

Answer on Question #49699 – Chemistry – Physical Chemistry

Question:

Oxides of a metal containing 22.53% and 50.45% oxygen, and in the first valence metal oxide is II, and the second - VII. Based on calculations of equivalent weight metal oxides, name the metal.

Answer:

The empirical formula for the first oxide is MeO and the second oxide is Me₂O₇.

Mass percent of oxygen (**O**) = 22.53%

Mass percent of metal in oxide is (**Me**) = 100-22.53 = 77.47%

Number of moles of oxygen present in the oxide is

$$22.53/16.0 = 1.41 \text{ mol}$$

Ratio of **Me** to **O** in the oxide is

$$X:1.41 = 1:1$$

So, number atomic weight of **Me** present in the oxide is

$$77.74/M = 1.41$$

and $M = 77.74/1.41 \approx 55.13 \text{ g/mol}$.

It means that the unknown metal is iron (**Fe**).

The same is for the second metal oxide.

The empirical formula for the second oxide is Me₂O₇.

Mass percent of oxygen (**O**) = 50.45%

Mass percent of metal in oxide is (**Me**) = 100-50.45= 49.55%

Number of moles of oxygen present in the oxide is

$$50.45/16.0 = 3.15 \text{ mol}$$

Ratio of **Me** to **O** in the oxide is

$$X:3.15 = 2:7$$

$$\text{then } X = 2*3.15/7 = 0.9$$

So, number atomic weight of **Me** present in the oxide is

$$49.55/M = 0.9$$

and $M = 49.55/0.9 \approx 55.05 \text{ g/mol}$.

It once more confirms that the unknown metal is iron (**Fe**).

Answer: unknown metal is **iron (Fe)**.