Physical Chemistry-Properties of Gases

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

University of Mustansiriyah — **1st Semester-2021**

Department of Chemistry — **1st Exam-paper A**

(50 degrees)

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

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 NO ANSWER

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**

Q2 $V = 335\ M$ $T = 37^\circ C$

$M = 64\ g/mol$ $P = 745\ mm\ Hg$

$T = 37 + 273 = 310\ K$

$P = \frac{745\ mmHg}{760\ mmHg} = 0.98\ atm$

$PV = nRT$

you need to convert mL to L

$0.98\ atm \times 335\ mL = \frac{m}{64\ g/mol} \times 0.082\ atm.L/mol.K \times 310\ K$

$0.98\ atm \times M = \frac{335\ mL}{64\ g/mol} \times 0.082\ atm.L/mol.K \times 310\ K$

SO_2 32 + 16 × 2

$0.98\ atm \times M = 5.234 \times 0.082\ atm.L/mol.K \times 310\ K$

$M = \frac{5.234 \times 64 \times 0.082 \times 310}{0.98} = 135.76\ g$

Q2 17/25

$T = 25^\circ C + 273 = 298\ K$

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

$V = ?$

$M = 0.25\ g$

$T = 25^\circ C$

$P = 742\ mmHg$

Q3 18/25

$PV = nRT$

$0.976\ atm \times V = \frac{0.25\ g}{32\ g/mol} \times 0.082\ atm.L/mol.K \times 298\ K$

$0.976\ atm \times V = 0.0156\ mol \times 0.082\ atm.L/mol.K \times 298\ K$

$V = \frac{0.0156\ mol \times 0.082\ atm.L/mol.K \times 298\ K}{0.976\ atm}$

$= 0.390\ L$