

系所組別： 生物醫學工程學系丁組

考試科目： 普通化學

考試日期：0222，節次：1

※ 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。

- (15%) Name the following compounds in **English**.  
(a) HBr, (b) HClO<sub>3</sub>, (c) Na<sub>2</sub>HPO<sub>4</sub>, (d) Mn(OH)<sub>3</sub>, (e) (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>.
- (15%) Name the functional group in each of the following molecules:  
(a) CH<sub>3</sub>CH<sub>2</sub>OH, (b) (CH<sub>3</sub>)<sub>3</sub>N, (c) CH<sub>3</sub>COOH, (d) C<sub>4</sub>H<sub>9</sub>OC<sub>4</sub>H<sub>9</sub>, (e) CH<sub>3</sub>COH
- (10%) An organic compound had the following analysis: C=55.8%, H=7.03%, O=37.2%. A 1.5 g sample was vaporized and was found to occupy 530 cm<sup>3</sup> at 100 °C and 740 torr. What is the molecular formula for the compound?
- (15%) The Ostwald process of making HNO<sub>3</sub> involves the air oxidation of NH<sub>3</sub> over a catalyst. The first two steps in this process are
$$4\text{NH}_3 + 5\text{O}_2 \rightarrow 6\text{H}_2\text{O} + 4\text{NO}$$
$$2\text{NO} + \text{O}_2 \rightarrow 2\text{NO}_2$$
  
(a) How many cubic feet of air (21% O<sub>2</sub> by volume) at 27°C and 1.00 atm are needed for the conversion of 50.0 tons of NH<sub>3</sub> to NO<sub>2</sub> by this process?  
(b) Balance the reaction: NO<sub>2</sub> + H<sub>2</sub>O → 2 HNO<sub>3</sub> + NO.
- (15%) Consider the unbalanced reaction:
$$\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} + \text{H}^+ \rightarrow \text{Mn}^{2+} + \text{CO}_2 + \text{H}_2\text{O}$$
  
(a) Balance the reaction.  
(b) What is the molarity of a K<sub>2</sub>C<sub>2</sub>O<sub>4</sub> solution if 35.00 ml of it is needed for the titration of 47.65 ml of 0.06320 M KMnO<sub>4</sub> solution?
- (10%) In the fermentation of sugar in an enzymatic solution that is initially 0.12 M the concentration of the sugar is reduced to 0.06 M in 10 h and 0.03 M in 20 h. What is the order of the reaction and what is the rate constant?
- (15%) Calculate a point on the titration curve for the addition of 2.0 mL of 0.0100 M NaOH to 50.0 mL of 0.0100 M chloroacetic acid, HC<sub>2</sub>H<sub>2</sub>O<sub>2</sub>Cl (K<sub>a</sub>=1.40×10<sup>-3</sup>).
- (5%) A particular linear hydrocarbon molecule has six carbons and ten hydrogens. Is it saturated or unsaturated? Draw the possible line drawings.