※ 考生請注意：本試題不可使用計算機

1. **(15%)** Name the following compounds in **English**.
   (a) HF, (b) $HClO_4$, (c) Na_2HPO_4, (d) $Mn(OH)_3$, (e) $CuSO_3$.

2. **(15%)** Name the functional group in each of the following molecules:
   (a) $CH_3CH_2CH_2OH$, (b) $(CH_3)_3N$, (c) CH_3COOH, (d) $C_4H_9OC_4H_9$, (e) CH_3COH

3. **(10%)** An organic compound had the following analysis: C=55.8%, H=7.03%, O=37.2%. A 1.5 g sample was vaporized and was found to occupy 530 cm^3 at 100 $^\circ$C and 740 torr. What is the molecular formula for the compound?

4. **(15%)** The Ostwald process of making HNO_3 involves the air oxidation of NH_3 over a catalyst. The first two steps in this process are

   $$4NH_3 + 5O_2 \rightarrow 6H_2O + 4NO$$
   $$2NO + O_2 \rightarrow 2NO_2$$

   (a) How many cubic feet of air (21% O_2 by volume) at 27°C and 1.00 atm are needed for the conversion of 50.0 tons of NH_3 to NO_2 by this process?
   (b) Balance the reaction: $NO_2 + H_2O \rightarrow 2\ HNO_3 + NO$.

5. **(15%)** Consider the unbalanced reaction:
   $$MnO_2 + H_2C_2O_4 + H^+ \rightarrow Mn^{2+} + CO_2 + H_2O$$
   (a) Balance the reaction.
   (b) What mass of MnO_2 is reduced by 35 mL of 0.080 M oxalic acid, $H_2C_2O_4$, in sulfuric acid solution? The atomic weight of manganese is 54.9 g/mol.

6. **(10%)** In the fermentation of sugar in an enzymatic solution that is initially 0.12 M the concentration of the sugar is reduced to 0.06 M in 10 h and 0.03 M in 20 h. What is the order of the reaction and what is the rate constant?

7. **(10%)** An electrolytic cell contains a solution of $CuSO_4$ and an anode of impure copper. How many kilograms of copper will be refined (deposited on the cathode) by 150 amp maintained for 12 hours. The atomic weight of copper is 63.5 g/mol.

8. **(10%)** Calculate a point on the titration curve for the addition of 2.0 mL of 0.0100 M NaOH to 50.0 mL of 0.0100 M chloroacetic acid, $HC_2H_2O_2Cl$ (K_a=1.40×10^{-3}).