

ORGANIC CHEMISTRY- TUTORIAL 1 : QUANTITATIVE ANALYSIS

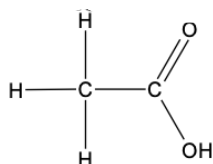
1. 0.70 g of an Organic compound having S was reacted with fuming HNO_3 and was heated to a high temperature. After cooling, excess BaCl_2 solution was added to it. The resulting white precipitate (BaSO_4) was separated and was weighed after drying. The total mass so obtained was 1.37 g. Calculate percentage of Sulphur in the Organic compound (Ba = 137, S= 32, O= 16)-26.8%
2. 1.90 g of the Organic compound having Br was reacted in a closed vessel with fuming HNO_3 and AgNO_3 . The weight of the so obtained AgBr was 2.61 g. Calculate the percentage of Br in the compound. (Br = 80; Ag = 108)-58.4%
3. A compound is known to be composed of 71.65 % Cl, 24.27% C and 4.07% H. Its molar mass is known to be 98.96 g mol^{-1} . What is its molecular formula? - $\text{C}_2\text{H}_4\text{Cl}_2$
4. An organic compound contains C, H and O only. There is 48.65 % of C and 43.19% of O. The molecular weight of this compound is 74. Determine the molecular formula of the compound. $\text{C}_3\text{H}_6\text{O}_2$
5. An organic compound contains 73.3% of C, 3.8 % of H, 12.2% of O and 10.7% of N. The relative molecular weight of this compound is 262. Determine the molecular formula of this organic compound. $\text{C}_{16}\text{H}_{10}\text{O}_2\text{N}_2$
6. 10 cm^3 of the gaseous hydrocarbon was mixed with 80 cm^3 of oxygen in excess and was reacted fully. Upon cooling to the room temperature this had a volume of 70 cm^3 . The mixture was then passed through a solution of KOH and resulted in a volume of 50 cm^3 . Determine the molecular formula of the gaseous hydrocarbon. C_2H_4
7. 15 cm^3 of a gaseous hydrocarbon was reacted with excess O_2 (volume of 105 cm^3) and was reacted fully by making a spark. Upon cooling this yielded a volume of 75 cm^3 . The resulting gaseous mixture was bubbled through a solution of KOH and the volume so obtained was 30 cm^3 . Determine the molecular formula of the hydrocarbon. C_3H_8
8. The molecular formula of a gaseous organic compound is $\text{C}_n\text{H}_{3n}\text{O}_m$. 16 mL of this hydrocarbon was mixed with 60 cm^3 of oxygen and was reacted by applying a spark. Upon cooled to room temperature this gave a volume of 44 mL. The mixture was then bubbled up through a solution of KOH and the resulting volume was 12 cm^3 . Determine the molecular formula of this compound. $\text{C}_2\text{H}_6\text{O}$
9. An 11.5 mL of a gaseous hydrocarbon was mixed with excess oxygen and was reacted completely. The total volume decreased by 34.5 mL after the reaction (measured at Room temperature). The resulting gaseous species were bubbled through a KOH solution and the volume decreased by another 34.5 cm^3 . Determine the molecular formula of the hydrocarbon. C_3H_8

10. An organic compound contains C, H, O and N only. The percentage of C is 73.3% and that of H and N are 3.8% and 10.7% respectively. If the molecular mass of this compound is 262 determine the molecular formula of this compound. C_2H_6O
11. The organic compound Y has C, H and O only. When Y is completely reacted with oxygen the resulting molar ratio of CO_2 and H_2O are 2:1. The accurate molecular mass of Y is 152. The O content as a weight is less than 40%. Determine the molecular formula of Y. $C_8H_8O_3$
12. The compound Y(15 mL), which is a gaseous hydrocarbon, was mixed with excess volume of oxygen. This was combusted with an electric spark and the resulting volume was measured at room temperature and pressure. The total volume dropped by 30 mL. The gaseous sample was then bubbled up through a concentrated KOH and the volume decreased by another 45 mL. Determine the molecular formula of this compound. C_3H_4
13. The compound P contains C, H, N and O. The percentages of C, H, N are 47.4%, 2.63% and 18.4%. The molecular weight of P is roughly 150. Determine the molecular formula of P. $C_6H_4N_2O_3$
14. The compound A has a molecular formula of $RCOOH$. There is only C and H in R. This yielded CO_2 : H_2O in 44:9 mass ratio upon complete combustion. The mass spectra data give the relative atomic mass of A as 160. Determine the molecular formula of A. $C_{10}H_{10}O_2$
15. The compound K has only C, O and H. This yielded CO_2 : H_2O in 1:0.75 molar ratio upon complete combustion. The mass spectra data give the relative atomic mass of 102. Determine the molecular formula of K. ($C_4H_6O_3$)
16. The compound P contains C, H, N and O. The percentages of C, H, N are 37.0%, 2.2% and 18.5%. The rough molecular weight of P is 200. Determine the molecular formula of P. ($C_7H_5O_6N_3$)
17. A compound A contains C, H and O. There are 2 carboxylic groups in one molecule of A and there is another functional group with an Oxygen atom. Upon combustion A yielded CO_2 and H_2O in 2:1 molar ratio. The relative molecular mass of A is 130. Determine the molecular formula of A. ($C_4H_4O_5$)
18. A 20 mL of the gaseous hydrocarbon was mixed with 80 mL of oxygen and was combusted. The volume of the cooled mixture was 50 mL. The gas was passed through concentrated KOH and the remaining volume is 10 mL. Determine the molecular formula of the hydrocarbon if the volumes were measured at constant temperature and pressure. C_2H_6

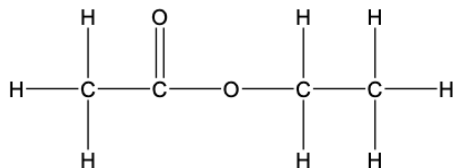
19. The volumes measured are of standard temperature and pressure. A gaseous hydrocarbon (10 mL) was mixed with excess oxygen in a closed vessel and was ignited by an electric spark. The mixture was allowed to reach STP and the total volume decreased by 25 mL. The remaining gaseous sample was bubbled through concentrated KOH and the volume dropped by another 20 mL. Determine the molecular formula of the hydrocarbon. C_2H_6
20. An 18 mL sample of the gaseous hydrocarbon was reacted with dried O_2 (180 mL) and was ignited. When the mixture was cooled the volume dropped by 54 mL. The resulting gaseous mixture was bubbled through a concentrated KOH solution and the amount of oxygen left was 18 mL. If all these measurements were made at same temperature and pressure, then determine the molecular formula of the hydrocarbon. C_7H_8
21. When a 10 mL gaseous hydrocarbon was mixed with excess amount of oxygen, the total volume was 110 mL. The mixture was ignited and then cooled. The total volume was 80 mL. The remaining gaseous mixture was passed through a concentrated solution of KOH and the remaining volume was 50 mL. Determine the molecular formula of this compound. C_3H_8

Identify the following functional groups

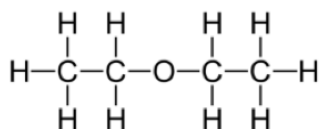
a.



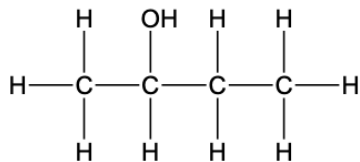
b.



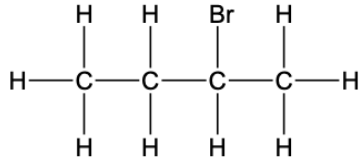
c.



d.



e.



Identify the functional groups present in these molecules.

