Deacon's Challenge No. 67 Answer

How many mL of hydrochloric acid (SG 1.16) are required to prepare 500 mL of 2.5 molar hydrochloric acid? The purity of the acid is 32% w/w.

MW hydrochloric acid (HCl) = 1 + 35.5 = 36.5

Therefore weight of pure acid required to make 1 L of 1M HCl = 36.5 g

Weight of pure acid required to make l L of 2.5 M HCl = 36.5 x 2.5 g

Weight of pure acid required to make 500 mL (i.e. 0.5 L) of 2.5 M HCl

= 36.5 x 2.5 x 0.5 g

Since HCl has a purity of 32% w/w, the weight of SG 1.16 HCl required is more than this

i.e. $\frac{36.5 \times 2.5 \times 0.5 \times 100}{\%\ \text{purity}} = \frac{36.5 \times 2.5 \times 0.5 \times 100}{32} = 142.6$ g

Since Density (g/mL) = $\frac{\text{Weight (g)}}{\text{Volume (mL)}}$ then, Volume (mL) = $\frac{\text{Weight (g)}}{\text{Density (g/mL)}}$

Substitute weight = 142.6 g, density = 1.16 g/mL

Volume = $\frac{142.6}{1.16}$ = **123 mL** (3 sig figs)

Question 68

The following results were obtained for two different serum samples:

	Sample 1	Sample 2
Measured calcium (mmol/L)	1.85	2.52
Albumin (g/L)	23	52

Stating any assumptions you make, use these data to derive an expression to "adjust" serum calcium to a "normal" albumin concentration of 40 g/L.