Chapter 9

1. At isoelectric pH, protein is

(a) Positively charged (b) Negatively charged (c) Neutral

Ans: (c)

2. What major problems in electrophoresis arises due to joule heating effects?

Ans: (a) Density difference occurs leading to free convection.

(b) Temperature increase degrades protein.

3. How joule heating is prevented?

Ans: (a) Efficient cooling.

(b) Electrophoresis is used in a gel/membrane to prevent cooling.

4. How electroosmosis is prevented in electrophoresis?

Ans: Use of material for gel having low residual charge like ploy acrylamide.

5. In a batch page electrophoresis, $\mu_{osm}=0$. Mobilities of two proteins are $\mu_A = 5X10^{-5}$ $cm^2/V.s$ and $\mu_B = 3X10^{-5} cm^2/V.s$. $D_A=1.5X10^{-7}$ cm^2/s and $D_B=1.2X10^{-7}$ cm^2/s.

E=200 V/cm; t=4 hours. Find resolution (R).

Ans

$$\mu_A = 5\times10^{-5}\frac{cm^2}{v.s}$$

$$\mu_B = 3\times10^{-5}\frac{cm^2}{v.s}$$

$$Z_A = \mu_A E t_{\exp}$$

$$= 5\times10^{-5}\frac{cm^2}{v.s}\times 200\frac{v}{cm}\times(4\times3600)s$$

$$= 144cm$$

$$Z_B = \mu_B E t_{\exp}$$

$$= 3\times10^{-5}\,\frac{cm^2}{v.s}\times 200\,\frac{v}{cm}\times(4\times3600)s$$

$$= 86.4cm$$

$$D_{eff} = (\frac{1.5+1.2}{2})\times10^{-7}\,cm^2 / \sec$$

$$= 1.35\times10^{-7}\,cm^2 / \sec$$

$$\sigma = \sqrt{2D_{eff}\,t_{\exp}}$$

$$\sigma = \sqrt{2\times1.35\times10^{-7}\times(4\times3600)}$$

$$= 0.0039cm$$

$$R = \frac{1}{4}E\sqrt{\frac{t_{\exp}}{2D_{eff}}}(\mu_1-\mu_2)$$

$$= \frac{1}{4}\times200\sqrt{\frac{4\times3600}{2\times1.35\times10^{-7}}}(2\times10^{-5}) = 230.94$$