Physical Chemistry_Chpt_One_Properties of Gases

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

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 20×10^5 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)

Thur_11/11/2021 Best wishes Dr Abduljabbar I. R. Rushdi

Q2/ $PV = nRT$ $\quad 10^2\,kPa \equiv 10^2 \times 10^3\,Pa \equiv 10^5\,Pa$ $\quad V = 4.00\ L$

$P = 1.00\ kPa$

$P = \frac{1\ kPa}{101.3\ \frac{kPa}{atm}} = 9.87\ atm$ $\quad 10^5\,Pa \equiv 1\,atm$

Have a look on Page 2

Chapter 1

$9.87 * 4 = n * 0.082 * 273$

$39.48 = n * 22.386 \Rightarrow n = \frac{39.48}{22.386} = 1.76\ mol$ ... ①

? ≡ Units

$P = \frac{2\ kPa}{101.3\ \frac{kPa}{atm}} = 0.019\ atm$

$V = 7.50\ L$

$P = 2.00\ kPa$

$0.019 * 7.50 = n * 0.082 * 273$

$0.1425 = n * 22.386 \Rightarrow n = \frac{0.1425}{22.386} = 6.36\ mol$ ... ②

$P = \frac{3\ kPa}{101.3\ \frac{kPa}{atm}} = 0.029\ atm$

$V = 11.75\ L$

$P = 3.00\ kPa$

$0.029 * 11.75 = n \times 0.082 * 273$

$0.34075 = 22.386\ atm * n \Rightarrow n = \frac{0.34075}{22.386} = 0015\ mol$ ... ③

Q2 10/25

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

$m = 10000 \times 10^{-1} = 1000\ g$ $\quad 10^{-3}$

$1.76 = \frac{1000}{M} \Rightarrow \frac{1000}{1.76} = M$

$M = 568.18\ g/mol$

$n = 1.76$ sic

Q2 also

$6.36 * \frac{1000}{M} = 157.2\ g/mol$ $\quad n = 6.36\ mol$ sic

$n = 0.15$ sic

$0.015 = \frac{1000}{M} = 66.6\ g/mol$

Q3/

$P_i \times V_i = P_f \times V_f$

$P_f = \frac{P_i \times V_i}{V_f} = \frac{2 \times 10^2 \times 2.14}{2.48} = \frac{4.28 \times 10^2}{2.48} = 10.61 \times 10^2$ $\quad$ not V_f

$P_f = \frac{10.61\ kPa}{101.3\ \frac{kPa}{atm}} = 0.104\ atm$

$P_f = 0.104\ atm \times 1\ \frac{bar}{atm} = 0.104 \times 10^2\ bar$

$P_f = 0.104 \times 10^2\ atm \times 760\ \frac{torr}{atm} = 79.04\ torr$

Q3 10/25