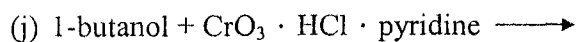
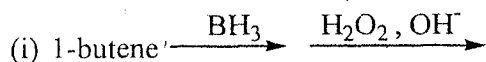
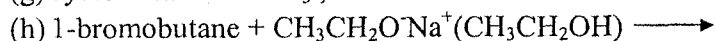
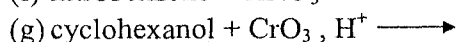
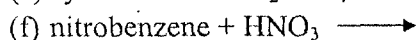
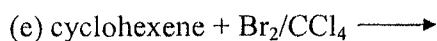
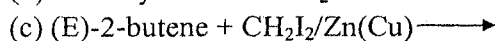
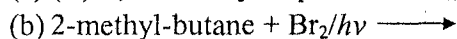
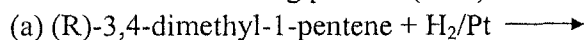


(1) Predict the following product (20%)



(2) Show how 1-butyne could be converted to 3-hexyne using a nucleophilic substitution reaction. (5%)

(3) Use Fischer projections to draw the stereoisomers of 2,3-dichlorobutane. (5%)

(4) Provide mechanism for the following reaction (10%)



(5) Can you draw chair conformations of β -D-glucopyranose (the most stable chair form with all OH and CH_2OH groups in the equatorial position)? Convert into the Haworth projection and also draw the Fischer projection for the acyclic D-glucose (15%)

(6) Glycine is the smallest amino acid, write the structures of glycine
(a) at the isoelectric point (b) at pH 8 (c) at pH 6 (10%)

(7) A compound, $\text{C}_5\text{H}_{10}\text{O}_3$ has a strong infrared band at 1745 cm^{-1} . Its proton NMR spectrum consists of a quartet at $\delta 4.15$ and a triplet at $\delta 1.20$ with relative ratio of 2:3 what is the structure? (8%)

(8) Identify the product of the Claisen condensation of ethyl propanoate with sodium ethoxide. (7%)

(9) Write simple synthetic route for the following (20%)

(a) from bromobenzene and ethylene oxide to 2-phenylethanol (aroma of oil of roses).

(b) from butanal to 2-ethylhexane-1,3-diol (a mosquito repellent).

(c) from benzene to *m*-bromonitrobenzene.