Question 30 **(15 marks)**

Salvarsan is an organic compound that contains the elements: carbon (C), hydrogen (H), arsenic (As), chlorine (Cℓ), nitrogen (N) and oxygen (O). It was one of the first drugs used in chemotherapy and for treating sleeping sickness.

The empirical formula of this compound can be determined in a series of analyses. One process involves the reaction of a known mass of Salvarsan with excess strong acid to convert all the chlorine into aqueous chloride ions.

(a) Describe the laboratory process involved in determining the mass of chlorine in this sample of Salvarsan once it has been treated with the acid. You should reference any chemicals used and include a balanced equation in your answer. (6 marks)

The results of these analyses using 5.22 g samples determined that it contained:

- 32.83% carbon by mass
- 3.21% hydrogen by mass
- 1.78 g of arsenic
- 16.18% of chlorine by mass
- 6.38% of nitrogen by mass.

(b) Use this information to calculate the empirical formula of Salvarsan. Show **all** workings.

(9 marks)