



Physical Chemistry-Properties of Gases



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1<sup>st</sup> 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<sup>3</sup> c) 0.1 dm<sup>3</sup> d) 0.1 bar

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

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

3: Calculate Z for a gas if T is 22 °C, V<sub>m</sub> is 5 dm<sup>3</sup> mol<sup>-1</sup> 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<sub>2</sub> (16 g.mol<sup>-1</sup>) in a 4 L cylinder at 9 atm and 281 K.

Answer: a) 32 g.mol<sup>-1</sup> b) 32 g c) 50 g.mol<sup>-1</sup> d) 50 g

5: Calculate the V<sub>m</sub> of a gas, if p is 1 atm and temperature is 32 °C.

Answer: a) 25 K b) 25 atm c) 25 L mol<sup>-1</sup> 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<sup>3</sup> c) psi d) free of units

8: What is the partial pressure of a gas in a mixture if the X<sub>i</sub> 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<sub>r</sub>p<sub>c</sub> = p b) p<sub>r</sub>p = p<sub>c</sub> c) p<sub>r</sub>/ p<sub>c</sub> = p d) p<sub>r</sub> = p<sub>c</sub>p

Q2: Calculate the mass of 335 mL of sulfur dioxide (64 g mol<sup>-1</sup>) 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)

Q2/

? = units

$$PV = nRT$$

$$P = \frac{745}{760} \times 1 \text{ atm} \Rightarrow P = 0.98 \text{ atm} \quad (t(K) = 37 + 273 = 310 \text{ K})$$

$$V_L = \frac{335}{1000} = 0.335 \text{ (L)}$$

$$n = \frac{0.98 \text{ atm} \times 0.335 \text{ L}}{0.082 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}} \times 310 \text{ K}} = 0.012 \text{ mol}$$

Q2  $\frac{23}{25}$

$$m = n \cdot M \Rightarrow m = 0.012 \text{ mol} \times 64 \text{ g/mol} = 0.768 \text{ g}$$

Q3

$$PV = nRT$$

$$P = \frac{745}{760} \times 1 \text{ atm} = 0.98 \text{ atm}$$

$$T = t(K) = 273 + 25 = 298 \text{ K}$$

$$n = \frac{m}{M} \Rightarrow \frac{0.25 \text{ g}}{32 \text{ g/mol}} = 0.0078 \text{ mol}$$

$$V = \frac{0.0078 \text{ mol} \times 0.082 \frac{\text{atm} \cdot \text{L}}{\text{mol} \cdot \text{K}} \times 298 \text{ K}}{0.98 \text{ atm}} = 0.194 \text{ L}$$

Q3  $\frac{24}{25}$