國立成功大學

112學年度碩士班招生考試試題

編 號：282

系 所：環境醫學研究所

科 目：普通化學

日 期：0207

節 次：第 2 節

備 註：不可使用計算機

> ※ 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. Draw Lewis structures for all possible isomers of C_3H_4. (10%)

2. Describe (a) the first law of thermodynamics; (b) the second law of thermodynamics. (10%)

3. The sun radiates 3.9×10^{23} J of energy into space every second. What mass is lost from the sun in 36 s? (10%)

4. A 50.0 mL sample of 0.0152 M Na_2SO_4 (aq) is added to 50.0 mL 0.0125 M $Ca(NO_3)_2$ (aq). What percentage of the Ca^{2+} remains unprecipitated? (10%)

5. A certain radiation has a wavelength of 474 nm. What is the energy, in joules of (a) one photon; (b) a mole of photons of this radiation? (10%)

6. Draw the following chemical structures (a) benzene, toluene, ethylbenzene, xylene; (b) PCBs, dioxins, phthalates; (c) epoxide, 1,3-butadiene, acrylamide; (d) magnesium perchlorate; (e) phosphorus dichloride trifluoride (10%)

7. At room temperature (20 ºC), milk turns sour in about 64 hours. In a refrigerator at 3 ºC, milk can be stored three times as long before it sours. (a) Estimate the activation energy of the reaction that causes the souring of milk. (b) How long should it take milk to sour at 40 ºC? (10%)

8. Vinegar is a dilute aqueous solution of acetic acid, CH_3COOH, a monoprotic acid. A 5.00 mL sample of commercial vinegar was titrated with 38.08 mL of 0.100 M aqueous NaOH. Vinegar has a density of 1.01 g/mL. What is the percent by mass composition of this vinegar? (10%)

9. The molar extinction coefficient of lysozyme at pH of 6.1 is 2.0×10^4 M^{-1} cm^{-1}, for incident light of wavenumber 1645 cm^{-1}. An aqueous solution containing 80 mg/mL of this enzyme has an 8.3% transmittance at 1645 cm^{-1} in a cuvette of 0.100 mm light path. What is the approximate molar mass of lysozyme? (10%)

10. Methyl chloromethyl ether is an organic compound with the formula $CH_3\text{-}O\text{-}CH_2Cl$. This liquid is a very good solvent and it has a density of 1.0605 g/cm^3 at 20 ºC. (a) What is the mass of 8.2×10^{11} molecules of this compound? (b) What is the mass of the oxygen present in 6.47 cm^3 of this liquid? (c) How many hydrogen atoms are there in 2.3×10^{19} molecules of methyl chloromethyl ether? (d) Determine the ratio by mass of C to O. (e) Determine the ratio by number of C atoms to O atoms. (10%)