

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

moles of haemoglobin = mass / molar mass

$$= (756 \text{ g}) / (6.45 \times 10^4 \text{ g mol}^{-1}) = 0.0117 \text{ mol}$$

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 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: 2.8 g

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