

Name _____

Use complete sentences when requested. There are 100 possible points on this exam.

Exam Memory Bank

$V_0 = \frac{V_{\max} \times [S]}{K_m + [S]}$ $V_{\max} = k_{\text{cat}} \times E_t$ $k_{\text{cat}} = \frac{kT}{h} \times e^{\frac{-G^\ddagger}{RT}}$ $\Delta G = \Delta H - T\Delta S$	$\Delta G^{\circ'} = -nF\Delta E^{\circ'}$ $\Delta G^{\circ'} = -RT \ln K_{\text{eq}}^{\circ'}$ $\Delta G_i = RT \ln \frac{c_2}{c_1}$ $\Delta G_i = RT \ln \frac{c_2}{c_1} + ZF\Delta\psi$	$R = 8.314 \text{ J/mol}\cdot\text{K}$ $F = 96,500 \text{ J/V}\cdot\text{mol}$ Boltzman constant, $k = 1.381 \times 10^{-23} \text{ J/K}$ Plank's constant, $h = 6.626 \times 10^{-34} \text{ J}\cdot\text{sec}$ Avogadro's number, $6.02 \times 10^{23} / \text{mol}$ $\ln x = 2.303 \log_{10} x$ calorie = 4.184 J
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- (4 points) Why is ATP considered a high energy compound?
- (6 points) Compare and contrast lactose intolerance and galactosemia, what enzymes are defective or missing, what are the physiological effects? How do the treatments differ, or are they the same?

3. (26 points) Draw all of the structures for glycolysis and gluconeogenesis, include all of the enzymes, cofactors and all reactants for each reaction. Indicate which reactions are controlled by regulatory enzymes.

4. (24 points) Describe how liver cells are controlled so that glycolysis and gluconeogenesis do not occur simultaneously. Give specific details about the regulation by insulin, glucagon and epinephrine. Give specific details about the reactions that are regulated. What enzyme, how is it regulated? Include details about any of the following control mechanisms that are involved: allosteric modulation, reversible covalent modification, protein-protein binding.

7. (25 points) Using complete sentences, fully describe how Insulin regulates blood glucose levels. Include the reactions that are regulated by insulin by phosphorylation and by control of gene expression. You may include pictures as appropriate, but there must be sentences to describe your pictures. Use the following subtopics for your organization:
- How does insulin regulate glucose uptake by myocytes and adipocytes.
 - Describe an example of how glycolysis is regulated by insulin.
 - Describe an example of how gluconeogenesis is regulated by insulin.
 - Describe how insulin regulates glycogen synthesis.