

Given that haemoglobin contains 4 Fe atoms per molecule and its concentration in blood is 15 g per 100 mL, calculate the total mass of Fe in the patient's blood *before* being treated with Desferal. (The molar mass of haemoglobin is  $6.45 \times 10^4 \text{ g mol}^{-1}$ .)

**Marks**  
**4**

**In 5.04 L, the total mass of haemoglobin is  $15 \times (5.04 \times 10^3 / 100) = 756 \text{ g}$ . If the molar mass is  $6.45 \times 10^4 \text{ g mol}^{-1}$ , this corresponds to**

$$\begin{aligned}\text{moles of haemoglobin} &= \text{mass} / \text{molar mass} \\ &= (756 \text{ g}) / (6.45 \times 10^4 \text{ g mol}^{-1}) = 0.0117 \text{ mol}\end{aligned}$$

**As haemoglobin contains 4 Fe atoms, the number of moles of Fe is  $4 \times 0.0117 \text{ mol} = 0.0469 \text{ mol}$ . There is also 3.2105 mol of free  $\text{Fe}^{3+}$  present (from 2004-J-3) so the total number of moles of Fe is  $(0.0469 + (3.2105 \times 10^{-3})) \text{ mol} = 0.050 \text{ mol}$ .**

**The mass of Fe is given by moles  $\times$  atomic mass:**

$$\text{mass of Fe} = (0.050 \text{ mol}) \times (55.85 \text{ g mol}^{-1}) = 2.80 \text{ g}$$

**ANSWER: 2.80 g**

**THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY**