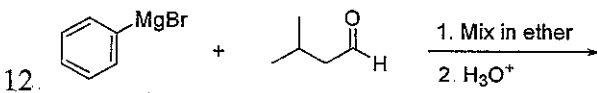
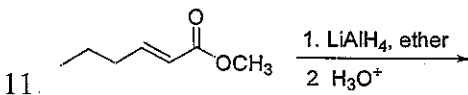
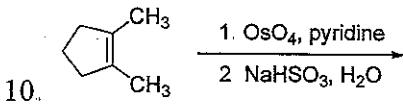
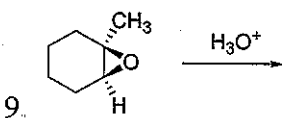
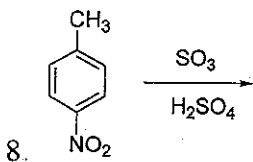
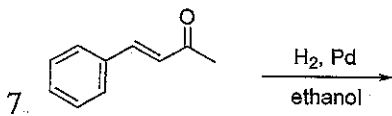
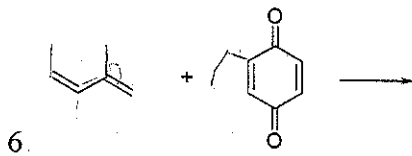
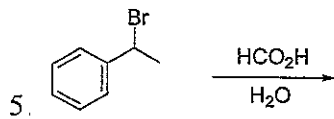
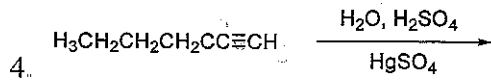
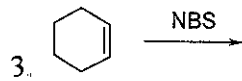
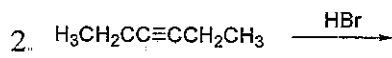
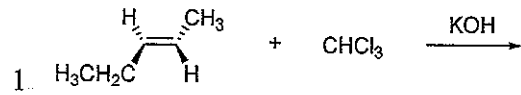
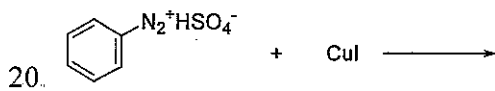
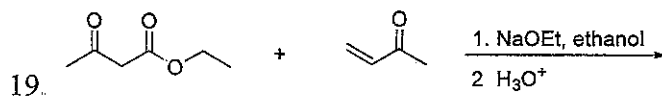
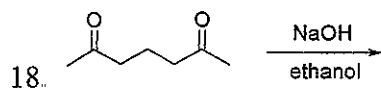
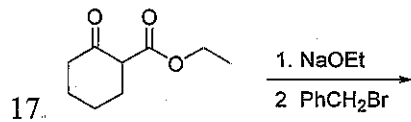
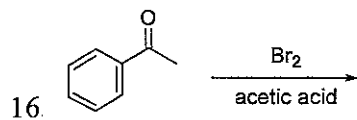
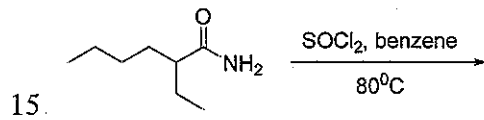
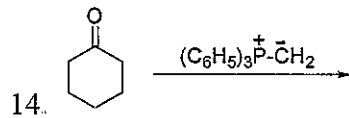
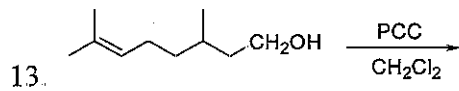


1. Describe the four types of separation mechanism in liquid chromatography and its applications (20%)
2. What is the principle of micellar electrokinetic capillary chromatography? What does it differ from capillary zone electrophoresis? (20%)
3. Please describe some kinds of LC-MS interfaces (20%)
4. Describe the principle of the following detectors in HPLC. (a) evaporative light scattering detector (b) UV detector (c) fluorescence detector (d) refractive index detector (20%)
5. The infrared spectrum of CO shows a vibrational absorption peak at 2170 cm^{-1} . What wavenumber would the corresponding peak for ^{14}CO occur? (10%)
6. A nucleus has a spin quantum number of $5/2$. How many magnetic energy states does this nucleus have? What is the magnetic quantum number of each? (10%)

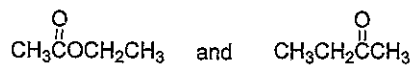
I. Give the major product(s) of the following reactions (60%)



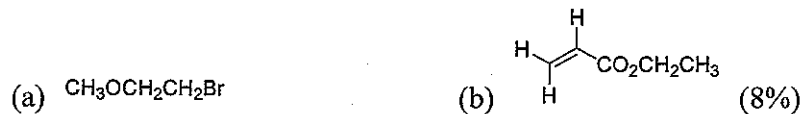


II Propose a synthesis of *m*-chloropropylbenzene from benzene. (10%)

III How could you use ¹H NMR to distinguish between the following pairs of isomers? (6%)



IV. Predict the splitting patterns you would expect for each protons in the following molecules:



V. Why are terminal alkynes more acidic than alkenes? (5%)

VI. Please explain the term "green chemistry". (5%)

VII. Propose a mechanism for the following reaction: (6%)

