



## Physical Chemistry-Properties of Gases



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Department of Chemistry

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<sup>o</sup><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)  $p_r p_c = p$     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<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 / sol 1

$$t(K) = 37 + 273$$

$$= 310 \text{ K}$$

$$PV = nRT$$

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

$$P_{atm} = \frac{745 \text{ mmHg}}{760 \text{ mmHg}}$$

$$0.98 \text{ atm} \times 0.335 \text{ L} = \frac{m}{64 \text{ g/mol}} \times 0.082 \text{ L.atm/K.mol} \times 310 \text{ K} = 0.98 \text{ atm}$$

$$0.328 = \frac{m}{64} \times 25.42$$

$$V(L) = \frac{335}{1000}$$

$$= 0.335 \text{ L}$$

$$m = 533.6 \text{ g}$$

23  
Q2 26

Q2 / sol 1

$$t(K) = 25 + 273$$

$$= 298 \text{ K}$$

$$PV = nRT$$

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

$$P_{atm} = \frac{742 \text{ mmHg}}{760 \text{ mmHg}}$$

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

$$0.976 \times V = 0.01 \times 24.4$$

$$V = \frac{0.01 \times 24.4}{0.976}$$

$$V = 0.25 \text{ L}$$

20  
Q3 25