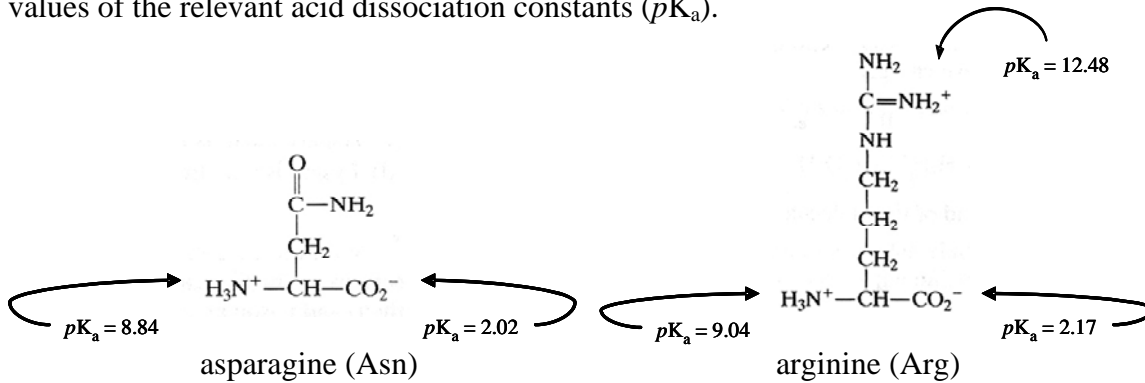# Self-Assessment: Organic Materials

Weekly Quiz 2: Biomaterials
Solution Outlines

The skeletal structures of the two amino acids, asparagine and arginine, are given below along with the values of the relevant acid dissociation constants (pK_a).


asparagine (Asn)   arginine (Arg)

(a) For an aqueous solution of asparagine (Asn) alone, calculate the ratio of the concentration of neutral asparagine zwitterion to the concentration of protonated cation when the pH is 3.091.
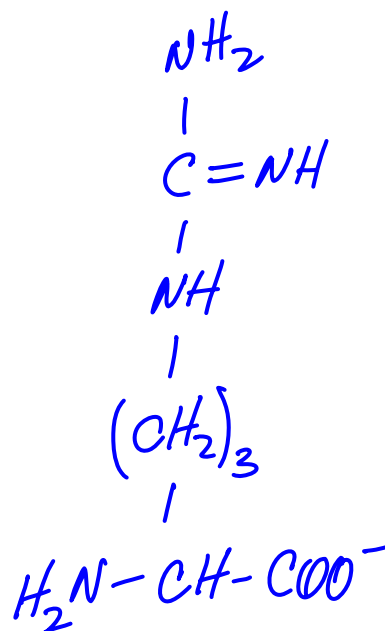
$$HA + H^+ = HAH^+$$

$$K_a = \frac{[H^+][HA]}{[HAH^+]}$$

$$\therefore \frac{[HA]}{[HAH^+]} = 10^{(pH - pK_a)}$$

$$\therefore pK_a = pH + \log_{10}\frac{[HAH^+]}{[HA]}$$

$$= 10^{3.091 - 2.02}$$

$$\therefore \log_{10}\frac{[HAH^+]}{[HA]} = pH - pK_a$$

$$= 11.8$$

(b) Draw the skeletal structure of arginine (Arg) when it is solvated in an aqueous solution under each of the following conditions.
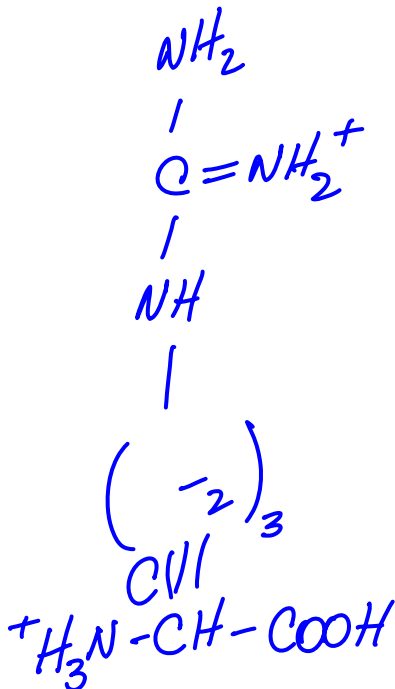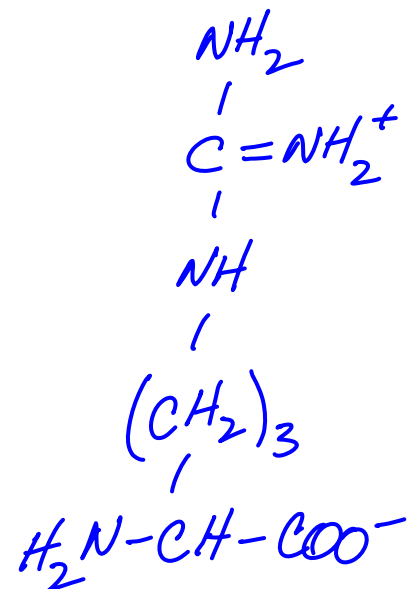
(i) $pH = 1.5$ (ii) $pH = 14$ (iii) $pH = pI$, the isoelectric point

(c)   Calculate the value of pH at which arginine (Arg) exists as the neutral zwitterion.

look at The structure drawn in answer to (6)(iii)

to see That The pH must be set at The midpt

between The pK_a values of The two amino groups

$\therefore pI = \dfrac{12.48 + 9.04}{2} = 10.76$

3.091SC Introduction to Solid State Chemistry

Fall 2009