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Physical Chemistry-Properties of Gases

Name of a student ---------- Signature ---------- No. 15

University of Mustansiriyah — 1st Semester-2021

Department of Chemistry — 1st Exam-paper A

Q1: Circle the right answer for all of the following:

1: A vessel of 50 mL capacity contains a certain amount of gas at 40 °C and 2 bar pressure. The gas is transferred to another vessel of volume 100 mL at 40 °C. What should be it is pressure?

Answer: a) 1.0 atm b) 0.85 mmHg c) 0.9 cmHg (d) 1 bar

2: What is the right formula of the Van der Waals equation?

Answer: a) $p = [nRT/(V-nb)] - n(a^2/V^2)$ b) $P = [nRT/(V-nb)] - V(n^2/a^2)$ c) $p = [nRT/(b-nV)] - a(n^2/V^2)$ d) $P = [nRT/(V-nb)] - a(n^2/V^2)$

3: Calculate the temperature of 4.0 mol of a gas occupying 5.0 dm^3 at 3.3 bar?

Answer: a) 50.3 °C b) 48 K c) 51 °C (d) 50.3 K

4: Calculate the weight of O_2 (32 $g.mol^{-1}$) in a 4 L cylinder at 9 atm and 281 K.

Answer: a) 50 kg (b) 50 g c) 50 K d) 50 °C

5: Calculate the p_C of He gas, if the p_r and p is 0.44 and 1 atm respectively

Answer: a) 2.26 K (b) 2.26 atm c) 2.26 L d) 2.26 mol

6: If the repulsion forces are negligible, 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) 0.10 mol b) 1.0 mol c) 0.10 (d) 1.0

8: What is the partial pressure of a gas in a mixture if the X_i is 0.5, and the conditions are at STP?

Answer: a) 1.5 Pa b) 0.49 bar (c) 0.5 atm d) 0.5 bar

9: If the value of R is 0.082 then the unit of temperature is?

Answer: (a) Kelvin b) Celsius c) Fahrenheit d) no one of these

10: According to the Avogadro's law the amount of a gas at STP is?

Answer: (a) 1.00 mol b) 2.00 mol c) 1.00 L d) 2.00 mol

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

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

12/01/2021 — Best wishes — Dr Abduljabbar I. R. Rushdi

Q2 $V_1 = 3.5\,L$ $P_1 = 115\,kPa$ $P_2 = 625\,torr \approx kPa$

$V_2 = ?$

$$\frac{P_1}{P_2} = \frac{V_2}{V_1}$$

$$\frac{115\,kPa}{625\,kPa} = \frac{V_2}{3.5\,L} \Rightarrow V_2 = 0.64\,L$$

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Q3 $V = 3\,dm^3 = 3\,L$ $n = 0.5\,mol$ $T = 42^\circ C + 273\,K = 315\,K$

$P = ?$

$$PV = nRT$$

$$P \cdot 3\,L = 0.5\,mol \cdot 0.082\,L \cdot atm/mol \cdot K \cdot 315\,K$$

$$P = \frac{0.5\,mole \cdot 0.082\,L\,atm/mole\,K \cdot 315\,K}{3\,L}$$

$$P = 4.3\,atm$$

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