

BIOLOGY 205H

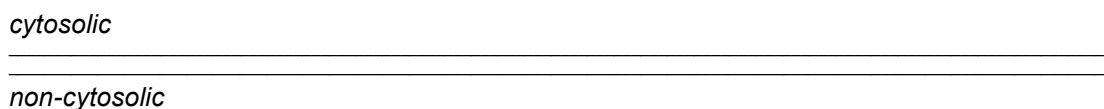
SAMPLE EXAM 2

A red X mark has been added to the questions that are not relevant to BIOL240H before exam 2 for Fall 2024.

- PRINT YOUR NAME AT THE TOP OF EVERY PAGE.
- USE PEN, NOT PENCIL.
- SIGN THE HONOR PLEDGE AT THE END OF THE EXAM.
- EACH ANSWER WILL BE GRADED BASED ON HOW CORRECT AND HOW COMPLETE IT IS.

1. (6 points) What is the final location of a protein if it has the following signal sequences:
a. no signal sequences at all _____
b. only an uncleaved ER import signal sequence _____

2. (4 points) On the phospholipid bilayer diagram below, draw the transmembrane arrangement of a protein that has a cleaved N-terminal ER import signal sequence and three additional transmembrane domains. Label the N terminus and the C terminus of the cleaved protein.



X3. (4 points) Explain how Viagra keeps blood vessels dilated.

X4. (4 points) What was Rita Levi-Montalcini's main contribution to cell & developmental biology? _____

X5. (4 points) Cells sense the release of _____ from mitochondria as part of the triggering mechanism for programmed cell death.

X6. (6 points) A checkpoint exists in cells to prevent entry into anaphase while mono-oriented chromosomes remain. What is monitored by the cell at this checkpoint, and how do we know this?

X7. (3 points) Fas ligand and Fas receptors promote _____.

X8. (7 points) Explain, step-by-step, how a growth factor binding to a receptor tyrosine kinase at the cell surface can result in a change in transcription in the nucleus, in a case where signaling does not occur through phospholipase C.

9. (6 points) What is the most common mutation causing cystic fibrosis? Explain in detail how this mutation results in the disease.

X10. (6 points) Explain the molecular mechanism by which cholera causes diarrhea and dehydration.

11. Explain how scientists learned the following:

a. (3 points) that rotation of parts of ATP synthase is sufficient to drive ATP synthesis

b. (3 points) that a proton gradient is sufficient to drive ATP synthesis

12. (6 points) Explain how endocytic vesicles are shaped and then separated from the plasma membrane during receptor-mediated endocytosis.

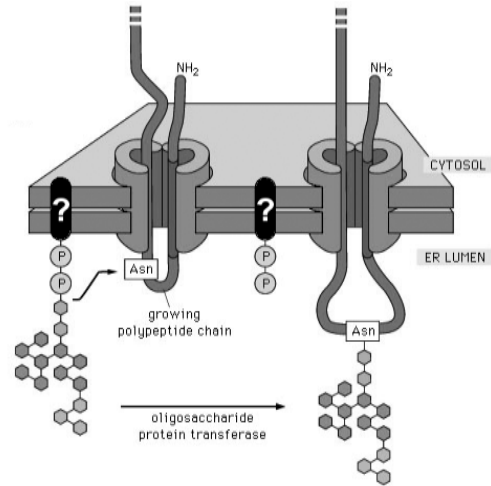
13. (6 points) Explain what happens, and why, after microtubule growth slows to below the rate of GTP hydrolysis on tubulin near the plus end of a microtubule.

14. A cell biologist fractionates cellular components into cytosolic, nuclear, mitochondrial, and other fractions and finds that after adding oxygen, ADP, phosphate, H⁺ and glucose, ATP is produced in just one of the fractions.

a. (2 points) Which fraction is this? _____

b. (2 points) What does this tell us about this fraction? _____

15. (4 points) In the ER, complex oligosaccharide side chains are transferred to proteins from a specialized lipid called _____. This specialized lipid is marked with question marks in the figure at right.



16a. (2 points) What kinds of proteins do *Listeria* bacteria have on their surfaces that allows them to move inside your intestinal cells? _____

b. (4 points) Explain how we know that these proteins are *sufficient* to drive *Listeria*'s motility.

X17. (4 points) What motors drive anaphase B, and where in the cell (be specific) are they functioning to drive anaphase B?

18. (4 points) Actin-related proteins, or ARPs, form complexes that perform a specific function in shaping the architecture of actin networks in cells. What is that function? _____

19. A cell biologist isolates mitochondria, bursts them by hypotonic lysis, collects the sealed inner membranes, and fractionates them into 5 fractions: (1) Sealed inner membrane vesicles *with* ATP synthase associated, (2) sealed inner membrane vesicles *without* ATP synthase associated, (3) unsealed inner membrane fragments *with* ATP synthase associated, (4) unsealed inner membrane fragments *without* ATP synthase associated, and (5) isolated ATP synthase complexes.

a. (1 point) Which fractions (#1-5) produce ATP? _____

b. (4 points) Explain why. _____

20. (5 points)

a. What is the name of the structure that underlies and strengthens the nuclear envelope?

b. What is the protein that makes up this structure? _____

c. What class of cytoskeletal filament does this protein belong to (microfilament, intermediate filament or microtubule)? _____

Xd. What happens to this protein at prophase, allowing this structure to partially disassemble during nuclear envelope disassembly? _____

Xe. What is the enzyme that catalyzes this? _____

ON MY HONOR, I HAVE NEITHER GIVEN NOR RECEIVED UNAUTHORIZED AID ON THIS ASSIGNMENT.

SIGNED _____