Deacon's Challenge
No 110 - Answer

Your bench method for making up a 0.2 mol/L solution of anion X⁻ requires you to dissolve 53.65 g of salt A.X heptahydrate in water to a solution volume of 1L. You mistakenly use the anhydrous salt instead. What volumes of water and your solution must be mixed together to correct for this error and produce a final solution of volume 1L.

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First calculate the molecular weights of both chemicals:

$$\text{Concentration (mol/L)} = \frac{\text{Concentration (g/L)}}{\text{Molecular weight}}$$

$$\text{Therefore molecular weight (MW)} = \frac{\text{Concentration (g/L)}}{\text{Concentration (mol/L)}}$$

For salt A.X heptahydrate concentration = 53.65 g/L = 0.2 mol/L

$$\text{MW salt A.X heptahydrate} = \frac{53.65}{0.2} = 268 \text{ (3 sig figs)}$$

MW anhydrous salt A.X = MW salt A.X heptahydrate - (7 x MW H_2O)

MW H_2O = (2 x 1) + 16 = 18

Therefore MW anhydrous salt A.X = 268 - (7 x 18) = 268 - 126 = 142

$$\text{Actual concentration of solution} = \frac{\text{Concentration (g/L)}}{\text{MW anhydrous salt A.X}} = \frac{53.65}{142} = 0.378 \text{ mol/L}$$

To prepare dilution:

$$M_1 \times V_1 = M_2 \times V_2$$

Where M_1 = Required concentration = 0.200 mol/L

V_1 = Required volume = 1 L

M_2 = Stock concentration concentration = 0.378 mol/L

V_2 = Volume of stock to dilute to V1 = ?

0.200 x 1 = 0.378 x V_2

$$V_2 = \frac{0.200 \times 1}{0.378} = 0.53 \text{ L (2 sig figs)}$$

Alternatively the volume required is simply the ratio of the two molecular weights!

$$\text{Volume required} = \frac{\text{MW } Na_2HPO_4}{\text{MW } Na_2HPO_4.7H_2O} = \frac{142}{268} = 0.53 \text{ L}$$

Therefore 530 mL of the solution is mixed with 470 mL water to give 1 L of solution with the correct concentration (or preferably 530 mL of the solution is made up to 1 L with water).

Question 111

A man with Type 2 diabetes was admitted in a hyperosmolar coma with a plasma glucose concentration of 55 mmol/L and a plasma sodium concentration of 130 mmol/L. His body weight at that time was 70 Kg. He was started on an insulin sliding scale and given an infusion of two litres of 0.9% saline over two hours (total sodium input 308 mmol), during which time he produced two litres of urine, with a total sodium excretion of 30 mmol. After two hours his plasma glucose concentration had fallen to 15 mmol/L. Estimate his plasma sodium concentration at that time.

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ACB South West and Wessex Region
Topical Liver Disease

Thursday 1st July 2010
Frenchay Hospital, Bristol

10.00-10.30	Registration and Coffee
10.30-11.10	Tumour Markers and The Liver *Dr Cathie Strugeon*
11.10-11.50	The ELF Test *(To be confirmed)*
11.50-12.30	Metabolic Liver Disease *Dr Berenice Lopez, Southmead Hospital*
12.30-13.30	Lunch/Trade Exhibition
13.30-14.10	Haemachromatosis *(To be confirmed)*
14.10-14.50	Autoimmunity and the Liver *Dr Edward Davies*
14.50-15.20	Tea/Trade Exhibition
15.20-16.00	Fibroscan *Dr R Przemioslo, Frenchay Hospital*
16:00-16:40	Liver Disease in Pregnancy *(to be confirmed)*

Registration cost is just £20 for ACB and IBMS Members, £10 for Grade A trainees, £25 to others. Closing date 25th June 2010. For further details and to register on-line please visit acbsww.org.uk or contact Dr Julie Wassell, Clinical Biochemistry, Southmead Hospital, Bristol BS10 5NB. E-mail Julie.wassell@nbt.nhs.uk Tel: 0117-323-8514