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| https://upload.wikimedia.org/wikipedia/en/3/33/BSHS_Logo.jpg | Bunbury Senior High School | | | | | |
| **CHEMISTRY UNIT 3 & 4** | | | | | | |
| **Practical Test:** | | | | | | |
| **Identifying Unknown Organic Compounds** | | | | | | |
|  | | | | | | |
| **NAME:** | | |  | | | |
|  | | |  | | | |
| **Time allowed for this paper** | | | | | | |
| Reading time: | | 5 minutes | | | | |
| Working time: | | 50 minutes | | | | |
|  | | | | | | |
| **Marks for investigation:** | | | | | | |
| Section | | | Marks available | Marks obtained | | Weighted mark |
| Empirical formula calculations | | | 37 | \_\_\_\_\_ / 37 | | \_\_\_\_\_ / 25 |
| Chemical tests and identification | | | TBA | \_\_\_\_\_ / \_\_\_\_\_ | | \_\_\_\_\_ / 75 |
|  | | |  | | **Total** | \_\_\_\_\_\_ / 100 |

Substance A

Substance A was analysed for carbon, hydrogen and oxygen. The sample was found to contain 62% carbon, 10% hydrogen and 28% oxygen by mass. The molecular weight of the compound was found to be approximately   
58 g mol-1. Find the empirical formula and molecular formula of Substance A. **(6 marks)**

Substance C

EMPIRICAL FORMULA OF ‘A’: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

MOLEUCLAR FORMULA OF ‘A’: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Substance C is a colourless liquid. The substance known to contain carbon, hydrogen and oxygen.

* A 2.05 g sample of the colourless liquid underwent combustion in an excess of oxygen, producing 4.87 g of carbon dioxide.
* A separate 1.66 g sample underwent combustion in an excess of oxygen, producing 2.02 g of water.
* A separate analysis revealed a molecular weight of approximately 70-80 g mol-1.

Calculate the empirical formula and molecular formula of the compound. **(11 marks)**

Substance E

EMPIRICAL FORMULA OF ‘C’: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

MOLEUCLAR FORMULA OF ‘C’: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Substance E has an empirical formula of CH2. A 0.92 g sample of the colourless liquid was vapourised and found to occupy 350 mL at 118 °C and 101.5 kPa. Calculate the molecular weight of the compound, and hence find the molecular formula of the compound. **(6 marks)**

Substance F

MOLEUCLAR FORMULA OF ‘E’: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Substance F is a colourless liquid. The substance was known to contain carbon and hydrogen. It is difficult to test for the presence of oxygen in organic compounds, so oxygen may or may not be present in substance F.

* A 0.45 g sample of the compound was combusted in an excess of oxygen, producing 0.493 g of water and 0.797 L of carbon dioxide gas at 22.4 °C and 101.3 kPa.
* The density of the colourless liquid at 25 °C was measured to be 0.811 g/mL. A 5.00 mL aliquot of this liquid was collected using a volumetric pipette and then vaporised at a temperature of 114 °C. The resulting vapour was transferred to a 1.00 L container and the pressure of the vapour was measured to be 159 kPa.

From the information provided, calculate the molecular formula and empirical formula of substance F. **(14 marks)**

EMPIRICAL FORMULA OF ‘F’: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

MOLEUCLAR FORMULA OF ‘F’: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_