

## Problems of Gases

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- 1) A vessel if filled with an ideal gas at a temperature of  $70\text{ }^{\circ}\text{C}$  and at a pressure of  $32.5\text{ atm}$ . Calculate the temperature of the vessel when its pressure is  $13\text{ atm}$ .
- 2) A piston has a volume of  $28.5\text{ L}$  and it's filled with an ideal gas at a temperature of  $75\text{ }^{\circ}\text{C}$ . Find out the volume of the piston at the same pressure and at a temperature of  $13\text{ }^{\circ}\text{C}$ .
- 3)  $31\text{ L}$  of an ideal gas are confined in a vessel at a temperature of  $25\text{ }^{\circ}\text{C}$  and at a pressure of  $1\text{ atm}$ . Calculate the pressure of this gas in another vessel that has a capacity of  $35.5\text{ L}$  and it's at  $90\text{ }^{\circ}\text{C}$ .
- 4) A tank of  $5.3\text{ L}$  of capacity if filled with an ideal gas at a pressure of  $35\text{ atm}$ . Find out the pressure of this gas when it's contained in another tank of  $12.2\text{ L}$  of capacity at the same temperature.
- 5) A tank that has a capacity of  $82.2\text{ L}$  is filled with  $4.5\text{ mol}$  of carbon dioxide ( $\text{CO}_2$ ) gas at a temperature of  $70\text{ }^{\circ}\text{C}$ . At what pressure is the gas?
- 6)  $11.97\text{ g}$  of hydrogen ( $\text{H}_2$ ) gas are confined in a vessel of  $21\text{ L}$  of capacity at a temperature of  $95\text{ }^{\circ}\text{C}$ . Calculate the pressure in the vessel.  
Atomic masses (g/mol):  $\text{H} = 1$ .
- 7) Find out the mass of nitrogen monoxide ( $\text{NO}$ ) gas that is contained in a tank of  $3.27\text{ L}$  of capacity at a temperature of  $115\text{ }^{\circ}\text{C}$  and at a pressure of  $1900\text{ mmHg}$ .  
 $760\text{ mmHg} = 1\text{ atm}$ .  
Atomic masses (g/mol):  $\text{N} = 14$ ,  $\text{O} = 16$ .
- 8) A vessel that has a capacity of  $5.3\text{ L}$  is filled with  $88\text{ g}$  of chlorine ( $\text{Cl}_2$ ) gas and  $71\text{ g}$  of oxygen ( $\text{O}_2$ ) gas at a temperature of  $40\text{ }^{\circ}\text{C}$ . Determine the total pressure in the vessel.
- 9) Determine the number of moles of  $\text{Cl}_2$  gas when it's contained in a balloon of  $50.44\text{ L}$  of capacity at a temperature of  $130\text{ }^{\circ}\text{C}$  and at a pressure of  $1444\text{ mmHg}$ .  
 $760\text{ mmHg} = 1\text{ atm}$ .
- 10)  $3.5\text{ mol}$  of  $\text{Cl}_2$  gas are contained in a tank at  $1.6\text{ atm}$  and  $55\text{ }^{\circ}\text{C}$ . Calculate the capacity of the tank.
- 11) Find out the volume of  $18.5\text{ g}$  of  $\text{Ar}$  gas confined at  $6.6\text{ atm}$  and  $45\text{ }^{\circ}\text{C}$ . What will be the volume at  $0\text{ }^{\circ}\text{C}$  and  $1\text{ atm}$ ?  
Atomic masses (g/mol):  $\text{Ar} = 40$ .

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12) Determine the density of nitrogen monoxide (NO) gas at a temperature of 85 °C and at a pressure of 1596 mmHg.

$$760 \text{ mmHg} = 1 \text{ atm.}$$

Atomic masses (g/mol): N = 14, O=16.

13) 159.3 g of an ideal gas occupy 46 L at a temperature of 20 °C and at a pressure of 2.6 atm. Calculate its molar mass and density.

14) An ideal gas has a density of 3.91 g/L when it's contained at a pressure of 23.9 atm and at a temperature of 25 °C. Find out its molar mass.

### Answers:

- 1) -135.8 °C.
- 2) 23.42 L.
- 3) 1.06 atm.
- 4) 15.2 atm.
- 5) 1.54 atm.
- 6) 8.6 atm.
- 7) 7.7 g.
- 8) 16.75 atm.
- 9) 2.9 mol.
- 10) 58.84 L.
- 11) 1.83 L, 10.36 L.
- 12) 2.15 g/L.
- 13) 32 g/mol; 3.46 g/L.
- 14) 4 g/mol.