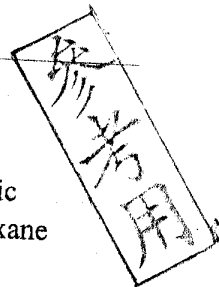


系所別: _____

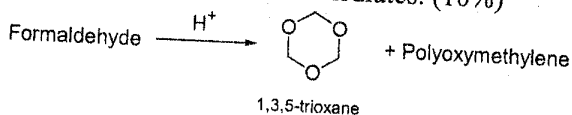
化學學系

科目: _____

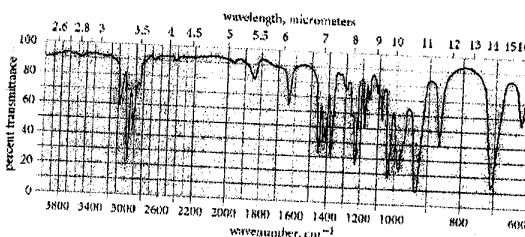
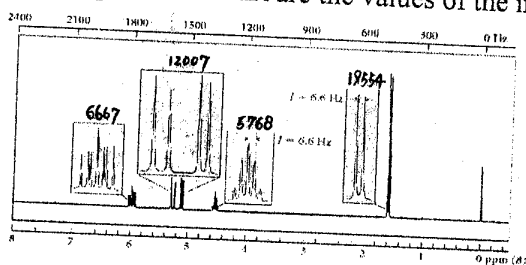
有機與無機化學



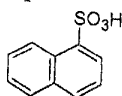
1. 1,3,5-Trioxane is formed when formaldehyde undergoes polymerization with catalytic sulfuric acid (see below). Draw a complete mechanism for the formation of 1,3,5-trioxane with Curved-arrow formalism and intermediates. (10%)



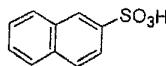
2. Propose a structure for the compound (C_4H_7Cl) that has the following IR and NMR spectra. The numbers (e.g., 6667, 12007, 5768, and 19554 from left to right) over each group of absorptions in NMR are the values of the integral in arbitrary units. (10%)



3. Sulfonation of naphthalene under mild conditions gives mostly 1-naphthalenesulfonic acid; however, under more vigorous conditions, sulfonation yields mostly 2-naphthalenesulfonic acid. Give your detailed explanation for such observations. (10%)

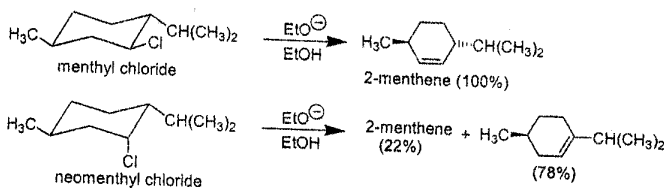


1-naphthalenesulfonic acid

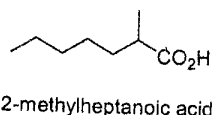


2-naphthalenesulfonic acid

4. When menthyl chloride is treated with sodium ethoxide in ethanol, 2-menthene is the only alkene product observed. When neomenthyl chloride is subjected to the same conditions, the alkene products are mostly 3-menthene along with some 2-menthene. Explain why different alkyl halides, and why 3-menthene is the major product in the second reaction. (10%)



5. Outline a malonic ester (diethyl malonate) synthesis of the following carboxylic acid. (10%)



注意：背面有試題

系所別:

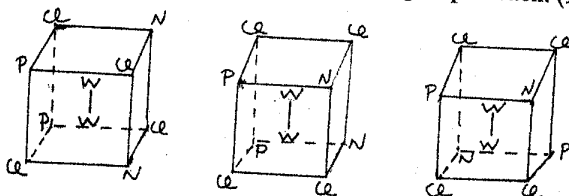
化學學系

科目:

有機與無機化學

Inorganic Chemistry

1. Three isomers of $W_2Cl_4(NHEt)_2(PMe_3)_2$ have been reported. These isomers have the core structures shown below. Determine the point group of each. (15%)



2. Determine the ground terms for high-spin and low-spin d^6 configuration in O_h symmetry. (10%)
3. Which of the following octahedral high-spin complexes should be Jahn-Teller distorted? TiF_6^{2-} , MoF_6 , $[Cr(H_2O)_6]^{2+}$, $[Mn(H_2O)_6]^{2+}$, $[Mn(H_2O)_6]^{3+}$, $FeCl_6^{3-}$, $[Ni(NH_3)_6]^{2+}$, $[Cu(NH_3)_4]^{2+}$. (5%)
4. Draw the Lewis diagram of the following molecules. (a) XeF_4 , (b) PF_5 , (c) diborane, (d) $COCl_2$, (e) nitrous acid (10%)
5. Identify the first row transition metal for the following 18-electron species: (10%)
- (a) $[M(CO)_3(PPh_3)]^-$, (b) $HM(CO)_5$, (c) $(\eta^4-C_8H_8)M(CO)_3$,
 (d) $[(\eta^5-C_5H_5)M(CO)_3]_2$ (assume single M-M bond),
 (e) $[M(diars)_2NO]^{2+}$ (where diars is a bidentate diarsine ligand and the nitrosyl group is linear)

參考用