

Name _____

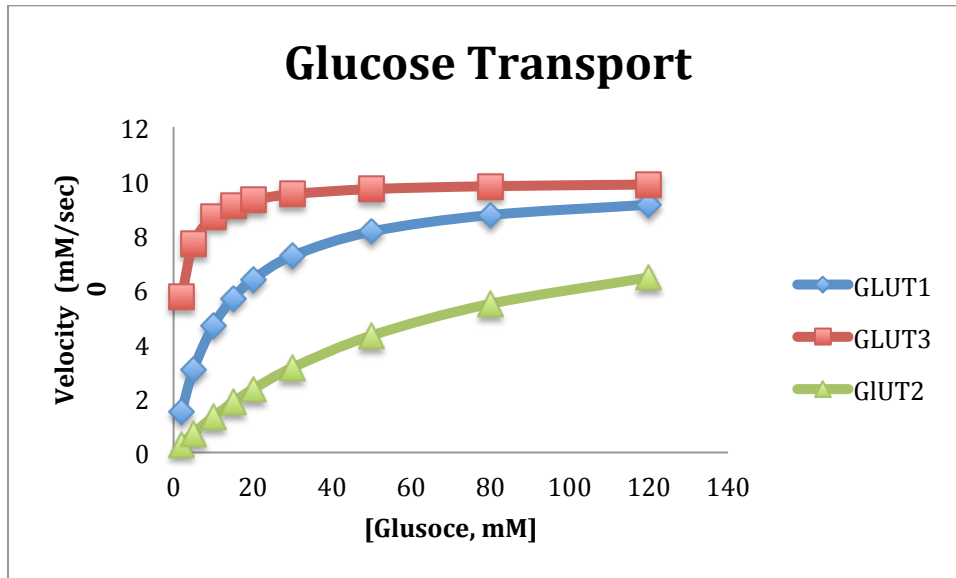
This is a take home exam. You may use your class notes, the textbook or any published web materials. You may not consult another human. If you use web materials, please provide a URL, otherwise it will be assumed that you consulted class notes or the text. There are no maximum or minimum numbers of words required. Please write your answers in organized paragraphs with complete sentences. Please submit one document to Turnitin.com by Thursday March 17 at midnight. There are 105 possible points.

Exam Memory Bank

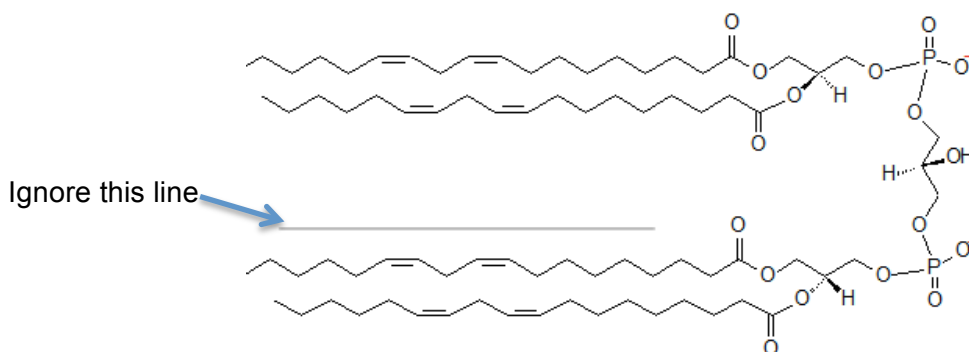
$V_0 = \frac{V_{\max} \times [S]}{K_m + [S]}$ $V_{\max} = k_{\text{cat}} \times E_t$ $k_{\text{cat}} = \frac{kT}{h} \times e^{\frac{-G^\ddagger}{RT}}$ $\Delta G = \Delta H - T\Delta S$	$\Delta G^{\circ'} = -nF\Delta E^{\circ'}$ $\Delta G^{\circ'} = -RT \ln K_{\text{eq}}^{\circ'}$ $\Delta G_t = RT \ln \frac{c_2}{c_1}$ $\Delta G_t = RT \ln \frac{c_2}{c_1} + ZF\Delta\psi$	<p>R = 8.314 J/molxK</p> <p>F = 96,500 J/Vxmol</p> <p>Boltzman constant, k = 1.381 x 10⁻²³ J/K</p> <p>Plank's constant, h = 6.626 x 10⁻³⁴ Jxsec</p> <p>Avogadro's number, 6.02 x 10²³ /mol</p> <p>ln x = 2.303 log₁₀ x calorie = 4.184 J</p>
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- (10 points) In mitochondria, F type active transporters are used to synthesize ATP by coupling the synthesis with the energy obtained when protons flow into the mitochondrial matrix. Calculate the energy that is available for ATP synthesis when 1 mole of protons flows into the mitochondrial matrix. The pH inside the mitochondrial matrix is 7.0, the pH outside the matrix is 6.7. The membrane potential is 80mV (inside is negative) and the temperature is 37°C. Show all of your work, as best you can.
- (10 points) Give a detailed description of the structure and function of a lipid raft.
- (10 points) Describe how the structure of an Aquaporin is related to how it functions.
- (10 points) Linoleic acid has a melting point of 13°C and linolenic acid has a melting point of -11°C. Give an explanation for the difference in melting temperatures for the two fatty acids. Use the shorthand notation when you refer to each fatty acid, (e.g. arachidonic acid is 20:4^{Δ5,8,11,14}). Be sure to discuss the relevant intermolecular forces.
- (10 points) Eggs have been wrongly accused of causing heart attacks! The body makes about a gram of cholesterol every day, so the amount obtained from eating an egg (200 mg) or two is not excessive. In fact, eggs are a very inexpensive source of a complete protein and thus should be included in most diets. In order to get cholesterol "out of jail" describe all of the functions and roles of cholesterol.
- (10 points) A mixture of phosphatidylinositol, triglyceride, phosphatidylcholine, sphingomyelin and cholesterol was dissolved in chloroform, then separated by chromatography on silica column. A mixture of chloroform/methanol was used as the eluent. What is the order that these lipids would elute from the column. Explain your reasoning for your answer.

