Physical Chemistry-Properties of Gases

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University of Mustansiriyah

Department of Chemistry

1st Semester-2021

1st Exam-paper A

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

1: A vessel of 100 L capacity contains a certain amount of gas at 50 °C and 0.5 bar pressure. The gas is transferred to another vessel has a pressure of 5 bar at 50 °C. What should be the volume of the vessel?

Answer: a) 10 bar b) 10 dm^3 c) 0.1 dm^3 d) 0.1 bar

2: What is the right formula of the Graham's law of effusion?

Answer: a) $\frac{r_1}{t_2} = (\frac{r_2}{M_1})^{\frac{1}{2}}$ b) $\frac{r_1}{r_2} = (\frac{M_1}{M_2})^{\frac{1}{2}}$ c) $\frac{d_1}{d_2} = (\frac{M_2}{M_1})^{\frac{1}{2}}$ d) $\frac{r_1}{r_2} = (\frac{d_2}{M_1})^{\frac{1}{2}}$

3: Calculate Z for a gas if T is 22 °C, V_m is 5 $dm^3\ mol^{-1}$ and p is 3 bar.

Answer: a) 0.62 °C b) 6.2 K c) 0.62 d) 6.2

4: Calculate the molar mass of O_2 (16 $g.mol^{-1}$) in a 4 L cylinder at 9 atm and 281 K.

Answer: a) 32 $g.mol^{-1}$ b) 32 g c) 50 $g.mol^{-1}$ d) 50 g

5: Calculate the $V^o m$ of a gas, if p is 1 atm and temperature is 32 °C.

Answer: a) 25 K b) 25 atm c) 25 L mol^{-1} d) 25 mol

6: If the attraction forces are negligible, that means the gas is?

Answer: a) real b) noble c) perfect d) expands

7: According to the Dalton's law the unit of the mole fraction is?

Answer: a) mol b) dm^3 c) psi d) free of units

8: What is the partial pressure of a gas in a mixture if the X_i is 0.1, and under atmospheric pressure?

Answer: a) 760 mmHg b) 10 bar c) 0.1 atm d) 1 bar

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

Answer: a) Pascal b) mmHg c) Psi d) bar

10: What is the right equation of one of the following?

Answer: a) $p_r p_c = p$ b) $p_r p = p_c$ c) $p_r / p_c = p$ d) $p_r = p_c p$

Q2: Calculate the mass of 335 mL of sulfur dioxide (64 g mol^{-1}) measured at 37 °C and 745 mm Hg pressure.? (25 degrees)

Q3: Calculate the volume of 0.25 g of oxygen at 25 °C and 742 mm Hg pressure. (25 degrees)

Wed_20/01/2021 Best wishes Dr Abduljabbar I. R. Rushdi

mass = ?

335 mL → L = ~~335 × 1000 = 33500 L~~ $\frac{335\ mL}{1000}$ =

0.335 L

M = 64 g mol⁻¹

T = 37°C → K = 37 + 273 = 310

? from where this no.

775 mmHg → 760 atm = $\frac{775}{760}$ = 1.01 atm

715 not 775

$PV = nRT$

$PV = \frac{m}{M}RT$

$(1.01\ atm)(335\ mL) = \frac{m}{64\ g/mol} * 0.082\ atm.L/mol.K * 310K$

$338\ atm.L = \frac{m(g)}{64\ g/mol} * 25.42\ atm.L/mol.K$

$m = \frac{21165\ atm.L.g/mol}{25.963\ atm.L/mol}$

10/25

? = units

$m = 83.4\ g$

V = ?

m = 0.25 g

T = 25°C → K = 25 + 273 = 298 K

$n = \frac{m}{M} = \frac{0.25\ g}{32\ g/mol} = 0.078\ mol$

P = 742 mmHg → atm 760 = $\frac{742}{760}$ = 0.976 atm

$M_{wt\ O_2} = 16 \times 2 = 32\ g/mol$

R = 0.082 atm.L/mol.K

$PV = nRT$

$V = \frac{nRT}{P} \rightarrow \frac{0.078\ mol * 0.082\ atm.L/mol.K * 298\ K}{0.976\ atm}$

V = 0.195 L

Q3 25/25