Cell Biology Lab Exam 1 Spr 2006  Name

REMEMBER YOU ARE LIMITED IN TIME SINCE THIS IS AN OPEN LAB
NOTEBOOK EXAM.

1. T F In your lab notebook, you should start each experiment with a statement of
   purpose (why you are performing the experiment), and then end the section on that
   experiment with a one sentence summary of what the data mean (the drug did not work).

2. T F With Sigmaplot statistics, you use a t Test. The P value is found to be 0.07, and
   you summarize in your lab notebook that means that the experimental group is
   significantly different from the control group.

3. Compare the Pooled t Test with the Paired t Test:

   Pooled - Con & Exp groups
different

   Paired - = same

4. If statistics suggest that the experimental group is just barely significantly different
   from the control group, we might be wrong about 5% of the time.

5. BY DRAWING A NEW GRAPH TO THE RIGHT, show how you would make the
   following line into a straight line:

   ![Graph Image]

6. Using the Sigmaplot regression line statistics, you note the

   b[0] stands for _______ of the equation Y = mx + b

   b[1] stands for _______ of the equation Y = mx + b

7. In SDS polyacrylamide electrophoresis, what is SDS?

   Sodium dodecyl sulfate, a detergent that unravels protein
8. T  F After running SDS polyacrylamide electrophoresis, small proteins end up at the top and big proteins end up at the bottom of the gel.

9. T  F By use of standard proteins (proteins of known weight), you can estimate the molecular weight of an unknown protein. Graphing molecular weight of the standard versus the distance run, you find a straight line.

10. You run three standard proteins on a gel and they run 3 to 10 cm down the gel. You find that your unknown protein runs 14 cm. What is the problem?

11. T  F Proteins are very rigid structures.

12. T  F Proteins typically bind to each other through strong covalent bonds.

13. Alzheimer patients have extracellular plaques made up of amyloid B (protein name) because the protein does not fold properly. Another protein, ApoE may cause the first protein not to fold properly.

14. Besides Alzheimer’s, name two diseases caused by bad protein folding:

15. Name of the major protein family that helps other proteins fold: chaperone

16. Ribonuclease is weird because it……

17. Name and describe the three types of amino acids (how they differ):

   1. NonPolar - R group has no charge separation - no polar covalent bonds - C-C or C-H bonds
   2. Polar - R group has a polar covalent bond (unequal sharing of e->) charge
   3. Charged - R group is ionic or has charge - change in R group
18. Describe the four levels of protein structure (primary, secondary, etc):
   a. 1°  correct order of Amino Ac
   b. 2°  α helix or β pleated sheet
   c. 3°  β-strands
   d. 4°  subunits

19. Below, name the 2 types of secondary structures (see two boxes)
   a. β pleated sheet
   b. α helix

20. We used the illustration of the following protein to show what? Answer here:
   2 domains make up protein
   Each domain has different function/bind different molecules
21. The beginning of a protein is called the **N-terminus** (or amino terminus).

22. Using the illustration below, this protein is called **calmodulin**.

23. This protein binds four **Ca⁺⁺ ions**.

24. **T** The illustration shows the protein in its form where it has bound other proteins (to activate the other protein).

25. Cdc2 is the kinase that causes cell division. When it is not bound to **cyclin** (name other protein), it is off and a cdc2 domain called **P-STATE** is not in the active site where it is required, and another domain called the **T-loop** will block the active site (so binding of substrate does not take place). That is, another protein binds to help activate cdc2 and one domain moves out of the active site and the other domain moves in when the other protein binds.
26. Chaperones bind to a folding protein at the folding protein's _________________.

(name type of amino acids), prevents the folding protein from precipitating.

27. A microliter is 0.000001 liters (fill in proper number of zeros).

28. A nanoliter is 0.0000001 liters

29. A milliliter is 0.001 liters

30. The Absorbance of light of a certain wavelength = e (concentration) where e is the extinction coefficient (name). For most proteins, the e value is about

10 for a concentration of 0.1% using a wavelength of light of 276 nm.

31. Express a 0.5% solution:

As the number of g per 100 ml solution: 0.5% = 0.5 g

As the number of mg per 100 ml solution: 500 mg

As the number of mg per ml solution: 5 mg/ml

As the number of g per Liter of solution: 0.5 g

31. Calculate the concentration (as a %) of insulin if the OD of the solution is 1.4: (show work)

\[ e = \frac{1.4}{0.1} = 14 \] (for 0.1% Sol’n)

\[ 1.05 \times 0.1 = 0.133\% \]

32. For a micropipette that goes up to one milliliter, this setting means what volume in microliters:

1000 µL
33. One ml of water has a mass of how many milligrams? \[ 1000 \text{ mg} \]

34. I want to make up a solution of glycine at 15 mM, with a final volume of 150 ml (glycine MW is 75). How many grams of glycine is needed?

\[ \frac{0.015 \text{ moles}}{2} \times \frac{0.15 \text{ L}}{1} \times \frac{75 \text{ g}}{\text{ mole}} = 0.16875 \text{ g} \]

35. How many grams are needed: 100 ml final volume, 5 M stock solution of CaCl₂ (MW of 111).

\[ \frac{5 \text{ moles}}{2} \times \frac{0.1 \text{ L}}{1} \times \frac{111 \text{ g}}{\text{ mole}} = 55.5 \text{ g} \]

36. A very large protein has a molecular weight of 400,000. You want to make a solution of the protein at 1% (most proteins will start precipitating out of solution at about 1-2%; so this protein solution is very very concentrated). How many grams of protein is needed for 10 ml?

\[ 1\% = \frac{1\text{ g}}{100\text{ ml}} = 0.01 \text{ g} \]

37. You want 25 ml of 0.5 M CaCl₂, 1 M MgSO₄, and have the following two stock solutions: 5 M CaCl₂, and 2.5 M MgSO₄. After adding the appropriate volume of the two stock solutions, you would top off to 25 ml. What is the volume of each stock solution to add together to form the desired solution?

\[ \frac{25 \text{ ml}}{25 \text{ ml}} \times \frac{25 \text{ ml}}{10} = 2.5 \text{ ml} \]

\[ \frac{25 \text{ ml}}{25 \text{ ml}} \times \frac{25 \text{ ml}}{2.5} = 10 \text{ ml} \]
38. Name and describe the three types of cell culture and what type we have used:

- a) Primary cells - taken from animal, live for days
- b) Tissue - from fetal tissue, DIV 20-30, 2-3xmo, live couple of months
- c) Transformed cells - live forever from tumors or made into cell lines

39. IN THE SPACE below: Does progesterone cause an early activation (less than 30 min after addition of hormone) and late activation of map kinase ERK when added to Xenopus oocytes? Explain how you looked for an early activation by describing the assay used (name it also; what does the antibody bind to, how do you detect the antibody, etc).
40. Describe the map kinase pathway: a hormone like **insulin** or progesterone (we used both) binds to a receptor located in the plasma membrane (this is unusual for progesterone), and the receptor turns on: 

GRB2 which turns on **SOS** which turns on a G protein (a protein that is on when GTP is bound) called **Ras**. This last protein then turns on a kinase called **Raf**. Which turns on another kinase called **MEK**. Which turns on map kinase. Map kinase does many things in the cell to induce cell division. One thing that map kinase does is that it enter the nucleus and turns on transcription factors (Ap1), which in turn activates certain genes.

41. Name the three types of map kinases and describe what each does:

a) Jnk - phosphoril Jun

b) p38 - MAPK - apoptosis

c) ERK5 - cell div, memory, learning

Erk1 = 44 kDa
Erk2 = 42