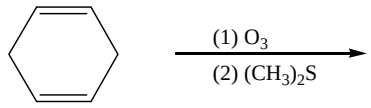
東吳大學 100 學年度碩士班研究生招生考試試題

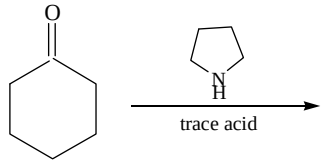
系級	化學系碩士班	考試時間	100 分鐘
科目	有機化學暨無機化學	本科總分	100 分

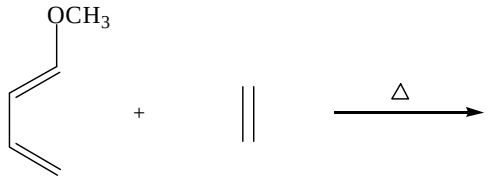
1. What organic functional group would show the following phenomenum by the specific reaction? (8%)
   (a) What organic functional group would turn the solution color from orange to blue –green by adding $Na_2Cr_2O_7$ in H_2SO_4?
   (b) What organic functional group would generate bubbles by adding $NaHCO_3$ to its solution?
   (c) What organic functional group would make the precipitates formed by adding aqueous $AgNO_3$ solution?
   (d) What organic functional group would make the precipitates formed by adding (1) HIO_4 then (2) $AgNO_3$ solution?

2. Give the product for each of the following reactions. (10%)

   (a) $CH_3CH_2CH_2CH_2Br \xrightarrow[(2)\ H_2,\ \text{Raney Ni}]{(1)\ NaCN}$

   (b) 

   (c) 

   (d) 

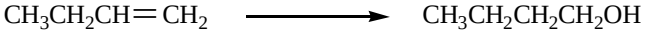
   (e) $CH_3CH_2CH_2CO_2C_2H_5 \xrightarrow{LiAlH_4}$

東吳大學 100 學年度碩士班研究生招生考試試題

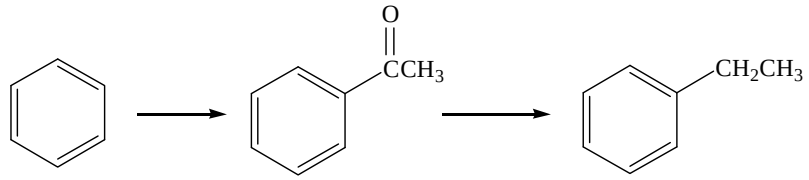
系級	化學系碩士班	考試時間	100 分鐘
科目	有機化學暨無機化學	本科總分	100 分

3. Provide the appropriate reagent for each of the following reactions: (10%)

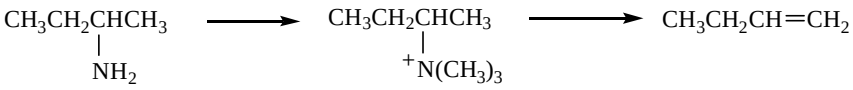
(a)



(b)



(c)



4. Give the structure for each of the following terms: (10%)

(a) thiol (b) acid chloride (c) epoxide (d) chloroform (e) acetaldehyde

(f) aniline (g) allyl bromide (h) THF (i) Grignard reagent (j) crown ether

5. Give structures consistent with the following spectra: (8%)

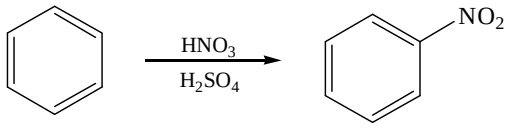
(1) PMR for $C_9H_{10}O_2$

δ 1.4	3H(t)
δ 4.4	2H(q)
δ 7.4	2H(m)
δ 7.5	1H(m)
δ 8.0	2H(m)

(2) CMR for $C_6H_{10}O$

δ 23 (t)
δ 25 (t)
δ 37 (t)
δ 212 (s)

6. Give a reasonable mechanism for the following reaction: (4%)



東吳大學 100 學年度碩士班研究生招生考試試題

系級	化學系碩士班	考試時間	100 分鐘
科目	有機化學暨無機化學	本科總分	100 分

7. For each of the following molecules, write the Lewis structure(s), predict the molecular geometry and point group, and give the expected hybrid orbitals on the central atom (a) $\underline{Cl}F_3$ (b) $\underline{S}F_4$ (c) $\underline{Xe}F_2$ (d) $\underline{I}F_5$ (e) $\underline{Cl}F_2^+$. (10 %)

8. (a) Explain why $[Cu(NH_3)_4]^+$ is a completely colorless complex, but its sister complex, $[Cu(NH_3)_4]^{2+}$, is intensely blue. (b) The C–O bond strength decrease in the order of $[Mn(CO)_6]^+ > [Cr(CO)_6] > [V(CO)_6]^- > [Ti(CO)_6]^{2-}$. Explain. (10%)

9. Define the following terms. (a) degenerate (b) cis-trans isomers of square planar complex (c) resonance (d) node (e) facial and meridional isomers for octahedral complex. (10 %)

10. Draw out all the isomers of $[Co(en)_3]^{3+}$ and $[Co(en)_2(Cl)_2]$ (en = ethylenediamine). (10 %)

11. Draw the Lewis structure and molecular orbitals energy diagram and write the MO electron configuration for the NO^- ion. (a) What is the bond order according the MO diagram? (b) Will the HOMO unpaired electrons be concentrated more on the N or the O? Explain. (10%)