Problem 11.5

a.) $\overline{\Delta G_{O_2}} = \overline{\Delta H_{O_2}}(x) - T\overline{\Delta S_{O_2}}(x)$

From figure 11.10 for x=0.2

$\overline{\Delta H_{O_2}}$=-315 kJ/mole

$\overline{\Delta S_{O_2}}$=-0.126 kJ/mole-°K

$\overline{\Delta G_{O_2}}$=-315 + 1873 • 0.126
= -79 kJ/mole

$$\Pi_{O_2} = \exp\left(\frac{\overline{\Delta G_{O_2}}}{RT}\right)$$

$$= \exp\left(-\frac{79}{8.31 \bullet 1.873}\right)$$
= 0.0062 atm

From figure 11.6

Π_{O_2-} = 0.01 atm

b.) Following the Π_{O_2-} = 0.01 atm isobar, U_5O_{13} precipatates out at point Q, T= 1350°K

The other phase is $UO_{2.25}$

c.) Cooling at constant $\frac{O}{U}$ to 800 °C (point R) the

two phases present are;

$$UO_{2.17} \text{ @ } R'$$
$$UO_{2.23} \text{ @ } R''$$

Relative Amounts- (assuming 1 mole of $UO_{2.2}$ initially)

Let f = fraction of $UO_{2.17}$ in the mixture

Oxygen Balance:

$$2.17 f + 2.23(1-f) = 2.2$$

$$f=0.5$$

$$\Pi_{O_2} \approx 5 \times 10^{-10} \text{ atm @ } T$$