Module: BIOM - 1007 **Lecturer: Dr Weldon** **Date: 28/10/16**

Dilutions and Titrations

- Sometimes you know the concentration of a solution but it's not what you require
  - Therefore, you must dilute the stock solution
    - The amount of substance (mol) is the **same in the diluted sample as the undiluted sample**
    - The volume is the only variable that changes

- To dilute a sample, **take the volume of the original solution and add a known volume of solvent** to produce a more dilute solution
  - The undiluted and diluted sample has the following equations respectively:
    - **Moles = $C_1 \times V_1$**
    - **Moles = $C_2 \times V_2$**
  - Therefore: **$C_1V_1 = C_2V_2$**

- For example, if you have 100ml of a 2M HCL solution and you add 900ml of H_2O, what is the concentration of the diluted sample?
  - It will be 0.1x2 = 1(c)
    - It will then be 0.2/1 = c
    - C = 0.2 mol L^{-1}

- **You can also work out the volume needed to give a certain concentration in a diluted solution**, for example:
  - If the concentration of the undiluted sample is 2M, the volume is 0.2L and the concentration of the diluted solution is 0.2M then the volume of the new solution will be:
    - (0.2x2)/0.2 which is 2L

- Sometimes you need to dilute a solution by a significant amount, and so this is done using **serial dilutions**
  - This is done by **adding small dilutions to the stock solution** and then taking that as the **new stock solution**. This is then **repeated and yields many different sample dilutions**

- **Titration** is used to directly measure the concentration of a sample
  - This is done using a **series of chemical reactions to measure amounts in a sample**
  - The **production of a product** is key in this process
    - **A burette is used to deliver the second reactant to a flask** and an **indicator** is used to **detect the endpoint of the reaction**

- A **coupled reaction** is when the product from one reaction is then used straight way as the ingredient for another reaction, for instance A+B=C and C+D=E, therefore you cannot get E without A or B

- **UV spectroscopy** can be used to detect the concentration of a sample:
  - **The amount of light that passes through the sample is indirectly proportional to the concentration**
    - In a **low concentration**, **much light** passes through the sample
    - In a **high concentration**, **little light** passes through
  - The **Beer-Lambert** law states that the **absorbance of light is equal to the molar absorptivity (L mol^{-1} cm^{-1}) (ε) x the concentration (mol L^{-1}) (c) x the path length (cm) (l):**

$$A = \varepsilon c l$$