Quiz (Molar Volume)

1. Calculate the number of moles of the following gases at room temperature and pressure:
   (a) 7.6 dm^3 of CH_4
   (b) 360 cm^3 of NO_2
   (Molar volume of gas at room temperature and pressure = 24.0 $dm^3\ mol^{-1}$)

2. Calculate the number of moles of the following gases at room temperature and pressure:
   (a) 2.8 dm^3 of CO_2
   (b) 480 cm^3 of Cl_2
   (Molar volume of gas at room temperature and pressure = 24.0 $dm^3\ mol^{-1}$)

3. Calculate the volume of the following gases at room temperature and pressure:
   (a) 1.5 mol of SO_2
   (b) 0.03 mol of NH_3
   (c) 1.3 mol of H_2
   (d) 0.25 mol of N_2O_4
   (Molar volume of gas at room temperature and pressure = 24.0 $dm^3\ mol^{-1}$)

4. Calculate the volume of each of the following gases at room temperature and pressure:
   (a) 0.55 mol of N_2
   (b) 1.65 mol of Cl_2
   (Molar volume of gas at room temperature and pressure = 24.0 $dm^3\ mol^{-1}$)

5. Calculate the number of molecules in 180 cm^3 of HCl(g) at room temperature and pressure.
   (Molar volume of gas at room temperature and pressure = 24.0 $dm^3\ mol^{-1}$; Avogadro constant = $6.02 \times 10^{23}\ mol^{-1}$)

6. Calculate the volumes (in dm^3) of the following quantities of gases at room temperature and pressure.
   (a) 0.25 mol of Ar
   (b) 2.41×10^{21} CH_4 molecules
   (Molar volume of gas at room temperature and pressure = 24.0 $dm^3\ mol^{-1}$; Avogadro constant = $6.02 \times 10^{23}\ mol^{-1}$)

Suggested Answer

1. (a) Number of moles of CH_4
= volume of CH_4 / molar volume of CH_4
= 7.6 dm^3 / 24.0 $dm^3\ mol^{-1}$
= 0.317 mol

(b) Number of moles of NO_2
= volume of NO_2 / molar volume of NO_2
= 360 cm^3 / 24 000 $cm^3\ mol^{-1}$
= 0.015 mol

2. (a) Number of moles of CO_2
= 2.8 / 24.0
= 0.12 mol

(b) Number of moles of Cl_2
= 480 / 24000
= 0.02 mol

3. At room temperature and pressure,
volume of a gas (dm^3) = no. of moles (mol) × 24.0 ($dm^3\ mol^{-1}$)

(a) Volume of SO_2
= 1.5 mol × 24.0 $dm^3\ mol^{-1}$
= 36.0 dm^3

(b) Volume of NH_3
= 0.03 mol × 24.0 $dm^3\ mol^{-1}$
= 0.72 dm^3 (or 720 cm^3)

(c) Volume of H_2
= 1.3 mol × 24.0 $dm^3\ mol^{-1}$
= 31.2 dm^3

(d) Volume of N_2O_4
= 0.25 mol × 24.0 $dm^3\ mol^{-1}$
= 6.0 dm^3

4. (a) Volume of N_2
= 0.55 mol × 24.0 $dm^3\ mol^{-1}$
= 13.2 dm^3

(b) Volume of Cl_2
= 1.65 mol × 24.0 $dm^3\ mol^{-1}$
= 39.6 dm^3

5. Number of moles of HCl molecules
= 180 / 24000
= 7.5×10^{-3} mol

Number of HCl molecules
= $7.5 \times 10^{-3} \times 6.02 \times 10^{23}$
= 4.515×10^{21}

6. (a) Volume of Ar
= 0.25×24.0
= 6 dm^3

(b) Volume of CH_4
= $(2.41 \times 10^{21} / 6.02 \times 10^{23}) \times 24.0$
= 0.096 dm^3