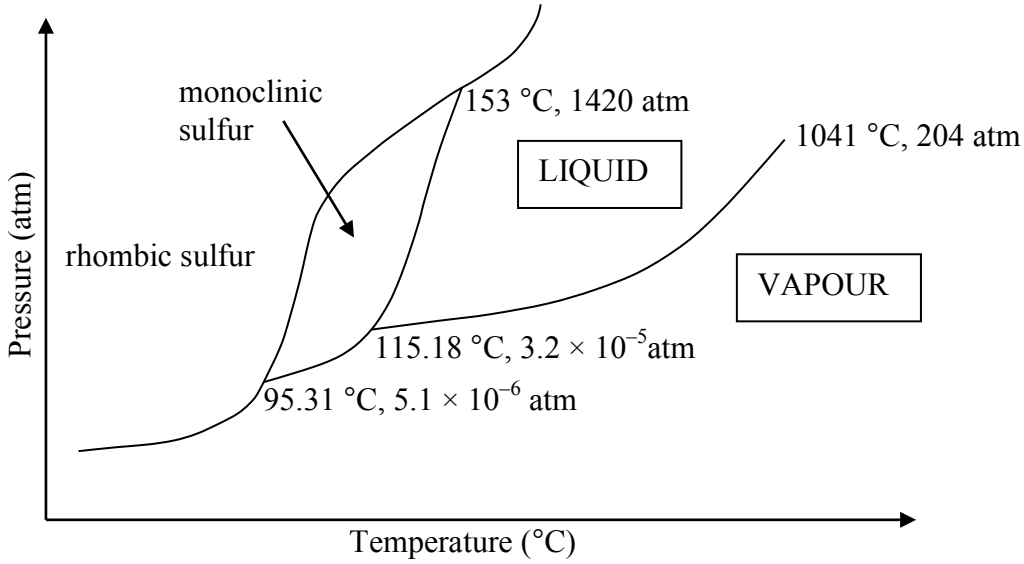
Marks 9

- Solid sulfur can exist in two forms, rhombic sulfur and monoclinic sulfur. A portion of the phase diagram for sulfur is reproduced schematically below. Complete the diagram by adding the labels "vapour" and "liquid" to the appropriate regions.



Which form of solid sulfur is stable at 25 °C and 1 atm? **rhombic**

Describe what happens when sulfur at 25 °C is slowly heated to 200 °C at a constant pressure of 1 atm.

It changes into the monoclinic form and then it melts.

How many triple points are there in the phase diagram? **3**

What phases are in equilibrium at each of the triple points?

- **rhombic, monoclinic and vapour (at 95.31 °C and 5.1 × 10^{-6} atm);**
- **monoclinic, liquid and vapour (at 115.18 °C and 3.2 × 10^{-5} atm);**
- **rhombic, monoclinic and liquid (at 153 °C and 1420 atm);**

Which solid form of sulfur is more dense? Explain your reasoning.

Rhombic is denser. If you start in the monoclinic region and increase the pressure at constant temperature *(i.e.* draw a vertical line upwards) you move into the rhombic region. Rhombic is thus the more stable form at higher pressures, so must be denser.