Physical Chemistry_Chpt_One_Properties of Gases

Name of a student —Fatima Karim Auda— Signature —Fatir— No. 2

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Department of Chemistry   1st Exam-paper B

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

1: A vessel of 5000 mL capacity contains a certain amount of gas at 313 K and 2 bar pressure. The gas is transferred to another vessel of volume 10000 mL at 40 °C. What should be its pressure?
Answer: a) 1.0 atm   b) 1.0 mmHg   c) 75 cmHg   d) 1.5 bar

2: If the particles of a gas are polar that means the difference between p_{ideal} and p_{real} is
Answer: a) low   b) equal   c) high

3: Calculate the temperature of 5000 mmol of a gas occupying 5.0 dm^3 at 3.3×10^5 Pa?
Answer: a) 40.2 °C   b) 40.2 K   c) 44.2 °C   d) 44.2 K

4: Calculate the weight of NH_3 (17 g.mol^{-1}) in a 4 L cylinder at 8 atm and 300 K.
Answer: a) 22.11 kg   b) 22.11 g   c) 23 K   d) 23 °C

5: Calculate the p_c of a gas, if the p_r is 0.44 and p is 1 bar.
Answer: a) 2.27 K   b) 2.27 atm   c) 2.27 L   d) 2.27 mol

6: If the attraction forces are calculated, that means the gas is?
Answer: a) real   b) noble   c) perfect   d) compressed

7: According to the Dalton's law total mole fraction is equal to?
Answer: a) Σn   b) Σp_i c) Σp_T d) Σχ

8: What is the partial pressure of a gas in a mixture, if the X_i is 1, and the conditions are at STP?
Answer: a) 0.99 torr   b) 0.89 bar   c) 0.900 atm   d) 1.01 bar

9: At high pressure the Z > 1 which means the dominated forces are?
Answer: a) Van der Waal's   b) equal   c) repulsions   d) attractions

10: According to Avogadro's law the amount of a gas at STP is?
Answer: a) 1.00 mol   b) 2.00 mol   c) 1.00 mmol   d) 2.00 mmol

Q2: The air inside a flexible 3.5 L container has a pressure of 115 kPa. What should be the volume of the container be increased to in order to decrease the pressure to 625 torr?   (25 points)

Q3: A 3 dm^3 container holds 0.5 moles of N_2 gas at 42 °C. What is the pressure inside the container? (25 points)

09/11/2021   Best wishes   Dr Abduljabbar I. R. Rushdi

Q2 answer

$V_1 = 3.5L$

$V_2 = ?$

$P_1 = 115 kPa$

$P_2 = 625 torr$

1 torr = 133.23 Pa

$115 \times 10^3 \cancel{Pa} \times \dfrac{1 torr}{133.23 \cancel{Pa}} = \cancel{863.169} \, 863.169 \, torr$

$\dfrac{P_1}{P_2} = \dfrac{V_{1\rightarrow 2}}{V_2}$

$\dfrac{863.169 \, torr}{625 \, torr} = \dfrac{3.5 L}{V_2}$

$Q_2 \quad \dfrac{10}{25}$

$V_2 = 2.534 L$

Q3 answer

$V = 3 \, dm^3$

$n = 0.5 \, mol$

$T = 42 \, °c$

$P = ?$

$1L = dm^3$

$3 \cancel{dm^3} \times \dfrac{1L}{\cancel{dm^3}} = 3L$

$T = 42 + 273 = 315K$

$PV = nRT$

$P = \dfrac{nRT}{V}$

$P = \dfrac{(0.5 \, mol)(0.082 \, \cancel{L}.atm/mol.\cancel{K})(315\cancel{K})}{3\cancel{L}}$

$P = 4.305 \, atm$

$Q_3 \quad \dfrac{25}{25}$