F42 **Physical Chemistry_Chpt_One_Properties of Gases**

45/100 Fourty five

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

Department of Chemistry **1st Exam-paper F**

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

1: According to van der Waal's corrections if $V_{Real} < V_{Perfect}$ of any gas that means the gas has:
Answer: **a) non-polar particles** b) polar particles c) small particles d) big particles

2: Calculate the weight of CO_2 gas (44 g.mol^{-1}) in a 0.5×10^4 mL cylinder at 20×10^2 kPa and 25 °C.
Answer: a) 180 g mol^{-1} **b) 180 g** c) 180 mol d) 180 kg

3: Calculate the density of CO_2 placed in a 22.4×10^3 mL cylinder at 20×10^2 kPa and 298 K.
Answer: a) 36.06 kg L^{-1} **b) 36.06 g L^{-1}** c) 36.06 g d) 36.06 L^{-1}

4: According to Graham's law the heaviest gas has?
Answer: **a) low rate** b) high rate c) middle rate d) low density

5: A gas occupies 20 dm^3 at 90 °C and 760 torr pressure. What would be its volume at STP?
Answer: a) 15.04 mL b) 15.04 dm^3 c) 15.04 L^{-1} d) 15.04 dm^{-3}

6: A vessel contains a certain amount of gas at 80×10^5 Pa. The gas is transferred to another tank 20 dm^3 with pressure of 20×10^3 Pa. What should be its volume?
Answer: a) 0.5 L b) 0.5 Pa L **c) 0.5 Pa dm^3** d) 0.5 L^{-1}

7: According to Avogadro's law n is directly proportional with volume at constant?
Answer: a) p & V b) T & p **c) T & V** d) p & n e) R & P

8: Attractive and repulsive forces between particles are present in a?
Answer: a) perfect gas b) non-ideal gas **c) ideal gas** d) noble gas

9: It can follow the direct proportional between temperature and volume through the law of
Answer: a) Van der Waal b) Graham **c) Charles** d) Gay-Lussac

10: The mol fraction of atmospheric pressure is equal to?
Answer: **a) zero** b) one c) two d) three

Q2: The following data have been observed for 10000 mg of CO_2 gas at 273 K. Calculate the best value of the molar mass of CO_2. **(25 points)**

$p/10^2$ kPa	1.00	2.00	3.00
V/L	4.00	7.50	11.75

Q3: A perfect gas undergoes isothermal expansion, which increases its volume by 2.48 dm^3. The p_i and V_i of the gas are 2×10^2 kPa and 2.14 dm^3, respectively. Calculate the p_f of the gas in (i) bar, (ii) torr. (25 points)

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

Q2/ 10^5 Pa ≡ 1 atm

1- 1 pa = 1×10^5 atm ✗

$PV = nRT$

$n = \frac{PV}{RT}$

$= \frac{1 \times 10^5 \times 1}{0.082 \times 273}$

$= 1.331$ mol

? ≡ units

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

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

But how? → $= \frac{10}{1.331}$

$= 7.513$ g/mol

3- 3 pa = 3×10^5 atm ✗

$PV = nRT$

$n = \frac{PV}{RT}$

$= \frac{3 \times 10^5 \times 11.75}{0.082 \times 273}$

$= 63.64$ mol

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

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

$= 0.157$ g/mol

2- 2 pa = 2×10^5 atm

$PV = nRT$

$n = \frac{PV}{RT}$

$= \frac{2 \times 15 \times 7.5}{0.082 \times 273}$

$= 20.8$ mol

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

$M = \frac{m}{n} = \frac{10}{2708} = 0.037$ g/mol

Q3/

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

$\frac{2 \times 10^2}{P_2} = \frac{2.14}{2.42}$

$P_2 = \frac{2 \times 10^2 \times 2.42}{2.14}$ not V_f

$= 231.77$ kpa

$= 231.77 \times 10^{-5}$ pa

$= 231.77$ atm

$= 0.305$ torr $= 0.305$ bar