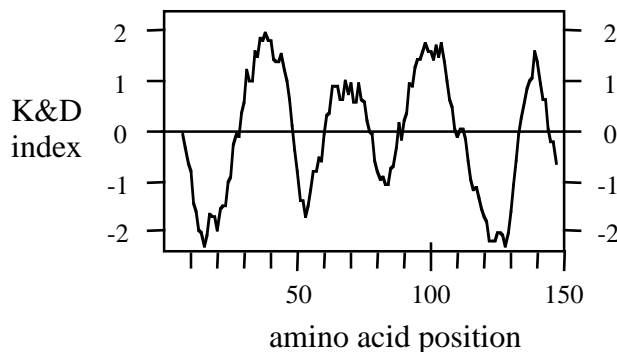


1. Lipids can be classified into two broad groups. List them. (2 points)
2. Draw the general structure (*i.e.*, a cartoon) of a generic membrane phospholipid AND identify the key parts of the structure. (4 points).
3. Which molecule (larger than an atom) is used as a precursor in the synthesis of all lipids? (1 point)
4. Which nucleotide triphosphate (NTP) is required for glycerophospholipid synthesis AND which of the NTP phosphate groups is specifically incorporated into the lipid? (2 points)
5. List the lipid(s) that specifically incorporate phosphatidic acid? (2 points)
6. Identify the predicted membrane spans in the following Kyte and Doolittle hydropathy plot using shading and numerical identifiers (I, II, *etc.*) AND depict the possible topology/topologies for this protein. (4 points)



7. What are the features of the targeting signal that directs a protein to the general Sec-dependent secretion system in prokaryotic organisms? Describe OR depict with descriptive labels (4 points)

8. List the different types of protein lipidation AND indicate whether they are typically found on intracellular or extracellular molecules. (5 points)

9. List the amino acids that can be modified by phosphorylation? (4 points)

10. List factors, as defined in lecture, than can influence proteolytic mechanisms. (3 points):

11. Provide examples of TWO protein-protein interaction domains AND define the motif that they interact with. (3 points)

12. List the four basic principles of signal transduction, as defined in lecture. (4 points)

13. Describe the role(s) of the basic components/modules of a GPCR signal transduction system. (6 points)

14. Draw/Depict in cartoon fashion the general structural features of ABC proteins (use descriptive labels). (3 points)

15. Label each blank to indicate whether the term is typically indicative of a Channel (C), Active Transporter (T), or Both(B)? (4 points)

- _____ Continuous pore
- _____ Easily saturable
- _____ Energetically uphill transport
- _____ Energetically downhill transport
- _____ ATP requiring
- _____ Fast, relative to passive diffusion
- _____ Cargo specific
- _____ Facilitated

16. Briefly compare AND contrast the properties of aquaporin and OmpF porin channels in terms of A) secondary structure, B) quaternary structure, C) pore location, and D) pore selectivity. (8 points)

17. Briefly describe the biophysical properties that make fluorochromes a good FRET pair? (6 points)

18. What is the basis for the differential effects of TPCK and TLCK on Chymotrypsin and Trypsin? (4 points)

19. The farnesyltransferase (FTase) and geranylgeranyltransferase I (GGTaseI) share a common α subunit and have distinct β subunits. The FTase β subunit can bind both farnesyl bisphosphate (Fpp) and geranylgeranyl bisphosphate (GGpp), but only Fpp is efficiently utilized as a substrate. Briefly describe why this is the case. (3 points)

20. *Vibrio cholerae* is responsible for cholera, a diarrheal type of disease. The causative agent is a toxin that is produced by this organism. The toxin exerts its effect on intestinal epithelial cells. Briefly describe (10 points total):

A) the mechanism used by cholera toxin for secretion from *Vibrio cholerae*.
(3 points)

B) the mechanism used for uptake and dispersion of the toxin in the cytoplasm of epithelial cells.
(4 points)

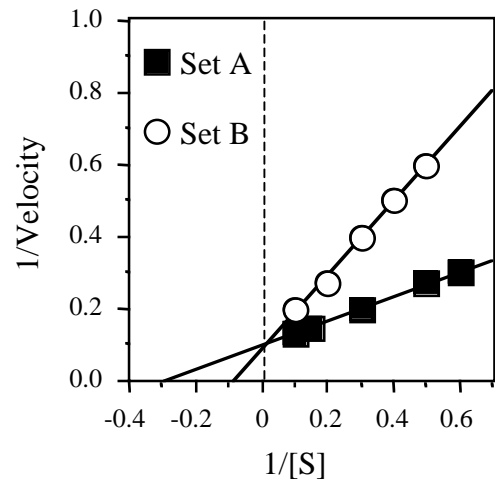
C) the target(s) of the toxin and the immediate cellular effect(s). (3 points)

21. You have isolated a new compound that is an inhibitor of the HIV aspartyl protease. You have obtained kinetic data on the inhibitory nature of your compound that is represented in the Lineweaver-Burke plot shown. Set A data was obtained by measuring the velocity (rate) of proteolytic activity in the presence of varying substrate concentrations. Set B data was obtained as in A but included the antiviral compound in the reactions. (5 points total)

A. What type of inhibition is occurring? (1 point)

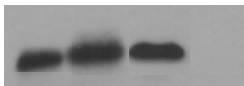
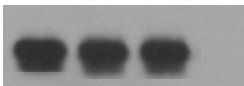
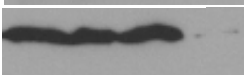
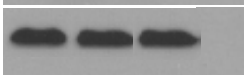
B. Your compound is likely a mimic of what? (2 points)

C. Your compound has a single hydroxyl group. When your compound is synthesized as an ester-derivative, it is more effective on infected intact cells. Why is this likely to be the case? (2 points)



22. You have a sample preparation containing both P- and V-type ATPases. The combined activity of both ATPases contributes to the measured activity of the total sample as determined by a colorimetric assay that can detect Pi release. How could you use the same type of assay to simply determine the relative contribution of each enzymatic activity? (4 points)

23. You obtained the following data from a protease protection experiment that was designed to determine the topology of a peroxisomal membrane protein that you are studying (called unknown in the diagram). Draw the simplest topology that is supported by the data. (2 points)

Site of reporter:	N-term				C-term			
TX-100:	-	-	+	+	-	-	+	+
Prot. K:	-	+	-	+	-	+	-	+
Unknown								
peroxisomal matrix protein								

24. List the key events required for vesicular fusion as described in the lecture notes (5 points)

25. List AND briefly describe TWO biochemical methods that could be used to evaluate whether a protein is part of an enzymatic complex. (2 points)

Extra Point Questions (5 points total) – Note that the maximum exam score is 100

1. What is the byproduct of the condensation reaction carried out by the fatty acid synthase (1 point)

2. Relate one piece of experimental evidence that supports either the pore or proximity model for vesicular fusion. (2 points)

3. Describe the role of regulated intramembrane proteolysis in the maturation of a transcription factor. (2 points)