Gas Volumes Q

1 3.0 dm^3 of sulfur dioxide are reacted with 2.0 dm^3 of oxygen according to the equation:

$$2SO_2\,(g) + O_2\,(g) \rightarrow 2SO_3\,(g)$$

What volume of sulfur trioxide (in dm^3) is formed? (Assume the reaction goes to completion and all gases are measured at the same temperature and pressure.)

A 5.0 B 4.0 C 3.0 D 2.0

2 $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$

Hydrogen and chlorine react according to the equation above. What will be the result of the reaction between 200 cm^3 of H_2 and 150 cm^3 of Cl_2? (all gas volumes measured at the same temperature and pressure)

A 350 cm^3 of HCl
B 150 cm^3 of HCl and 50 cm^3 of H_2
C 200 cm^3 of HCl and 50 cm^3 of Cl_2
D 300 cm^3 of HCl and 50 cm^3 of H_2

3 According to the equation: $2SO_{2(g)} + O_{2(g)} \rightarrow 2SO_{3(g)}$
what volume of air (20 % O_2) is required to react with 10 dm^3 of SO_2?

A 2 dm^3 B 5 dm^3 C 10 dm^3 D 25 dm^3

4 Equal **volumes** of oxygen and hydrogen are reacted in a closed container. After the reaction is complete, the container will contain

A water and oxygen only
B water and hydrogen only
C water only
D water, hydrogen and oxygen

5 Chlorine was first prepared by by the reaction of hydrochloric acid with manganese(IV) oxide:

$$4HCl_{(aq)} + MnO_{2(s)} \rightarrow Cl_{2(g)} + MnCl_{2(aq)} + 2H_2O_{(l)}$$

In a repetition of the original chlorine preparation, a solution of hydrochloric acid containing 14.6 g of hydrogen chloride reacted completely with manganese(IV) oxide.

(a) Calculate how many moles of hydrogen chloride reacted. [1]

0.4

(b) Calculate the volume of chlorine produced at 90KPa and 35^0C. [2]

Moles Cl_2 = 0.1
V = 2.85dm^3

6 A 12.6 g sample of propene undergoes combustion: $2C_3H_{6(g)} + 9O_{2(g)} \rightarrow 6CO_{2(g)} + 6H_2O_{(l)}$

Calculate the volume of carbon dioxide that would be produced from this combustion at 100KPa pressure and 20^0C. [2]

Moles propene = 0.3
Moles CO_2 = n = 0.9
V = 21.92dm^3

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7 A 1.20 dm^3 sample of helium gas has a pressure of 4.67 x 10^4 Pa at 300 K. What pressure will the sample exert if the volume is changed to 1.60 dm^3 and the temperature is changed to 400 K?

A 4.67 x 10^4 Pa B 3.47 x 10^4 Pa C 2.63 x 10^4 Pa D 8.27 x 10^4 Pa

8 The temperature of 420 cm^3 hydrogen gas is changed from 20.0 °C to -20 °C at constant pressure. What is the final volume?

A 363 cm^3 B 392 cm^3 C 406 cm^3 D 486 cm^3

9 2.00 mol of helium at a temperature of 27 °C and a pressure of 3.00 atm (304 kPa) may be contained in a vessel of what volume?

A 6.1 x 10^{-2} dm^3 B 1.48 dm^3 C 4.48 dm^3 D 16.4 dm^3

10 A 0.365 g sample of a common anaesthetic has a volume of 225 cm^3 at 35 °C and 98.6 kPa. What is its molar mass?

A 42.1 B 40.8 C 39.9 D 4.79

11 A certain gas has a density of 2.35 g dm^{-3} at 30 °C and 96 kPa (0.95 atm). The molar mass of this gas will be closest to which of the following?

A 50 B 60 C 70 D 80

12 Magnesium metal reacts with hydrogen gas according to the following equation:

$$Mg + 2HCl \rightarrow MgCl_2 + H_2$$

When excess hydrochloric acid is reacted with magnesium 100 cm^3 of hydrogen gas is collected at a temperature of 20 °C and a pressure of 1.08 x 10^5 Pa.

(a) Calculate the number of moles of hydrogen gas produced. [2]

4.43x10^{-3}

(b) Calculate the mass of magnesium that reacted. [1]

0.106g

13 When manganese(IV) oxide (MnO_2) is heated strongly it decomposes:

$$3MnO_2 \rightarrow Mn_3O_4 + O_2$$

When 10.00 g of MnO_2 is heated what volume of oxygen (collected at 18 °C and 1.05 x 10^5 Pa) is produced? [3]

Moles MnO_2 = 0.115
Moles O_2 = 0.0383
Volume O_2 = 883cm^3