7. (10 points) Use the data in the graph to determine the K_t value for each transporter. Then relate that value for each glucose transporter to the function of the cells where the receptor is found.



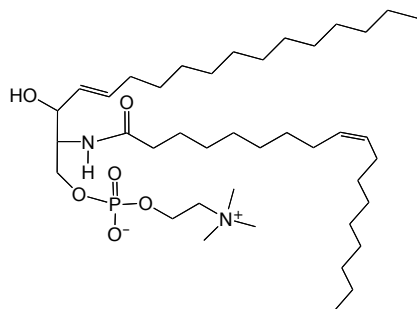
8. (10 points) Most cells have intracellular Na^+ concentrations of 10 mM, compared to the extracellular concentration of 130 mM. Calculate the Gibb's free energy change for the flow of Na^+ from the inside of the cell to the outside, for a cell with a membrane potential of 50 mV (negative on the inside).
9. (5 points) What is this the name of this molecule? Where is it found? What does it do? (The line in the middle is not relevant, please ignore it.)



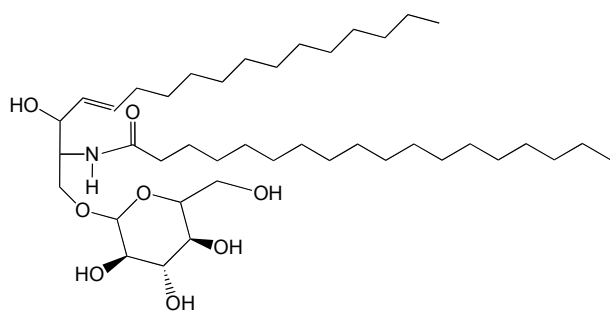
10. (10 points) Compare and contrast ion channels with passive transporters. Use specific examples as you describe their structures and functions.

11. (10 points) Identify each type of lipid molecule. Where are they located and what is their function?

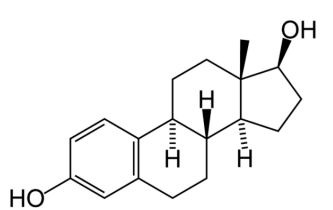
A.



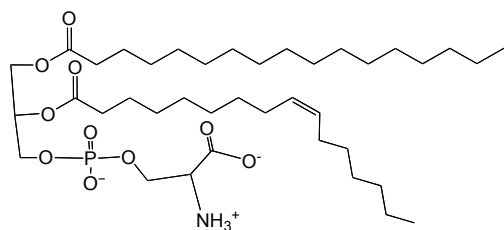
B.



C.



D.



E.

