Problem 1. Short answer.

(a) What is the purpose of immunostaining?

(b) What are antibodies and antigens? Describe how they are related.

(c) What does it mean to fix a cell? Why is it necessary?

(d) For Western Blots, the samples are washed with PBS. What reagent do we use to wash the samples in an immunostaining procedure? Why is this necessary?

(e) Why is it important to work in a dimly-lit environment when we are imaging?

Problem 2. You are performing an immunostaining lab that requires antigen-X to be diluted by a factor of ξ. If you start out with γ mL of solvent, *approximately* what volume of antigen-X is required?

Denote the volume as V_x, and assume $V_x \ll \gamma$. Also, please express your answer in μL.

Problem 3. Your friend from U$C wanted to run an immunostaining experiment last week, but he realized he ran out of reagents in his lab. As a nice and helpful person, your Principal Investigator offered him some spare antibodies from your lab. After driving over to UCLA and picking up the antibodies, your friend decides to roll down the top of his convertible to enjoy the beautiful Southern California weather on his way back.

The next morning, your friend attempted to perform his immunostaining experiment again. However, the data that he obtained from the microscope was dark and unclear. *Come up with an explanation as to what went wrong. What can he do to fix this?*

Problem 4. Derive the kinematic equation shown by equation (1) using the force equation described by Newton's Second Law.

$$x = \frac{1}{2}at^2 + v_0 t + x_0 \tag{1}$$

Assume you are given the boundary conditions described by equations (2) and (3):

$$\left.\frac{dx}{dt}\right|_{t=0} = v_0 \tag{2}$$

$$x(t=0) = x_0 \tag{3}$$

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