GQs for Topic: Protein Sorting via the Secretory Pathway & Vesicular Transport

1. Sorting of proteins via the secretory pathway consists of three fundamental steps, which are _____.

2. Movement of proteins through the secretory pathway takes place by what mode of transport?

Questions 3-7 refer to the original pulse-chase experiments conducted by George Palade and colleagues through which they provided early definition of the secretory pathway.

3. In the early experiments that first defined the "secretory pathway", George Palade and colleagues were seeking to understand how cells secrete proteins after their synthesis within cells. To do so, they used a cell line derived from the pancreas. Why was selection of pancreatic cells as their model system advantageous as compared to other cell types (e.g., neuronal cells)?

4. Pulse-chase experiments are commonly used in cell biology research and entail three major steps when conducting one. Those steps are _____.

5. By 3 minutes after adding radioactive amino acids to pancreatic cells growing in culture, George Palade and colleagues detected accumulation of radiation within the rough endoplasmic reticulum. How did this observation inform their understanding of how proteins are secreted from cells?

6. By 7 minutes after starting their chase period, George Palade and colleagues detected radiation mostly in the Golgi apparatus. How did this observation inform their understanding of how proteins are secreted from cells?

7. By 120 minutes after starting their chase period, George Palade and colleagues detected radiation mostly vesicles underneath the plasma membrane and in the extracellular medium/solution. How did this observation inform their understanding of how proteins are secreted from cells?

8. Cells use the secretory pathway to sort proteins to which of the following compartments?

9. What does the term "signal sequence" refer to?

10. TrkA is a protein that is imported into the ER for sorting through the secretory pathway. If you had the amino acid sequence for TrkA (which, remember, you could find yourself on the NCBI Protein Database), how would you analyze it to identify its potential signal sequence?

11. Why do N-terminal signal sequences allow for co-translational import of proteins in to the rough ER?

12. How does the protein signal recognition particle (SRP) contribute to import of proteins into the rough ER?

13. How does the SRP receptor contribute to import of proteins in the rough ER?

14. What role does the ER translocon play during import of proteins in the rough ER?

15. APP, BACE1, and nicastrin are three examples of proteins with N-terminal signal sequences. Based on this information, which of the following mutations would you predict to interfere with import of all three protein into the ER? Which mutation would you predict to interfere with import of only BACE1?

16. APP, BACE1, and nicastrin are also three examples of transmembrane proteins. Based on this information, what would you expect these proteins to have in common?

17. How do cells insert transmembrane proteins into a membrane?

18. What does the term "internal noncleavable signal sequence" refer to?

19. N-linked glycosylation refers to _____ and takes place _____.

20. What is a GPI anchor?

21. The term "vesicle budding" refers to _____.

22. The phrase "protein sorting into a budding vesicle" refers to _____.

23. The term "vesicle fusion" refers to _____.

24. GM130 is a protein that functions in the Golgi apparatus. Following its translation on ER-bound ribosomes, GM130 transported to the Golgi apparatus by _____.

25. Vesicle budding refers to _____.

26. Sorting of cargo into a budding vesicle refers to _____.

27. Vesicle fusion refers to _____.

28. What role do vesicle coat proteins play in cells?

29. How are COP proteins and clathrin similar? How are they different?

30. In 2004, researchers discovered that the protein sorLA is involved in the pathology underlying Alzheimer's disease. Investigation into sorLA's function in cells determined that it functions as a sorting receptor in neurons. Based on this information, what can you tell me about the function of sorLA in neurons?

31. ARF, GGA, and AP1 are adaptor proteins that are critical for the packaging of cargo into budding vesicles. How do they contribute to that process?

32. **TRUE or FALSE:** LAMP1 is a protein that functions in lysosomes. EGF receptor is a transmembrane that functions at the plasma membrane. Based on this information, you can conclude that LAMP1 and EGF receptor are packaged into the same vesicles during vesicle budding from the *trans* Golgi network.

33. How are ER export receptors and mannose-6-phosphate receptors similar? How are they different?

34. O-linked glycosylation refers to _____ and takes place in the _____.

35. Generally speaking, how do sorting proteins in the *trans* Golgi network identify proteins for packaging into vesicles bound for the plasma membrane?

36. PERK is a protein that functions in the rough ER. GCP60 is a protein that functions in the Golgi apparatus. Cathepsin B is a protein that functions in lysosomes. And ABCA1 is a protein that functions at the plasma membrane. Based on this information, which of these proteins would you predict to be modified with a mannose-6-phosphate?

37. What role does the mannose-6-phosphate receptor play in cells?

38. Transport of vesicles from the *trans* Golgi network to the plasma membrane is carried out by _____.

39. The term "vesicle docking" refers to _____.

40. What role do Rab proteins play in cells?

41. Once docked at a target membrane, fusion of the vesicle membrane with the target membrane is driven by _____.

42. What does the term "coiled-coil" refer to in the context of vesicle fusion?

43. What is the difference between v-SNAREs and t-SNARES?