1. Give appropriate structural formulas to illustrate each of the following: (畫出結構式，每小題 5 分)
   (A) isopropyl bromide ;
   (B) 1-chloro-4-methylpentane ;
   (C) cis-1,2-dimethylene-cyclobutane ;
   (D) 3-ethylcyclohexene
   (E) tetrahydrofuran (THF)
   (F) (R)-1,2,4-butanetriol

2. Outline a procedure for separating hexylamine from cyclohexane using dilute HCl, aqueous NaOH, and diethyl ether. (10 分)

3. Draw basic structural formulas of steroids, derivatives of perhydrocyclopentanophenantherene ring system. (畫出類固醇之基本結構式 - 共 19 個 C，並予以標號，此題 10 分)

4. What product would be obtained from the ethanolation of tert-butyl chloride?
   Outline the steps of this S_N1 reaction. (20 分)

5. Arbutin (熊果素) can be isolated from the leaves of barberry and pear trees, has the molecular formula C_{12}H_{16}O_{7}.
   When arbutin is treated with aqueous acid or with a β-glucosidase, the reaction produces D-glucose and a compound X with the molecular formula C_{6}H_{4}O_{2}. The 1^H NMR spectrum of compound X consists of two singlets, one at δ 6.8 (4H) and one at δ 7.9 (2H).
   Methylation of arbutin followed by acidic hydrolysis yields 2,3,4,6-tetra-O-methyl-D-glucose and a compound Y (C_{8}H_{14}O_{2}). Compound Y is soluble in dilute aqueous NaOH but is insoluble in aqueous NaHCO_3. The 1^H NMR spectrum of Y shows a singlet at δ 3.9 (3H), a singlet at δ 4.8 (1H), and a multiplet at δ 6.8 (4H).
   Treating compound Y with aqueous NaOH and (CH_3)_2SO_4 produces compound Z (C_{9}H_{16}O_{2}). The 1^H NMR spectrum of Z consists of two singlets, one at δ 3.75 (6H) and one at δ 6.8 (4H).
   Propose structures for arbutin and for compounds X, Y, and Z. (30%)