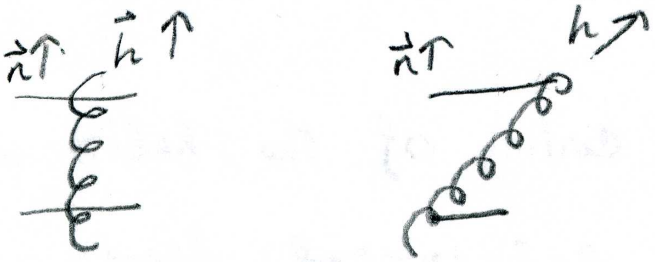
4. a. Helix axis should be parallel to the bilayer normal.

$$3 \times 10^{-9}\ m = n \times \frac{\text{turns}}{3.6\ \text{residues}} \times \frac{5.4 \times 10^{-10}\ m}{\text{turn}}$$

$n \approx 20$

b. If the helix axis is not parallel to the bilayer normal, then n will be increased by $\frac{1}{\cos\theta}$ where θ is the angle between the helix and normal axes.



$\vec{n} \equiv$ bilayer normal

$\vec{h} \equiv$ helix axis

$\theta = 0$ $\quad$ $\theta \neq 0$

5. a. The helix axis extends $\frac{3.4 \times 10^{-8}\ cm}{nucleotide}$

total helix length

$= 1.4 \times 10^{8}\ nucleotide \times \frac{3.4 \times 10^{-8}\ cm}{nucleotide}$

$= 5\ cm$

b. $20\ \mu m = 2 \times 10^{-3}\ cm$ (Voet & Voet, Fig. 1-14)

c. Not reasonable because the length of the chromosome would exceed the length of the nucleus.

d. Additional coiling of the helix would reduce its end-to-end length.

no coiling — coiling