Physical Chemistry_Chpt_One_Properties of Gases

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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 20×10^5 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}
NO ANSWER why?

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

① wt = 10000 mg/L / 1000 mg/g = 10 gm

T = 273 K

P = 10^2 kPa

PV = RnT

1 atm = 101.325 kPa

P = 10^2 kPa / 101.325 atm/kPa = 0.98 atm ≈ 1 atm

0.98 atm * 1 L = 0.082 atm·L/mol·K * 273 K

4 L

0.98 = 22.3 mol * n

n = 0.98 / 22.3 mol = 0.04 mol

n = mass / M·mass ⇒ 0.04 mol = 10 gm / M·mass

M·mass = 10 gm / 0.04 mol = 250 g/mol

I dont understand this

② P = 1.00 ⇒ atm = 1.00 kPa / 101.325 atm/kPa = 0.0098 atm

PV = RnT

0.0098 atm * 4 L = 0.082 atm·L/mol·K * 273 K * n

0.039 = 22.38 mol * n

n = 0.039 / 22.38 mol = 0.0017 mol

n = mass / M·mass ⇒ 0.0017 mol = 10 g / M·mass

M·mass = 10 g / 0.0017 mol = 5882 g/mol

③ P = 2 kPa / 101.325 atm/kPa = 0.019 atm

Q2 20/25

PV = RnT

0.019 atm * 7.5 L = 0.082 atm·L/mol·K * 273 K

0.14 = 22.38 mol * n

n = 0.14 / 22.38 mol = 0.006 mol

n = mass / M·mass

0.006 mol = 10 g / M·mass

M·mass = 10 g / 0.006 mol = 1666 g/mol

④ P = 3.00 kPa ⇒ P = 3 kPa / 101.325 atm/kPa = 0.029 atm

PV = RnT

0.029 atm * 11.75 L = 0.082 atm·L/mol·K * 273 K * n

0.34 = 22.38 mol * n

n = 0.34 / 22.38 mol = 0.015 mol

n = mass / M·mass

0.015 mol = 10 g / M·mass

M·mass = 10 g / 0.015 mol = 666.6 g/mol

سعيد سليم مراد
C2

الموضوع :
التاريخ / / ٢٠٢

Q3 // $V = 2.48\ dm^3$

$P_1 = 2 * 10^2\ Kpa$ $\frac{2*10^2}{101.325} = 1.97\ atm$

$V_1 = 2.14\ dm^3$

This is not V_f

$P_1 V_1 = P_2 * V_2$

$2*10^2 * 2.14\ dm^3 = P_2 * 2.48$? → unit

$428 = P_2 * 2.48$

$P_2 = \frac{428\ Kpa \cdot dm^3}{2.48\ dm^3} = 172.5\ Kpa$

$1\ bar = 10^5\ Kpa \Rightarrow P = \frac{172}{10^5} = 0.0017\ bar$ ✗

$1\ torr = 133.32\ Kpa$

$P = 0.000012\ torr$

Q3 $\frac{10}{25}$