

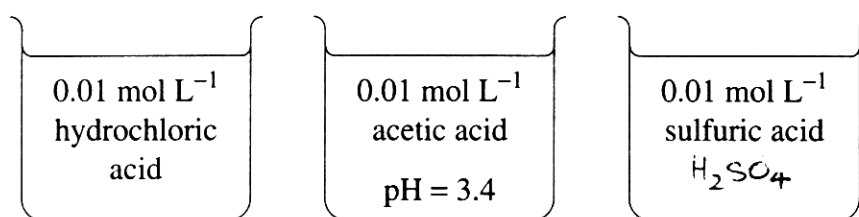
Chemistry

Section I – Part B (continued)

Marks

Question 22 (5 marks)

Solutions of hydrochloric acid, acetic acid and sulfuric acid were prepared. Each of the solutions had the same concentration (0.01 mol L^{-1}). The pH of the acetic acid solution was 3.4.



- (a) Calculate the pH of the hydrochloric acid solution. 1

$$\text{pH} = -\log[\text{H}^+] = 2$$

- (b) Compare the pH of the sulfuric acid solution to the pH of the hydrochloric acid solution. Justify your answer. (No calculations are necessary.) 2

As sulfuric acid is a diprotic acid, there are twice as many H^+ ions in the solution as hydrochloric acid, which is single protic. Therefore, it is a stronger acid than HCl and accordingly, the pH of H_2SO_4 will be lower than hydrochloric acid.

- (c) Explain why the acetic acid solution has a higher pH than the hydrochloric acid solution. 2

Hydrochloric acid is a strong acid as it is almost completely ionised in water, thus the concentration of H^+ ions is around 100%, meaning the pH is lower. Acetic acid is a weak acid as it is not completely ionised, and the H^+ concentration is lower, therefore the pH is a higher value.