

How to find a chemistry formula from compounds?
 for example like I have a compound consists of three compounds which are 43% of cellulose(C₆H₁₀O₅),35% of hemicellulose (C₅H₁₀O₅) and 22% of lignin (C₃₁H₃₄O₁₁)with the molecular mass of C is 12 g/mole,H is 1 g/mole and O is 16 g/mole.So how can I find the chemistry formula for this compounds?

Solution. All listed substances are an integral part of wood. Cellulose is an integral part of plant cell membranes; hemicelluloses provide non-covalent crosslinking of certain parts of the cellulose; lignin is part of the stiffened plant cells. In this regard, if you need to carry out some calculations, then take the mass of the mixture of substances in the amount of m grams and find the mass of cellulose, hemicellulose and lignin, multiplying the total mass by the percentage of each substance, that is, by 0.43, 0.35 and 0.22, respectively. The molar mass is calculated for one unit for each polysaccharide. So, the molar mass is:

- for cellulose: $M(C_6H_{10}O_5) = 6 * M(C) + 10 * M(H) + 5 * M(O) = 6 * 12 + 10 * 1 + 5 * 16 = 162$ g/mole;
- for hemicelluloses: $M(C_5H_{10}O_5) = 5 * M(C) + 10 * M(H) + 5 * M(O) = 5 * 12 + 10 * 1 + 5 * 16 = 150$ g/mole;
- for lignin: $M(C_{31}H_{34}O_{11}) = 31 * M(C) + 34 * M(H) + 11 * M(O) = 31 * 12 + 34 * 1 + 11 * 16 = 582$ g/mole.

We can calculate the average molar mass of reduced wood composition as follows. We take 1 gram of wood. Then the masses of the components (cellulose, hemicellulose and lignin) are calculated as above, that is, the mass of cellulose will be 0.43 grams, the mass of hemicelluloses will be 0.35 grams, and the mass of lignin will be 0.22 grams.

Now we know the composition of wood with a mass of 1 gram and the molar masses of the components of wood, then we find the average molar mass of wood of the above composition.

It can be found by the formula:
$$M_{av} = \frac{1g}{\frac{m(C_6H_{10}O_5)}{M(C_6H_{10}O_5)} + \frac{m(C_5H_{10}O_5)}{M(C_5H_{10}O_5)} + \frac{m(C_{31}H_{34}O_{11})}{M(C_{31}H_{34}O_{11})}} = \frac{1}{\frac{0.43}{162} + \frac{0.35}{150} + \frac{0.22}{582}} = 187.6$$
 g/mole.

Answer: 187.6 g/mole.

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