Dilution and pH calculations

$$pH = -\log_{10}[H_3O^+]$$

$$10^{-14} = [H_3O^+][OH^-]$$

$$C_1V_1 = C_2V_2$$

Using the three formulae shown on the right answer the following questions.

1) Calculate the pH of a solution that has an $[H_3O^+]$:
   i. 10^{-4} M

   ii. 0.35 M

   iii. 4.52×10^{-4} M

2) Calculate the pH of a solution that has an $[OH^-]$:
   i. 10^{-6} M

   ii. 0.78 M

   iii. 3.6×10^{-10} M

3) Consider the table below. It represents changes made to an original solution. All solutions are at 25°C. Complete the table.

Volume of original solution (mL)	pH	Volume of water added (mL)	New pH
300	0.55	200	
150		350	1.20
200	4.52		6.33
	2.34	100	3.53

4) A 350mL sample of an acid solution at 25°C has 4.52 grams of HCl dissolved in it.

i. Knowing that HCl is a strong acid what can be assumed about the ionisation of HCl in water?

ii. Calculate the $[OH^-]$ of the resulting solution.

iii. What is the pH of the solution that results?

iv. 150 mL of distilled water is added to the 350 mL acid solution. Calculate the pH of the resulting solution.

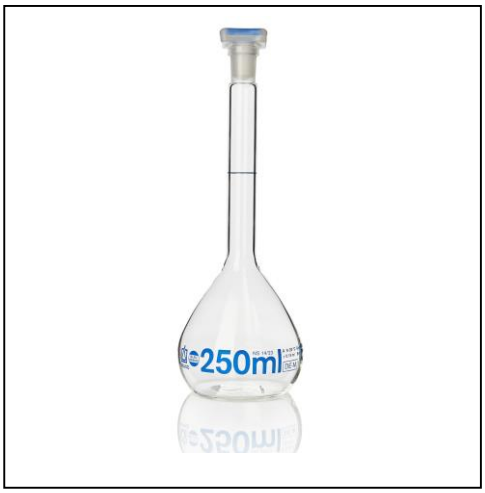
5) Consider a 400 mL solution, at 25°C, with a $[H_3O^+]$ of $10^{-3.524}$ M.

i. Calculate the $[OH^-]$

ii. Calculate the pH of the solution.

iii. Calculate the pH of the resulting solution when 200 mL of distilled water is added to the 400 mL solution.

6) Consider a solution that is made up by placing 0.512 g of calcium hydroxide ($Ca(OH)_2$) in a 250 mL volumetric flask and made to the mark with distilled water.



i. Calculate the molarity of the $Ca(OH)_2$ solution.

ii. Calculate the $[OH^-]$

iii. Calculate the $[H_3O^+]$

iv. Calculate the pH of the solution.