淡江大學99學年度碩士班招生考試試題

系別：化學工程與材料工程學系　　科目：有　機　化　學

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1. Using the data in the following table, estimate the heat of combustion of (a) 2-methylnonane and (b) cyclohexane. (10%)

compound	heptane	octane	nonane	decane	2-methylheptane
Heat of combustion (kJ/mol)	4,817	5,471	6,125	6,778	5,466

2. Explain the high acidity of 2,4,6-trinitrobenzoic acid and 2,4,6-trinitrophenol, respectively. (10%)

3. Write a reaction showing the preparation of amides from amines and (a) acyl chlorides; (b) esters. (10%)

4. Write a possible reaction scheme to prepare each of the following compound (15%)
   (a) *p*-sulfobenzoic acid from benzene
   (b) carboxylic acid from alkyl halide
   (c) tertiary alcohol from alkyl halide and ester

5. Draw the mechanism of formation of *tert*-butyl chloride from *tert*-butyl alcohol and hydrogen chloride. (15%)
   Step 1: Protonation of alcohol to give an alkyloxonium ion
   Step 2: Dissociation of alkyloxonium ion to give a carbocation
   Step 3: Capture of carbocation by halide ion

6. Draw the mechanism for the acid-catalyzed nucleophilic ring opening of ethylene oxide by water. (15%)

7. Draw the mechanism of the initiation, propagating and termination steps for the peroxide-initiated free-radical polymerization of ethylene. (15%)

8. Explain the meaning of the following description. (10%)

   Sodium octadecanoate has a polar carboxylate group at one end and of a long hydrocarbon chain. The carboxylate group is hydrophilic, and the hydrocarbon chain is hydrophobic. The compromise achieved by sodium octadecanoate when it is placed in water is to form a colloidal dispersion of spherical aggregates called micelles. Micelles form spontaneously when the carboxylate concentration exceeds a certain minimum value called the critical micelle concentration. Micelles are approximately spherical because a sphere encloses the maximum volume for a given surface area and disrupts the water structure least. Because their surfaces are negatively charged, two micelles repel each other rather than clustering to form higher aggregates.