1. Show by calculation that $[H_2O]$ in pure water is about 55M. (10 %)

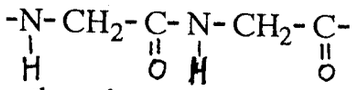
2. You want to make a buffer with a pH of about 6 which one of the following conjugated acid-base pairs would you use? Explain. (10 %)

(a) H_3PO_4 - $H_2PO_4^-$ (Ka H_3PO_4 = 7.5 x 10^{-3})

(b) H_2CO_3 - HCO_3^- (Ka H_2CO_3 = 4.2 x 10^{-7})

(c) NH_4^+ - NH_3 (Ka NH_4^+ = 5.6 x 10^{-10})

3. The following condensation polymer is made from a single monomer. Identify the monomer. (10 %)



4. Describe the alternative definitions of acids and bases on the basis of Arrhenius, Brönsted-Lowry and Lewis concepts, respectively. (10 %)

5. For the alkene and the alkyne containing three carbon atoms, write the (i) molecular formula; (ii) structural formula. (10 %)

6. Write structural formulas for each of the following: (10 %)

(a) 3-isopropyl-3-methylheptane, (b) 2-bromo-3-methylpentane,
(c) cis-2-pentene, (d) tetraethylammonium iodide,
(e) 2-methyl-4-nonanone

7. Name the following compounds. (20 %)

(1) N_2O_5, (2) N_2O, (3) $HClO_4$, (4) H_2SO_3, (5) H_2S, (6) $SnCl_4$, (7) $K_3[Fe(CN)_6]$, (8) $NaBH_4$, (9) $K_2[PtCl_4]$, (10) $NaHCO_3$

8. Describe how the primary, secondary, tertiary, and quaternary structures of a protein differ. (20 %)