7}\ atm$

$P = 234.2 \times 10^{-7} \times 1.01325\ bar$

$P = 2.373015 \times 10^{-5}\ bar$

$P = 2.4 \simeq \quad bar$

$P = 234.2 \times 10^{-7} \times 760\ torr$

$P = 0.0177992\ torr$

$P = 0.02 \simeq \quad torr$