CHEMISTRY DEPARTMENT 2023
S.6 BRAINSTORMING TEST
TOPIC; IONIC EQUILIBRIA
SUB-TOPIC; BUFFER SOLUTIONS

NAME……**INDEX number**…….
Signature …… **expected score(%)**…….
Instructions; Attempt *all questions in this paper.*

1. (a). Define the tem **buffer solution** (01 mark)

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(b). Explain the mode of action of an acidic buffer solution (06 marks)

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(c). **50cm^3** of a **0.05M** ethanoic acid was added to **50cm^3** of **0.02M** sodium hydroxide solution

(i). Write an equation for the reaction that took place. (1½ marks)

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(ii). Calculate the pH of the resultant solution at 25°C (04 marks)
(Ka for ethanoic acid is **1.8 × 10^{-5}** $moldm^{-3}$)

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(d). Calculate the mass of sodium ethanoate that should be added to 1 litre of 0.1M ethanoic acid solution in order to produce a solution of pH 4.0
(Ka for ethanoic acid is 1.8 × 10^{-5} $moldm^{-3}$) (03 marks)

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(e). State what would happen to the pH of the solution in (b) if a small amount of the following are added

(i). Sodium hydroxide solution (0½ mark)

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(ii). Hydrochloric acid solution (0½ mark)

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(d). State one biological use of buffer solutions (0½ mark)

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2. (a). **25cm^{-3}** of **0.3M** sodium hydroxide was added to **225cm^{-3}** of water. Calculate the pH of the resultant solution. (03 marks)

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(b). Calculate the mass of sodium ethanoate that should be added to **1dm^3** of **0.1M** ethanoic acid at 25°C to give a solution whose pH is **5.5**. (Ka for ethanoic acid is 1.8×10^{-5} $moldm^{-3}$) (03 marks)

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(ii) State any assumptions made. (01 mark)

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(c). A few drops of dilute hydrochloric acid were added to the solution in (b) above.

(i). State what was happen to the pH of the solution (0½ mark)

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(ii). Give a reason for your answer. (01 mark)

(d). A solution is made by dissolving **7.2g** of ethanoic acid and **12.0g** of sodium ethanoate to make **1 dm^3**. To this solution was added **14cm^3** of **1M** hydrochloric acid calculate the pH of the solution. (Ka for ethanoic acid is $1.8 \times 10^{-5}\ moldm^{-3}$) (04 marks)

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3. Describe how an acidic buffer solution of **pH 4.2** can be prepared using methanoic acid of **pKa** value **3.74**. (04marks)

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4. A solution consists of **0.01M** ammonia solution and **2.13g** of ammonium chloride in a litre of solution (Kb for NH_3 = 1.8 × 10^{-5} $moldm^{-3}$)

a) Calculate the pH of the solution (03marks)

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b) pH change of solution on addition of **1cm^3** of **1M** HCl acid. (03marks)

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5. (a) Calculate the pH of the solution which was made by adding **30cm^3** of **0.1M** Hydrochloric acid to **80cm^3** of **0.1M** ammonia solution
(Kb for NH_3 = 1.8 × 10^{-5} $moldm^{-3}$)

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(b) State one application of buffer solutions.

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