第一部分　有機化學 (50%)

1. a 至 d：以英文 IUPAC 或英文俗名命名化合物； e 至 h：寫出化合物之結構式 (16%)

a. $CH_3CH=CHCH_2CH_2C\equiv CCH_3$　　b. 　　c. 　　d.
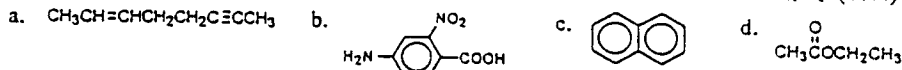
e. (2R,3S)-2,3-Dibromo-butane　f. (E)-3-Methyl-3-heptene　g. 4-tert-Butoxy-1-cyclohexene　h. acetic anhydride

2. 在下列問號(?)處填入適當之反應物、或試劑（含催化劑或條件）、或生成物 (20%)

A. + Br_2 $\longrightarrow$?

B. + $KMnO_4$ $\xrightarrow{H_2O}$?

C. $\xrightarrow{?}$ $\xrightarrow{?}$

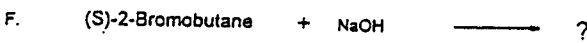D. Cis-2-Butene $\underset{}{\overset{H^+}{\rightleftharpoons}}$?

E. $CH_3CH_2CH_2C\equiv CH$ + H_2O $\xrightarrow[HgSO_4]{H_2SO_4}$?

F. (S)-2-Bromobutane + $NaOH$ $\longrightarrow$?

G. $CH_3CH_2CH_2\overset{O}{\overset{\|}{C}}H$ $\xrightarrow[2.\ ?]{1.\ ?}$ $CH_3CH_2CH_2CH_2OH$

H. CH_3CH_2OH $\xrightarrow{?}$ $CH_3\overset{O}{\overset{\|}{C}}H$

I. $\xrightarrow[2.\ ?]{1.\ ?}$

J. CH_3CH_2Br $\xrightarrow{?}$ CH_3CH_2CN $\xrightarrow[2.\ ?]{1.\ ?}$ $CH_3CH_2CH_2NH_2$
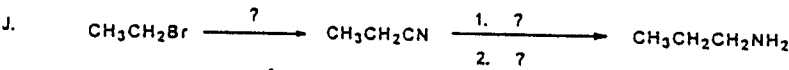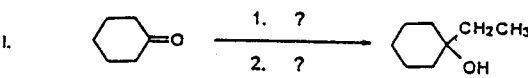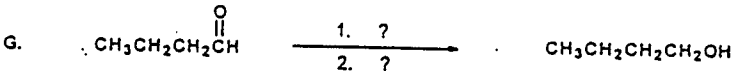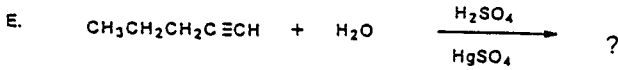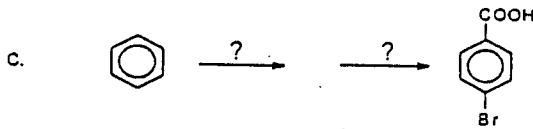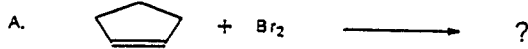
3. 舉例說明下列名詞 (9%)
   a. Lewis Acid
   b. Racemic Mixture
   c. Resonance Forms

4. 請分別為下列各化合物選取一種理想溶劑，並且解釋你選擇之理由 (5%)

a. $CH_3CH_2\overset{O}{\overset{\|}{C}}O^-\ ^+Na$　　b. 　　c. 　　d. 　　e. $CH_3CH_2CH_2CH_2CH_2CH_3$
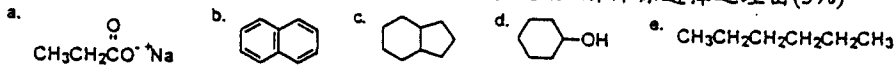
Part II. Analytical Chemistry (50%)

1. (8%) A 5.010-g sample of a DDT-containing pesticide was decomposed with metallic sodium in alcohol, and the liberated chloride ion was precipitated as AgCl. Express the results of this analysis in terms of the percentage of DDT (fw = 354.5) based upon the recovery of 0.1616 g of AgCl. (Ag = 107.870, Cl = 35.453)

2. (8%) The iron in a 100.0-mL sample of spring water was reduced to the +2 state, and treated with 25.00 mL of 0.002107 M $K_2Cr_2O_7$:

   $$6Fe^{2+} + Cr_2O_7^{2-} + 14H^+ ---> 6Fe^{3+} + 2Cr^{3+} + 7H_2O$$

   The excess $K_2Cr_2O_7$ was back-titrated with 7.65 mL of 0.00987 M Fe^{2+}. Calculate the parts per million (ppm) of Fe in the water sample. (Cr = 51.996, Fe = 55.847, $K_2Cr_2O_7$ = 294.19)

3. (8%) Calculate the hydronium ion concentration of a 0.080 M NH_3 solution. The base dissociation constant (K_b) for NH_3 is 1.76×10^{-5}.

4. (8%) Calculate the pH of a solution that is 0.250 M in NH_3 and 0.360 M in NH_4Cl.

5. (12%) For the titration of 50.00 mL of 0.00500 M NaBr with 0.01000 M $AgNO_3$ (for AgBr, K_{sp} = 5.2×10^{-13}), calculate pAg values at the following points --
   a. initial point (i.e., before titiration)
   b. after addition of 5.00 mL of reagent
   c. at the equivalence point
   d. after addtion of 25.10 mL of reagent

6. (6%) Consider a redox reaction in which reductant A reacts with oxidant B to yield A' and B'. Assuming A, B, A', and B' are in equillibrium, calculate K_{eq} for the equilibrium. (The electrode potentials for following electrode reactions are respectively E_A^o and E_B^o. $A + a e^- \rightleftharpoons A'$ and $B + b e^- \rightleftharpoons B'$)