A doctor recommends to a pregnant woman that she takes an iron supplement of 50 mg (as Fe$^{2+}$) daily. To achieve this, what mass (to the nearest mg) of iron(II) gluconate-2-water, FeC$_{12}$H$_{22}$O$_{14}$\cdot2H$_2$O, would be required?

What is the mass of each of the following at 298 K and 101 kPa pressure?

(i) argon (24.5 litre)

(ii) water (24.5 litre)

(iii) chlorine (12.25 litre)

(iv) zinc (1.00 mole)
The final step in the industrial production of urea, \( \text{CO(NH}_2\text{)}_2 \), is:

\[
\text{CO}_2(\text{g}) + 2\text{NH}_3(\text{g}) \rightarrow \text{H}_2\text{O}(\text{g}) + \text{CO(NH}_2\text{)}_2(\text{s}) \quad \Delta H^\circ = -90.1 \text{ kJ mol}^{-1}
\]

Using the following data, calculate the standard enthalpy of formation \( \Delta H^\circ_f \) of solid urea.

\[
\begin{align*}
\text{4NH}_3(\text{g}) + 3\text{O}_2(\text{g}) & \rightarrow 6\text{H}_2\text{O}(\text{g}) + 2\text{N}_2(\text{g}) \quad \Delta H^\circ = -1267.2 \text{ kJ mol}^{-1} \\
\text{C}(\text{s}) + \text{O}_2(\text{g}) & \rightarrow \text{CO}_2(\text{g}) \quad \Delta H^\circ = -393.5 \text{ kJ mol}^{-1} \\
\text{2H}_2(\text{g}) + \text{O}_2(\text{g}) & \rightarrow 2\text{H}_2\text{O}(\text{g}) \quad \Delta H^\circ = -483.6 \text{ kJ mol}^{-1}
\end{align*}
\]

\[\Delta H^\circ_f = \]

The formation of urea in this process is only spontaneous above 821 °C. What is the value of the entropy change \( \Delta S^\circ \) (in J K\(^{-1}\) mol\(^{-1}\)) for the reaction?

\[\Delta S^\circ = \]

Rationalise the sign of \( \Delta S^\circ \) in terms of the physical states of the reactants and products.