



**BIO1140 STUDY PACKAGE**

**FINAL EXAM**

**ANSWERS**

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## Protein Targeting

1. What is the point of Targeting?  
Mechanism to transport proteins to their correct destination between membrane bound compartments.
2. What is the consequence of a lack of signal recognition particles?  
Proteins will not be able to target to ER
3. How do proteins pass through multiple membranes?  
Multiple signal recognition sequences
4. What does GFP stand for?  
Green Fluorescent Protein
5. Targeting to the ER allows for which level of regulation?
  - a. Transcription
  - b. Post-transcriptional
  - c. Translational
  - d. Post-translational
6. How did scientists use GFP to elucidate the process of protein targeting? What else can it be used for?

GFP is a protein that fluoresces Green light, which allows visualization of structures within a cell under electron microscopes. To show the concept of protein targeting, scientists tagged an ER signal to the GFP gene. When the GFP was translated, the ER signal was also translated.

Visualized under the microscope, scientists saw the presence of GFP within the ER (thereby proving that the ER signal allowed the transport of GFP into the ER lumen). A subsequent tag of an ER retention signal to the GFP resulted in the retention, or sequestering of GFP molecules within the ER, preventing export.

Therefore, scientists were able to conclude that specific signals on the protein, or subsequent modifications to the protein, resulted in the movement, delivery, retention, or export of specific proteins to specific locations (ie. Protein targeting).

Because GFP fluoresces green light, it is a great biological tool for the visualization of multiple structures, as well as the confirmation of particular products. For example, GFP can be tagged onto other proteins to determine when the protein is expressed, and where the protein function is conferred.

## Regulation

1. A single promoter driving the expression of multiple genes makes up a(n) operon.
2. If the adenyl cyclase is deficient within *E. coli*, what would happen if the *E. coli* are starved of glucose and placed in galactose enriched medium?  
They would starve, due to a lack of cAMP, which will result in the inability of CAP protein to bind to the CAP binding site and activate transcription even in the presence of galactose.
3. Steroid hormones bind to the following:
  - a. Hormone-gated ion channels
  - b. G-protein coupled receptors
  - c. Intracellular receptors
  - d. Nuclear receptors
4. What is the main difference between *miRNA* and *siRNA*?  
*miRNA* is encoded endogenously (by the cell/organism itself), and *siRNA* is encoded exogenously (usually by a virus).
5. What is the purpose of RNA interference?  
To control the amount of available mRNA – result in either the blockage or the degradation of mRNA.
6. What is the purpose of ubiquitin?  
To mark a protein for degradation.

## Cell Cycle

1. What happens in the S phase?
  - a. Cell division
  - b. Protein synthesis
  - c. DNA replication
  - d. All of the above
  
2. What are the consequences of cyclin deficiency?

CDKs will be inactive, no proteins would be phosphorylated, and cells would be unable to meet their “checkpoints” and divide.
  
3. What are the consequences of p27 deficiency?

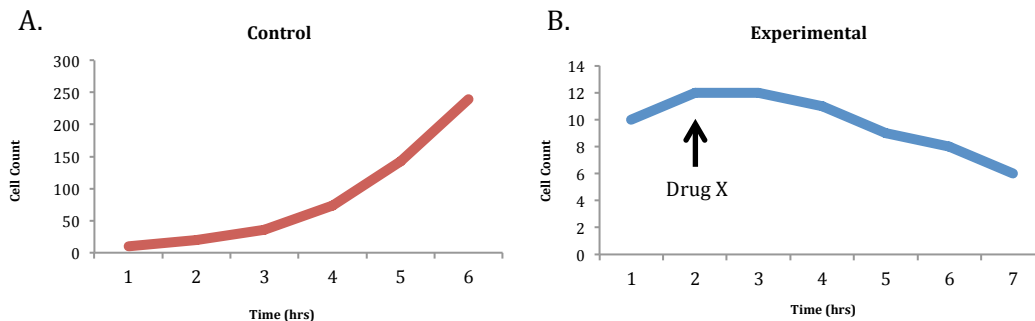
Cells will divide prematurely since p27 inhibits CDK1, and the absence of which would result in decreased regulation in cell division.
  
4. Prokaryotes divide according to the following:
  - a. Cytokinesis
  - b. Mitosis
  - c. Meiosis
  - d. Binary Fission

## Cytoskeleton, Cell Movement, and Extracellular Interactions

1. What is dynamic instability?  
 $\beta$ -Tubulin bound to GDP within microtubules, which results in an unstable state and possibly dissociation and shrinkage of the (-) end.
2. If  $\beta$ -Tubulin is bound to GTP, at which end would it add to on the microtubule filament?  
+ end
3. What initiates microtubulin production?  
Microtubule-organizing centers (MOC)
4. Movement along the microtubules are a result of \_\_\_kinesins\_\_\_ and \_\_\_dyneins\_\_\_.
5. Chemotaxinol is a drug that inhibits the release of  $\text{Ca}^{2+}$  within cellular vesicles. Which of the following would be affected? And why?
  - a. Microtubules
  - b. Microfilaments
  - c. Intermediate Filaments
  - d. Kinesins/Dyneins
  - e. Motor Proteins

Because  $\text{Ca}^{2+}$  is necessary in contraction, in which it binds to troponin and causes a conformational change in tropomyosin, wherein it reveals the binding site on actin for myosin (motor proteins) and allows contraction to take place. It does not affect the other filaments and motor proteins indicated because they do not require  $\text{Ca}^{2+}$  to function, they only require ATP/GTP.

6. Two intermediate filaments coil together to form a \_\_Dimer\_\_. Two of these aligned together make a protofilament. 8 (#) protofilaments make one filament.
7. A new drug has been developed. Trials have resulted in the following graphs.



Given the information, what function can we conclude is the purpose of the drug?

The control displays normal growth of cells, with a doubling time of about 1 hr. However, in the experimental, the number of cells remains relatively the same for the first few hours, and slowly decline as time passes from the time of drug onset. This is indicative of an inhibition of mitosis as the cells are clearly not dividing. Microtubules and microfilaments are involved in the mitotic process. \*\*You can argue for either of these filaments, however you must make your point clear. If you go with microtubules, think of how a drug might inhibit microtubule assembly (eg. Inhibition of polymerization, inhibition of MTOC function, etc). Same with microfilaments (eg. Effect of ATP, affect of inhibition on contractile force that is necessary in cytokinesis).\*\*

8. Fill in the following: indicate the proteins involved and their purpose

Animal Cells			Plant Cells
Adhesive Junctions	Tight Junctions	Gap Junctions	Plasmodesmata
Adherins (microfilaments) Desmosomes (intermediate filaments) Cadherins	Junctional proteins	Connexins	Channels that allow ions and small molecules to pass through (permeability)
Connect one cell to another via intracellular linkage proteins (integrins)	Permeability barrier	Free passage of ions/other molecules - Electrical/chemical communication	