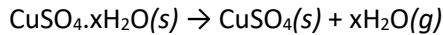


Contoh Soal Senyawa Hidrat dan Anhidrat beserta Pembahasannya

1. Hidrat tembaga (II) sulfat ($\text{CuSO}_4 \cdot x\text{H}_2\text{O}$) dipanaskan, maka massanya berkurang sebanyak 36%. Bagaimana rumus molekul hidrat tersebut? (Ar Cu = 63,5; S = 32; O = 16; H = 1)

Pembahasan:



$$\text{gr H}_2\text{O} = 36\% = 36 \text{ gr}$$

$$\text{gr CuSO}_4 = 100\% - 36\% = 64\% = 64 \text{ gr}$$

$$\text{Mr H}_2\text{O} = 18$$

$$\text{Mr CuSO}_4 = 159,5$$

$$n \text{H}_2\text{O} = \frac{\text{gr}}{\text{Mr}} = \frac{36}{18} = 2 \text{ mol}$$

$$n \text{CuSO}_4 = \frac{\text{gr}}{\text{Mr}} = \frac{64}{159,5} = 0,4 \text{ mol}$$

$$\frac{n\text{CuSO}_4}{\text{koefisien}} = \frac{n\text{H}_2\text{O}}{\text{koefisien}}$$

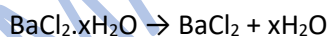
$$\frac{0,4}{1} = \frac{2}{x}$$

$$x = 5$$

Jadi, rumus hidrat tembaga sulfat tersebut adalah $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.

2. Senyawa hidrat barium klorida ($\text{BaCl}_2 \cdot x\text{H}_2\text{O}$) mengandung 14,75% air kristal. Tentukan rumus yang tepat untuk senyawa hidrat tersebut! (Ar Ba = 137, Cl = 35,5)

Pembahasan:



$$\text{gr H}_2\text{O} = 14,75\% = 14,75 \text{ gr}$$

$$\text{gr BaCl}_2 = 100\% - 14,75\% = 85,25 \text{ gr}$$

$$\text{Mr H}_2\text{O} = 18$$

$$\text{Mr BaCl}_2 = 208$$

$$n \text{H}_2\text{O} = \frac{\text{gr}}{\text{Mr}} = \frac{14,75}{18} = 0,8 \text{ mol}$$

$$n \text{BaCl}_2 = \frac{\text{gr}}{\text{Mr}} = \frac{85,25}{208} = 0,4 \text{ mol}$$

$$\frac{n\text{BaCl}_2}{\text{koefisien}} = \frac{n\text{H}_2\text{O}}{\text{koefisien}}$$

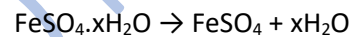
$$\frac{0,4}{1} = \frac{0,8}{x}$$

$$x = 2$$

Jadi, rumus senyawa hidrat barium klorida adalah $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$.

3. Sebanyak 10 gram senyawa hidrat besi (II) sulfat ($\text{FeSO}_4 \cdot x\text{H}_2\text{O}$) dipanaskan sehingga semua air kristalnya menguap. Massa zat padat yang tersisa adalah 5,47 gram. Bagaimana rumus senyawa hidrat tersebut?

Pembahasan:



$$\text{gr FeSO}_4 = 5,46 \text{ gr}$$

$$\text{gr H}_2\text{O} = 10 - 5,46 = 4,54 \text{ gr}$$

$$\text{Mr FeSO}_4 = 152$$

$$\text{Mr H}_2\text{O} = 18$$

$$n \text{FeSO}_4 = \frac{\text{gr}}{\text{Mr}} = \frac{5,46}{152} = 0,035 \text{ mol}$$

$$n \text{H}_2\text{O} = \frac{\text{gr}}{\text{Mr}} = \frac{4,54}{18} = 0,252 \text{ mol}$$

$$\frac{n\text{FeSO}_4}{\text{koefisien}} = \frac{n\text{H}_2\text{O}}{\text{koefisien}}$$

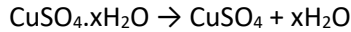
$$\frac{0,035}{1} = \frac{0,252}{x}$$

$$x = 7$$

Jadi, rumus senyawa hidrat besi (II) sulfat adalah $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$.

