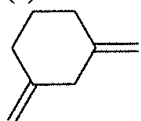
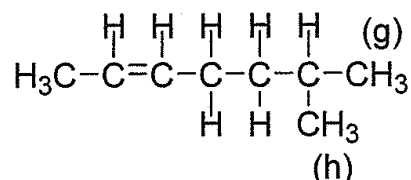


(1) How many stereoisomers can be obtained by hydrogenation of both double bonds in the following compound? (5%)

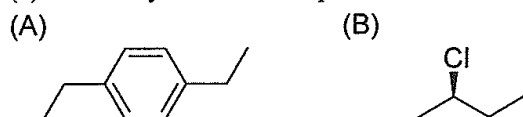


(2) Which H in the following compound should exhibit the highest reactivity towards radical substitution? (5%)

(a) (b) (c) (d) (e) (f)

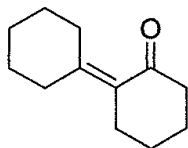


(3) How many kinds of nonequivalent H's are there in (A) and (B)? (10%)



(4) Give the structure for a compound C_2H_2BrCl , that has two doublets, coupling constant = 16 Hz in 1H NMR spectroscopy. (5%)

(5) Treatment of A with aqueous acid gives a single compound, $C_6H_{10}O$ (B). B can be converted to an oxime. B can be oxidized to $HOOC(CH_2)_4COOH$. Give the structure of B. (5%)



A

(6) Determine the formal charges on O and B in $H_2O:BF_3$. (10%)

(7) Briefly state why cyclooctatetraene is nonaromatic. (5%)

(8) The E2 dehydrohalogenation of 2-chloro-2,3-dimethylbutane can lead to A and B. A does not show C=C vibrational absorption. B has a C=C absorption peak at 1640 cm^{-1} . Give structures of A and B. (10%)

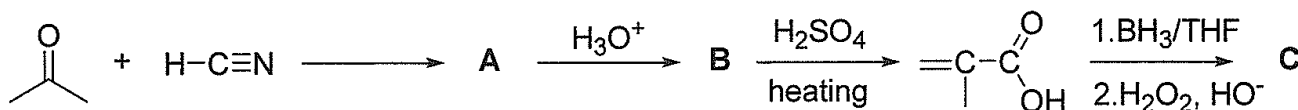
(9) Indicate which compound (H_2S or H_2Se) is more acidic. (5%)

(10) Indicate which compound ($HOSO_2^-$ or $HOSO_3^-$) is more basic. (5%)

(11) Explain the appearance of $m/z = 44$ in the mass spectrum of $CH_3CH_2CH_2CH=O$. (5%)

(12) Benzophenone was added to tetrahydrofuran to form a clear colorless solution to which the sodium dispersion was added dropwise to observe the color change to dark blue. Explain the appearance of dark blue. (5%)

(13) Give structures for A, B, and C. (15%)



(14) Please give the major product for each reaction listed below. (10%)

