Name of a student ــــ فاطمة وليد جميل ـــ Signature ـــــــــــــ No. (4)

University of Mustansiriyah   1st Semester-2021

Department of Chemistry   1st Exam-paper C

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

اذا كان دقائق قطبيه صوم الغاز

1: If a gas has polar particles then the difference between the volume of this gas is:

Answer: a) $V_{Real} > V_{Perfect}$ b) $V_{Real} < V_{Perfect}$ c) $V_{Real} = V_{Perfect}$ d) $V_{Real} \neq V_{Perfect}$

2: A gas occupies 60×10^3 mL at 150 °C and 760 mmHg pressure. What would be its volume at STP?

Answer: a) 38.7 mL   b) 38.7 dm^3 c) 38.7 L^{-1} d) 38.7 dm^{-3}

3: Calculate the weight of H_2O gas (18 g.mol^{-1}) in a 5 L cylinder at 10×10^2 kPa and 373 K.

Answer: a) 29.40 g mol^{-1} b) 29.40 g   c) 29.40 mol   d) 29.40 kg

4: Calculate the density of H_2O placed in a 22400 mL cylinder at 10^5 Pa and 0 °C.

Answer: a) 0.804 kg L^{-1} b) 0.804 g L^{-1} c) 0.804 g   d) 0.804 L^{-1}

5: According to Graham's law the heaviest gas is?

Answer: a) H_2O b) CH_4 c) NH_3 d) Cl_2

6: A tank contains a certain amount of gas at 10^5 Pa. The gas is transferred to another tank 40 dm^3 with pressure of 200×10^3 Pa. What should be its volume?

Answer: a) 80 L   b) 80 Pa L   c) 80 Pa dm^3 d) 80 L^{-1}

7: According to Boyle's law the pressure of a gas is inversly proportional with?

Answer: a) p   b) T   c) R   d) V   e) n

8: The difference between real and ideal gas, that the real gas interested in?

Answer: a) V & p   b) V & T   c) p & n   d) T & p

9: It can follow the direct proportional between temperature and pressure through the law of

Answer: a) Van der Waal   b) Graham   c) Charles   d) Gay-Lussac

10: The behaviour of real gas is ideal when the value of Z is equal to

Answer: a) $V_m < V^O_m$ b) $V_m > V^O_m$ c) $V_m = V^O_m$ d) $V_m \neq V^O_m$

Q2: The following data have been observed for 800 mg of nitrogen gas at 273 K. Calculate the best value of the molar mass of N_2.

$p/10^5$ Pa	0.750	0.500	0.200
V/dm^3	3.0	4.5	7.0

(25 points)

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 2×10^2 kPa and 2.14 dm^3, respectively. Calculate the $p_{original}$ of the gas in (i) bar, (ii) torr. (25 points)

Wed_10/11/2021   **Best wishes**   Dr Abduljabbar I. R. Rushdi

Q2/

$m = 800mg \Rightarrow 0.8g$

(red, top) Q3

$T = 273K$ *(red: you should explain how to convert Pa to atm)* $V = 1.80 dm^3$

$P_1 = 0.750 pa \Rightarrow 0.750 atm$ $\Rightarrow 1.80 bar$

$P_2 = 0.500 pa \Rightarrow 0.500 atm$ $P_2 = 2 \times 10^2 Kpa$

$P_3 = 0.200 pa \Rightarrow 0.200 atm$ $V_2 = 2.14 dm$

$V_1 = 3.0 dm^3 \Rightarrow 3.0 L$ $\Rightarrow 2.14 bar$

$V_2 = 4.5 dm^3 \Rightarrow 4.5L$ $P_1 = ?$

$V_3 = 7.0 dm^3 = 70L$ $\dfrac{P_1}{P_2} = \dfrac{V}{V_2} = \dfrac{P_1}{2\times10^2} \times \dfrac{1.80}{2.14}$

$M = ?$ *(red)* $Q3 \frac{5}{25}$ $P_1 = \dfrac{1.80 bar \times 2\times10^{dm}}{2.14} = 1.680$

$PV = nRT$ *(red ?)*

$P_2 = \dfrac{1.368 \, Torr \times 2\times10}{2.14L}$

① $PV = \dfrac{m}{M}RT$ $\boxed{P_2 = 1.278}$

$M = \dfrac{PV}{mRT} = \dfrac{mRT}{PV}$ *(red: Check eq. at home)* $P_1V_1 = P_2V_2$ *(red)* $P_1 = \dfrac{P_2V_2}{V_1}$

$M_1 = \dfrac{0.750 atm \times 3.0L}{0.8g \times 0.082 \, atm.L/K.mol \times 273K}$ *(red: $P_1 = \dfrac{P_2V_2}{V_1}$)*

$M_1 = 0.125 \, g/mol$

② $M_2 = \dfrac{P_2V_2}{mRT}$ *(red)* $Q2 \frac{16}{25}$

$M_2 = \dfrac{0.500 atm \times 4.5L}{0.8g \times 0.082 \, atm.L/mol.K^{-1} \times 273K}$

$M_2 = 0.130 \, g/mol$

③ $M_3 = \dfrac{P_3V_3}{mRT}$

$M_3 = \dfrac{0.200 atm \times 7.0L}{0.8g \times 0.082 \, atm.L/mol \times K^{-y} \times 273K}$

$M_3 = 0.078 \, g/mol$