4. Sebanyak 4,99 gram hidrat $\text{CuSO}_4 \cdot x\text{H}_2\text{O}$ dipanaskan hingga terbentuk 3,19 gram tembaga (II) sulfat, maka harga x?

Pembahasan:



$$\text{gr CuSO}_4 = 3,19 \text{ gr}$$

$$\text{gr H}_2\text{O} = 4,99 - 3,19 = 1,8 \text{ gr}$$

$$\text{Mr CuSO}_4 = 160$$

$$\text{Mr H}_2\text{O} = 18$$

$$n \text{ CuSO}_4 = \frac{\text{gr}}{\text{Mr}} = \frac{3,19}{160} = 0,02 \text{ mol}$$

$$n \text{ H}_2\text{O} = \frac{\text{gr}}{\text{Mr}} = \frac{1,8}{18} = 0,1 \text{ mol}$$

$$\frac{n \text{ CuSO}_4}{\text{koefisien}} = \frac{n \text{ H}_2\text{O}}{\text{koefisien}}$$

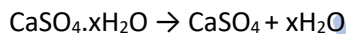
$$\frac{0,02}{1} = \frac{0,1}{x}$$

$$x = 5$$

Jadi, harga x adalah 5.

5. Sebanyak 8,6 gram mineral tersusun dari kalsium sulfat hidrat, $\text{CaSO}_4 \cdot x\text{H}_2\text{O}$. Jika mineral ini dipanaskan, akan menghasilkan 6,8 gram kalsium sulfat, CaSO_4 . Tentukan rumus molekul senyawa hidrat tersebut!

Pembahasan:



$$\text{gr CaSO}_4 = 6,8 \text{ gr}$$

$$\text{gr H}_2\text{O} = 8,6 - 6,8 = 1,8 \text{ gr}$$

$$\text{Mr CaSO}_4 = 136$$

$$\text{Mr H}_2\text{O} = 18$$

$$n \text{ CaSO}_4 = \frac{\text{gr}}{\text{Mr}} = \frac{6,8}{136} = 0,05 \text{ mol}$$

$$n \text{ H}_2\text{O} = \frac{\text{gr}}{\text{Mr}} = \frac{1,8}{18} = 0,1 \text{ mol}$$

$$\frac{n \text{ CaSO}_4}{\text{koefisien}} = \frac{n \text{ H}_2\text{O}}{\text{koefisien}}$$

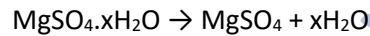
$$\frac{0,05}{1} = \frac{0,1}{x}$$

$$x = 2$$

Jadi, rumus molekul senyawa hidrat tersebut adalah $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$.

6. Jika 38 gr $\text{MgSO}_4 \cdot x\text{H}_2\text{O}$ dipanaskan akan memperoleh 20 gr MgSO_4 . Harga x dalam kristal $\text{MgSO}_4 \cdot x\text{H}_2\text{O}$ adalah

Pembahasan:



$$\text{gr MgSO}_4 = 20 \text{ gr}$$

$$\text{gr H}_2\text{O} = 38 - 20 = 18 \text{ gr}$$

$$\text{Mr MgSO}_4 = 120$$

$$\text{Mr H}_2\text{O} = 18$$

$$n \text{ MgSO}_4 = \frac{\text{gr}}{\text{Mr}} = \frac{20}{120} = 0,167 \text{ mol}$$

$$n \text{ H}_2\text{O} = \frac{\text{gr}}{\text{Mr}} = \frac{18}{18} = 1 \text{ mol}$$

$$\frac{n \text{ MgSO}_4}{\text{koefisien}} = \frac{n \text{ H}_2\text{O}}{\text{koefisien}}$$

$$\frac{0,167}{1} = \frac{1}{x}$$

$$x = 6$$

Jadi, harga x dalam kristal $\text{MgSO}_4 \cdot x\text{H}_2\text{O}$ adalah 6.