IB Chemistry II Study Worksheet 18.2 Buffer Solutions

1. (i) Identify two substances that can be added to water to form a basic buffer solution. (ii) Describe what happens when a small amount of acid solution is added to the buffer solution described in (i). Use an equation to support your answer.

2. A buffer solution can be prepared by adding which of the following to $50cm^3$ of 0.10 $moldm^{-3}$ solution of CH_3COOH?

I. $50cm^3$ of 0.10 $moldm^{-3}$ solution of CH_3COONa
II. $25cm^3$ of 0.10 $moldm^{-3}$ solution of NaOH
III. $25cm^3$ of 0.10 $moldm^{-3}$ solution of NaCl

A. I only
B. I and II only
C. II and III only
D. I, II and III only

3. a) State what is meant by a buffer solution. b) State and explain whether each of the following solutions will form a buffer solution:

(i) A 1.0 dm^3 solution containing 0.10 mol NH_3 and 0.20 mol HCl
(ii) A 1.0 dm^3 solution containing 0.20 mol NH_3 and 0.10 mol HCl

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4. A buffer solution that contains ethanoic acid and sodium ethanoate has a pH=4.0. How could the pH of this solution be changed to 5.0?

A. Dilute 10cm_3 of the solution to 100cm_3
B. Add more sodium ethanoate
C. Add more ethanoic acid
D. Add equal moles of ethanoic acid and sodium ethanoate

5. Give the relative amounts of NaOH and CH_3COOH needed to form a buffer solution and outline your reasoning. [no calculations necessary].

6. Calculate the pH of a mixture of 50cm^3 of ammonia solution of concentration 0.10 $moldm^{-3}$ and 50cm^3 of hydrochloric acid solution of concentration 0.050 mol dm^{-3}. pK_b (NH_3) = 4.75

7. Calculate the pH of a buffer solution containing 0.0500 $moldm^{-3}$ of ethanoic acid (Ka = 1.74 x 10^{-5}) and 0.100 mol dm^{-3} of sodium ethanoate.

8. 60 cm^3 of 0.100 mol dm^{-3} CH_3COOH is placed in a beaker and mixed with 20 cm^3 of 0.100 mol dm^{-3} KOH.

a) Explain, with the help of an equation, how the solution formed acts as a buffer solution when a small quantity of acid is added to it.
b) Calculate the pH of the buffer solution. (K_a of CH_3COOH = 1.74 x 10^{-5} mol dm^{-3})

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