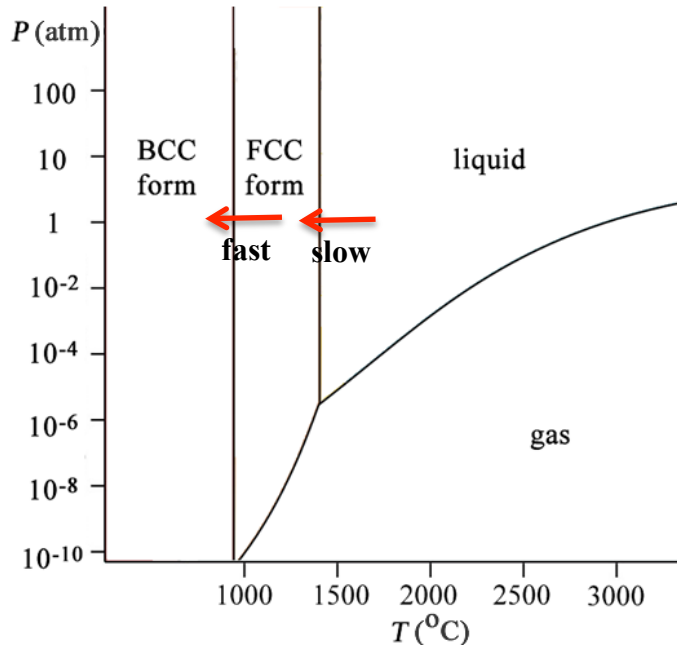


- A simplified phase diagram for iron is shown below.

Marks
5



Which form of iron is stable at room temperature and pressure?

BCC form

If molten iron is cooled slowly to around 1200 °C and then cooled rapidly to room temperature, the FCC form is obtained. Draw arrows on the phase diagram to indicate this process and explain why it leads to the FCC form.

See diagram above.

The rapid cooling from 1200 to 25 °C does not allow time for the atoms in the FCC arrangement to reorganise themselves into the more stable BCC structure. The atoms have insufficient energy for the considerable re-arrangement of their positions to occur.

The line dividing the BCC and FCC forms is almost, but not quite vertical. Given that the FCC form is more efficiently packed, predict which way this line slopes. Explain your answer.

FCC is more efficiently packed so is more dense. Increasing the pressure favours the more dense form.

The BCC/FCC equilibrium line slopes to the left so that moving vertically (i.e. increasing pressure) at the BCC/FCC equilibrium leads to FCC.