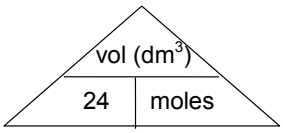
GAS VOLUMES 1

Volume (dm^3) = **24 x moles**



The volume must be in dm^3 (there are 1000 cm^3 in 1 dm^3).

$$\text{vol in } dm^3 = \frac{\text{vol in } cm^3}{1000}$$

Give all answers to 3 significant figures.

1 Find the volume of the following gases (measured at room temperature and pressure).

a 4.00 moles of oxygen (O_2) **volume = 4.00 x 24 = 96.0 dm^3**

b 0.250 moles of methane (CH_4) **volume = 0.25 x 24 = 6.00 dm^3**

c 15.0 g of argon (Ar) **moles Ar = $\frac{15}{40}$ = 0.375 mol** **volume = 0.375 x 24 = 9.00 dm^3**

d 0.220 g of carbon dioxide (CO_2) **moles CO_2 = $\frac{0.220}{44}$ = 0.00500 mol** **volume = 0.00500 x 24 = 0.120 dm^3**

2 Find the number of moles of the following gases (measured at room temperature and pressure).

a 48.0 dm^3 of carbon monoxide (CO) **moles CO = $\frac{48.0}{24}$ = 2.00 mol**

b 1.20 dm^3 of hydrogen (H_2) **moles H_2 = $\frac{1.20}{24}$ = 0.0500 mol**

c 360 cm^3 of oxygen (O_2) **moles O_2 = $\frac{360}{24000}$ = 0.01500 mol**

3 Find the mass of the following gases (measured at room temperature and pressure).

a 7.20 dm^3 of ammonia (NH_3) **moles NH_3 = $\frac{7.20}{24}$ = 0.300 mol** **mass = 17 x 0.300 = 5.10 g**

b 480 cm^3 of nitrogen (N_2) **moles N_2 = $\frac{480}{24000}$ = 0.0200 mol** **mass = 28 x 0.0200 = 0.560 g**

c 100 cm^3 of oxygen (O_2) **moles O_2 = $\frac{100}{24000}$ = 0.00417 mol** **mass = 32 x 0.00417 = 0.133 g**

4 Find the volume of hydrogen gas (measured at room temperature and pressure) formed when 0.540 g of calcium reacts with hydrochloric acid.

$$Ca(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2(g)$$

moles Mg = $\frac{0.540}{40}$ = 0.0135 mol

moles H_2 = 0.0135 mol

volume H_2 = 24 x 0.0135 = 0.324 dm^3

5 Find the volume of carbon dioxide gas (measured at room temperature and pressure) formed when 1.50 g of calcium carbonate reacts with hydrochloric acid.

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

moles $CaCO_3$ = $\frac{1.50}{100}$ = 0.0150 mol

moles CO_2 = 0.0150 mol

volume CO_2 = 24 x 0.0150 = 0.360 dm^3

6 Find the volume of carbon dioxide gas (measured at room temperature and pressure) formed when 6.00 kg of ethane (C_2H_6) burns in oxygen.

$$2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(l)$$

moles C_2H_6 = $\frac{6000}{30}$ = 200 mol

moles CO_2 = 400 mol

volume CO_2 = 24 x 400 = 9600 dm^3

Area	Strength	To develop	Area	Strength	To develop	Area	Strength	To develop
Done with care and thoroughness			Can work out moles from mass			Does not round too much		
Shows suitable working			Can work out moles from gas volume			Can use sig figs		
Can work our gas volume from moles			Can work out mass from moles			Gives units		
Can work out M_r			Use equation to find reacting moles					