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 20/0

P1

$P = \frac{kPa}{atm} = \frac{101.325}{1.00} = 101.325\,atm$

$PV = nRT$

$1.00 * 4.00 = n * 0.082\,L\,atm/mol\cdot K * 273\,K$

$n = \frac{0.082\,L\,atm/mol\cdot K * 273\,K}{101.325\,atm * 4.00\,L} = 0.88\,mol$

Q3 20/25

$n = \frac{m}{M} \Rightarrow M = \frac{m * n}{n} = 0.88\,mol * 10\,g = 8.8\,g/mol$

$PV = nRT \Rightarrow n = \frac{RT}{PV} = \frac{0.082\,L\,atm/mol\cdot K * 273\,K}{50.6\,atm * 7.50\,L} = 0.05\,mol$

$n = \frac{m}{M} = M = m * n = 10 * 0.05 = 0.5\,g/mol$

$PV = nRT \Rightarrow n = \frac{RT}{PV} = \frac{0.082\,L\,atm/mol\cdot K * 273\,K}{33.7\,atm * 11.75\,L}$

$n = 0.05\,mol$, $M = m \times n = 10 * 0.05 = 0.5\,g/mol$

Q4 8 0/0

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

$P_1V_1 = P_2V_2$

$V_2 = 2.48 + 2.14 = 4.62$

$2 * 10^2\,kPa * 2.14\,dm^3 = P_2 * 4.62\,dm^3$

$P_2 = \frac{2 * 10^2\,kPa * 2.14\,dm^3}{4.62\,dm^3} = 0.926 * 10^2\,kPa$

$kPa = atm \equiv bar$

① $0.926 * 10^2\,bar$

Q3 20/25

② $0.12\,torr$ → you do not explain oh how you current bar → torr