

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

- (a) 3-isopropyl-3-ethylheptane, (b) 2-chloro-3-methylpentane,
(c) Glycerol (d) tetrabutylammonium bromide,
(e) 2-methyl-4-nonanone

2. Name the following compounds. (20 %)

- (1) $(\text{CH}_3)_3\text{SiCl}$, (2) $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{C}\equiv\text{CH}$, (3) NaClO_4 ,
(4) KMnO_4 , (5) PCl_5 , (6) $\text{CH}_3\text{C}_6\text{H}_4\text{SO}_3\text{H}$
(7) $\text{K}_3[\text{Fe}(\text{CN})_6]$, (8) LiAlH_4 , (9) $\text{K}_2[\text{PtCl}_6]$,
(10) $(\text{CH}_3)_3\text{N}$

3. 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) $\text{H}_3\text{PO}_4 - \text{H}_2\text{PO}_4^-$ ($K_a \text{ H}_3\text{PO}_4 = 7.5 \times 10^{-3}$)
(b) $\text{H}_2\text{CO}_3 - \text{HCO}_3^-$ ($K_a \text{ H}_2\text{CO}_3 = 4.2 \times 10^{-7}$)
(c) $\text{NH}_4^+ - \text{NH}_3$ ($K_a \text{ NH}_4^+ = 5.6 \times 10^{-10}$)

4. Calculate the number of moles of H_2O molecules in 1.000 liter of water at 0°C if the density of water at this temperature is 0.9998 g/cm^3 . (10 %)

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

6. Please make an example describe what is (i) amino acid, (ii) lipid, (iii) nucleotide, (iv) DNA, respectively. (20 %)

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