

國立成功大學

111學年度碩士班招生考試試題

編 號：144

系 所：環境工程學系

科 目：普通化學

日 期：0219

節 次：第 1 節

備 註：不可使用計算機

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※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Buffer preparation is a common process in chemistry and biochemistry laboratories. Buffer solutions are used to help maintain a stable pH value of another solution that is mixed with the buffer. The buffer resists changes in the pH value of the whole solution when a small amount of a different acid or alkali is introduced into the solution either through addition or via any chemical reaction within the solution. Buffer solutions are therefore very useful in a wide variety of applications in which a relatively stable pH is required.

(1) When making a buffer what considerations should be made to ensure it is fit for maintaining the desired pH? (10%)

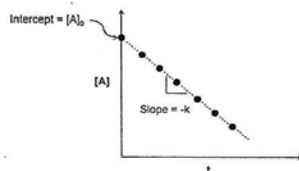
(2) How do you make a buffer solution with a pH of 5? What recipe will you use? (15%)

2. What is a Catalyst? How do catalysts work? (15%)

3. Consider this reaction  $A \xrightleftharpoons[k_{-1}]{k_1} Z$

Both the forward rate constant  $k_1$  and the backward rate constant  $k_{-1}$  have a unit  $\text{time}^{-1}$ . If the experiment is started using pure A, of concentration  $a_0$ , and if after time  $t$  the concentration of Z is  $C$ , that of A is  $a_0 - C$ . If  $C_e$  is the concentration of Z at equilibrium. Please derive that the expression (using  $k_1$ ,  $k_{-1}$ ,  $C_e$ ,  $a_0$ ) for the concentration of Z ( $C$ ) is a function of time ( $t$ ). (20%)

4. The graph below is the change in concentration of chemical A over time.



(1) Please determine the order of this reaction. (10%)

(2) Please use the symbols in the figure to find the expression for the half-life ( $t_{1/2}$ ) of A. (10%)

5. (1) What can oxidation be defined as? Please give all the definition for full points. (10%)

(2) Please give three examples of oxidation reactions. (10%)