

Biochemistry Cumulative Examination

May 9, 2017

100 points total.

1. (40 points) Briefly describe each method and discuss their pros and cons compared with other methods.

- (a) Fluorescence Correlation Spectroscopy (FCS)
- (b) Fluorescence Recovery After Photobleaching (FRAP)
- (c) Fluorescence Loss in Photobleaching (FLIP)
- (d) Single-particle tracking (SPT)

2. (15 points) Discuss why or why not you could use single-particle tracking of lamin A proteins to monitor their diffusional properties in cell nuclei. If you think you can use single-particle tracking, then also propose an experimental scheme.

3. (20 points) What is fluorescence photobleaching and how is it different from fluorescence quenching? Explain how photobleaching is used in continuous photobleaching (CP) experiments and discuss what information can be obtained from CP.

4. (25 points) Below shows the effect of lamin A protein on chromatin diffusion properties. The distributions of the anomalous exponent (α) of ~ 300 telomeres are shown for $Lmna^{+/+}$ cells (Blue) and for $Lmna^{-/-}$ cells (Red). * $Lmna^{-/-}$ and $Lmna^{+/+}$ cells are Mouse Embryonic Fibroblasts lacking lamin A/C (MEFs) and their WT.

(a) What the anomalous exponent (α)?

(b) How does the α relates to the diffusional behavior of molecules?

(c) Interpret and discuss the data shown here.

