# Answer on Question #65992 - Chemistry - General Chemistry

**Task 1**

Determine the amount of Hydrogen Peroxide in grams required to make 1 mole of Oxygen gas.

**Solution:**

The chemical reaction of decomposition of Hydrogen Peroxide to form of Oxygen gas is

$2H_2O_2 \rightarrow 2H_2O + O_2$

According to this reaction 1 mole of Oxygen corresponds to 2 moles of Hydrogen Peroxide so number of moles equal 2. That's why the amount of Hydrogen Peroxide in grams (mass) is

$m(H_2O_2) = n(H_2O_2) \cdot M(H_2O_2)$, where m is mass in grams; n is number of moles; M is molar mass.

Molar mass $M = 2 \cdot 1 + 2 \cdot 16 = 34$ (g/mole)

Substituting data we obtain:

$m(H_2O_2) = 2 \cdot 34 = 68$ (g)

**Answer:** $m(H_2O_2) = 68$ g.

**Task 2**

Determine the number of grams of water gas produced from a complete reaction of 2 moles of Hydrogen gas and 1 mole of Oxygen gas.

**Solution:**

The chemical reaction between Hydrogen gas and Oxygen gas to form of water gas is

$2H_2 + O_2 \rightarrow 2H_2O$

According to this reaction 1 mole of Oxygen gas and 2 moles of Hydrogen gas corresponds to 2 moles of water gas so number of moles equal 2. That's why the amount of water gas in grams (mass) is

$m(H_2O) = n(H_2O) \cdot M(H_2O)$, where m is mass in grams; n is number of moles; M is molar mass.

Molar mass $M = 2 \cdot 1 + 1 \cdot 16 = 18$ (g/mole)

Substituting data we obtain:

$m(H_2O) = 2 \cdot 18 = 36$ (g)

**Answer:** $m(H_2O) = 36$ g.

**Task 3**

Determine the volume of water gas resulting from the reaction in problem 2. Assume the volume of 22.4L for one mole of gas at STP (standard temperature and pressure)

**Solution:**

The chemical reaction between Hydrogen gas and Oxygen gas to form of water gas is

$2H_2 + O_2 \rightarrow 2H_2O$

If we know number of moles we can calculate the volume of water gas using formulae (at STP):

$V(H_2O) = n(H_2O) \cdot Vm$, where V is volume in liters; n is number of moles; Vm is molar volume.

Substituting data we obtain:

$V(H_2O) = 2 \cdot 22,4 = 44,8$ (l)

**Answer:** $V(H_2O) = 44,8$ l.

**Task 5**

Determine the number of kJ of heat produced by the reaction in problem 2. Convert this to Calories and then determine how much this amount of heat would change the temperature of 10 liters of liquid water.

**Solution:**

The chemical reaction between Hydrogen gas and Oxygen gas to form of water gas is

$2H_2 + O_2 \rightarrow 2H_2O$

The heat of reaction according to Hess's law we can calculate as:

$\Delta rH = 2\Delta H_{298}^0(H_2O) - (2\Delta H_{298}^0(H_2) + \Delta H_{298}^0(O_2))$

The value of standard enthalpy for simple substances is 0 so:

$\Delta rH = 2\Delta H_{298}^{0}(H_2O)$

We can determine the heat of reaction using reference data ($\Delta H_{298}^{0}(H_2O)$ = -241,84 kJ/mole):

$\Delta rH = 2\cdot(-241,84) = -483,68$ (kJ) = - 483680 (J)

**Answer:** $\Delta rH = -483,68$ (kJ).