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 D

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 x 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)

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

Q2

$m = 9g \times \frac{1000mg}{1000mg} \longrightarrow m = 10g$

$P = atm \times \frac{1 \times 10^2 kPa}{100 kPa} \longrightarrow P = 1atm$

$P = atm \times \frac{2 \times 10^2 kPa}{100 kPa} \longrightarrow P = 2atm$

$P = atm \times \frac{3 \times 10^2 kPa}{100 kPa} \longrightarrow P = 3atm$

① $PV = nRT \longrightarrow n(mol) = \frac{P_{(atm)} \times V_{(L)}}{R(\frac{atm.L}{mol.K}) T_{(K)}}$

$n(mol) = \frac{2(atm)(4L)}{0.082(\frac{atm.L}{mol.K}) 273(K)}$ not clear

$n = 0.178 mol$

you have converted it (g)

$n(mol) = \frac{m(g)}{M(g/mol)} \longrightarrow M(g/mol) = \frac{m(g)}{n(mol)} \longrightarrow M = \frac{10g}{0.178(mol)} \longrightarrow M = 56.179 \frac{g}{mol}$

Just one no need for the rest

② $PV = nRT \longrightarrow n(mol) = \frac{P(atm) V(L)}{R(\frac{atm.L}{mol.K}) T(K)} \longrightarrow n = \frac{2(atm) \times 7.5(L)}{0.082(\frac{atm.L}{mol.K}) 273(K)}$

$n = 0.670 mol$ $M(g/mol) = \frac{m(g)}{n(mol)} \longrightarrow \frac{10(g)}{0.670(mol)} \longrightarrow M = 14.925 \frac{g}{mol}$

③ $PV = nRT \longrightarrow n(mol) = \frac{P_{(atm)} \times V(L)}{R(\frac{atm.L}{mol.K}) T_{(K)}} \longrightarrow n = \frac{3(atm) \times 12.75(L)}{0.082(\frac{atm.L}{mol.K}) 273(K)}$

$n = 1.574 (mol)$ $M = \frac{10(g)}{1.574(mol)} \longrightarrow M = 6.353 g/mol$

25

Q2 25

Q2

$P_1(atm) \times V_1(dm^3) = P_2(atm) \times V_2(dm^3)$

$2_{atm} \times 2.14 dm^3 = P_2(atm) \times 2.48 dm^3$

$P_{(atm)} = \frac{4.28}{2.48}$

$P_{atm} = 1.725 \Longrightarrow 1.725 bar$

$P = atm \times \frac{2 \times 10^2 kPa}{100 kPa}$

$P = 2 atm$

Q3 20/25

1.7

torr?