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_2**

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 °C.

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 °C 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 °C. 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_05/12/2021 **With best my wishes** **Dr Abduljabbar I. R. Rushdi**

$wt = 5000\,mg = 5\,g$, $T°C = 273\,K$, $R = 0.082 \frac{L.atm}{mol.K}$, $P = 0.75\,10^5\,Pa = 9.8\times10^{-3}\,atm$

$V = 9.33\,dm^3 = 0.933\,L$ ← But how?

$P_{(atm)}\,V_{(L)} = \frac{wt\,g}{n.wt\,\frac{g}{mol}} \times R\,\frac{L.atm}{mol.K} \times T(K)$ $\quad dm^3 = L$ ف6

$\frac{wt\,g}{n.wt} = \frac{PV}{RT} \Rightarrow n.wt_{(g/mol)} = \frac{wt.RT}{PV}$

$n.wt = \frac{5(g) \times 0.082\,\frac{atm.K}{K.mol} * 273\,K}{9.8\times10^{-3}\,atm * 0.933\,L} = 12.2\times10^3\,g/mol$

$P = 0.60\,10^5\,Pa = 7.89\times10^{-3}$ bar
$V = 11.60\,dm^3 = 1.16\,L$

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$n.wt = \frac{5(g) * 0.082\,\frac{atm.L}{K.mol} * 273\,K}{1.16\,K * 7.89\times10^{-3}\,atm} = 12.23\times10^3\,g/mol$

$P = 0.25\,10^5\,Pa = 3.28\times10^{-3}\,atm$ bar
$V = 27.50\,dm^3 = 2.75\,L$
$n.wt = \frac{5(g)\times0.082 * 273}{3.28\times10^{-3} \times 2.75} = 12.4\times10^3\,g/mol$

$V_i = 2.14 + 1.80 = 3.94\,dm^3$? ? ? = units

$\frac{P_2}{P_1} = \frac{V_1}{V_2}$

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$\frac{1.97\,atm}{P_1} = \frac{3.94\,dm^3}{2.14\,dm^3}$

$3.94\,P_1 = 421.58\,atm$

$P_1 = 107\,atm \equiv 107$ bar

1 atm ≈ 1 bar

$P = 0.140$ Torr وكذلك يفسر نقصان العمر عند زيادة الضغط الجوي

You have to explain how do you convert bar to torr

$P = 107$ bar