

April 1, 2008

True / False (0.5 point each; 10 points total)

1. Regarding integral membrane proteins:
 they typically have transmembrane segments that are 10 nm in width.
 they typically constitute 25% of the genes in a typical genome.
2. Regarding naturally occurring fatty acids:
 they typically have an even number of carbon bonds.
 they typically have *trans* double bond configurations when unsaturated.
 they are relatively insoluble in water.
3. Regarding prokaryotic protein secretion:
 the Sec-system translocates unfolded proteins.
 the signal sequence targeting proteins to the Sec-system is retained on secreted proteins.
 Gram positive prokaryotes make extensive use of Type III systems for infection.
4. Proteins with a PDZ domain:
 typically bind a phosphorylated target.
 interact with the N-termini of proteins that are modified by the methionine aminopeptidase.
5. In terms of protease mechanisms:
 an aspartic protease forms an acyl intermediate with its substrates.
 the N-terminal product produced by all 4 proteolytic mechanisms would be radiolabeled in the presence of $^{18}\text{O}\text{-H}_2\text{O}$.
6. Regarding protease inhibitors:
 PMSF inhibits elastase, chymotrypsin, and trypsin.
 TLCK inhibits chymotrypsin.
7. GPI-linked proteins:
 are found in single celled parasites on the extracellular face of the plasmamembrane.
 are anchored in plasma membranes because of their conjugation with a sphingolipid.
8. On the topic of protein channels:
 they can be either gated or ungated.
 the aquaporin channel is 5.8 Å in diameter at its narrowest.
9. Regarding the 4 types of transport ATPases discussed in class:
 they can all be manipulated to hydrolyze ATP.
 the P-type ATPases represent the largest transporter gene family.

Multiple Choice (2 points each; 28 points total; one correct answer per question)

10. Which of the following biological membranes does not actively restrict ion movement across it?
 - A) endoplasmic reticulum
 - B) nucleus
 - C) peroxisome
 - D) plasma membrane

11. Which of the following amino acids is not a part of glutathione?
 - A) cysteine
 - B) glutamate
 - C) glycine
 - D) serine

12. Which of the following is the best source of dietary docosahexanoic acid?
 - A) beef
 - B) fish
 - C) leafy vegetables
 - D) nuts and seeds

13. The polar head group on cholesterol is derived from which functional group?
 - A) an amine
 - B) a hydroxyl group
 - C) a phosphate group
 - D) a sulfhydryl group

14. Cholesterol is similar in size to a fatty acid of which length?
 - A) C12
 - B) C14
 - C) C16
 - D) C18

15. What is the relative abundance of docosahexanoic acid in the plasma membranes of neurons (by weight relative to other lipid components)?
 - A) 50%
 - B) 33%
 - C) 25%
 - D) 10%

16. Approximately, what percentage of medically relevant drugs target membrane proteins?
 - A) 50%
 - B) 33%
 - C) 25%
 - D) 10%

17. Which of the following is the binding target of the FYVE domain:
 - A) PI(3)P
 - B) PI(3,4)P2
 - C) PI(4,5)P2
 - D) PI(1,4,5)P3 – more commonly known as IP3

18. The FYVE domain requires which ion cofactor:
 - A) Ca^{2+}
 - B) Fe^{2+}
 - C) Mg^{2+}
 - D) Zn^{2+}

19. Which of the following is not known to be nucleophile in proteolytic mechanisms?
- A) cysteine
 - B) histidine
 - C) serine
 - D) water
20. Which of the following eukaryotic organelle membranes is not known to have an associated ABC transporter?
- A) endoplasmic reticulum
 - B) lysosome
 - C) nucleus
 - D) plasma membrane
21. Which of the following typically exists in monomeric form in biological membranes?
- A) ABC-type ATPase
 - B) aquaporin channel
 - C) OmpF general porin
 - D) P-type Ca^{2+} ATPase
22. Based on class discussion, which of the following amino acids is least likely to be at the interfacial region of a porin or channel ionophore?
- A) His
 - B) Phe
 - C) Trp
 - D) Tyr
23. Which of the following does not contribute to the selectivity of the aquaporin channel?
- A) desolvation filter
 - B) dipole filter
 - C) proton filter
 - D) size filter

Short Answer - These can be answered using one or two keywords, lists, diagrams, and/or a few sentences (1-4 points each; 31 points total)

24. Using the stick figure method, draw the chemical structure of a naturally occurring $18:2(\Delta^{9,12})$ fatty acid. (4 points)