20-01-2021 Wed. 70/100 Seventy only

Physical Chemistry-Properties of Gases

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University of Mustansiriyah — 1st Semester-2021

Department of Chemistry — 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 5/5

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) $\frac{r_1}{r_2} = (\frac{d_2}{M_1})^{\frac{1}{2}}$ 0/5

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 5/5

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 5/5

5: Calculate the V°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 5/5

Q1 40/50

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

Answer: a) real b) noble (c) perfect d) expands 5/5

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 5/5

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 5/5

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

Answer: a) Pascal b) mmHg c) Psi (d) bar 5/5

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) $p_r = p_c p$ 0/5

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/

$V = 335\ mL$, $M = 64\ g.mol^{-1}$, $T = 37C$, $P = 745\ mmHg$

$V = \frac{335}{1000} \Rightarrow 335 \times 10^{-3}\ L$

$T = 37c° + 273k = \boxed{310k}$, $\frac{P = 745}{760} = 0,98\ atm$

$PV = nRT \rightarrow PV = \frac{m}{M}RT \rightarrow PM = \left(\frac{m}{V}\right)RT$

$PM = dRT \rightarrow \boxed{M = \frac{dRT}{P}}$

This is mass and d is not molar mass

$d = \frac{m}{V} \Rightarrow d = \frac{64\ g.mol^{-1}}{335 \times 10^{-3}\ L} = d = 19,1\ g.mol.L^{-1}$

$M = \frac{19,1\ g.mol.L^{-1} * 0,082\ L.atm/mol.K * 310K}{0,98\ atm} = \frac{485,5}{0,98}$

$M = 495,4\ g$

Q2 15/25

Q3/

$wt = 0,25\ g$, $T = 25c°$, $P = 25\ mmHg$, $V = ?$

742

$T = 25c° + 273k \rightarrow T = 298k$

$P = \frac{25\ mmHg}{760\ atm} = P = 0,032\ atm$

$n = \frac{wt}{M.wt} \Rightarrow n = \frac{0,25\ g}{32\ g/mol} = 0,0078\ mol$

Q3 25/15

$PV = nRT \Rightarrow V = \frac{nRT}{P} \Rightarrow V = \frac{0,0078\ mol * 0,082\ L.atm/mol.K * 298K}{0,032\ atm}$

0.97

$V = \frac{0,18\ L}{0,032} = 5,6\ L$

? = Vinit