**Question 35** **(16 marks)**

A chemical, commonly called iopromide (IOP), is used to enhance the images produced by a medical procedure called a CT scan. It contains carbon, hydrogen, iodine, nitrogen and oxygen, $C_vH_wI_xN_yO_z$.

Use the following information to determine the molecular formula of IOP.

- The molar mass of IOP is 791.102 g $mol^{-1}$.
- A 5.62 g sample of IOP contained 0.2986 g of nitrogen, N.
- A 3.54 g sample of IOP is fully combusted to produce;
  - 1.72 L of carbon dioxide gas, $CO_2(g)$, at 125 °C and 155.3 kPa.
  - 0.967 g of water vapour, $H_2O(g)$.
- All of the iodine contained in a 2.523 g sample of IOP is converted to iodide, $I^-$. This sample is then dissolved in water and excess lead(II) nitrate solution, $Pb(NO_3)_2(aq)$, is added to precipitate the iodine as lead(II) iodide, $PbI_2(s)$. This produced 2.21 g of lead(II) iodide.