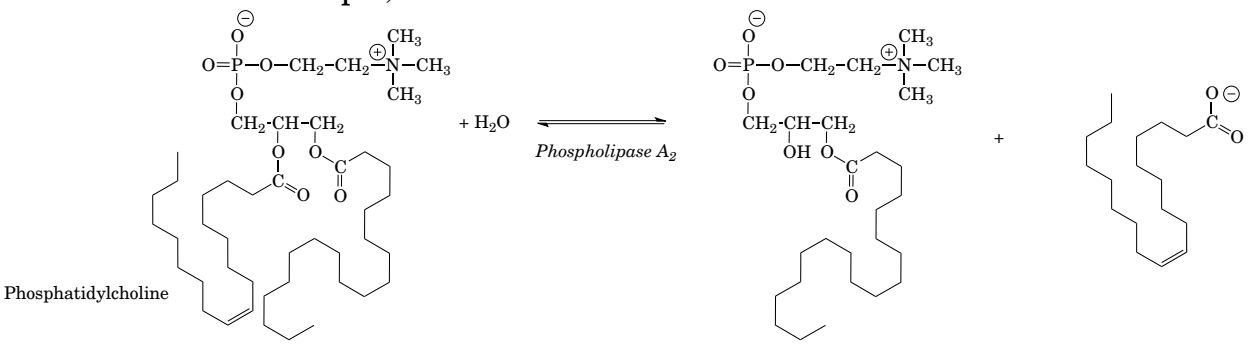
CHEM 331 Problem Set #1 **Winter, 2014-15** **Dr. Brandt**
Due date: Friday, December 5, 2014

1. In several venomous snakes, the venom toxin is a phospholipase A_2. This enzyme catalyzes the reaction below (the enzyme catalyzes the reaction for phosphatidyl choline and other related phospholipids; phosphatidyl choline is used as an example).



   a. Is this reaction likely to be thermodynamically favorable?
   b. Explain, in thermodynamic terms, how this toxin is lethal to cells, even though it usually hydrolyzes a relatively small fraction of the phospholipids.

2. Epinephrine acts via the β-adrenergic receptors to increase cAMP levels in both skeletal muscle and liver.
   a. Does epinephrine stimulate glycogen breakdown in liver?
   b. Does epinephrine stimulate glycogen breakdown in skeletal muscle?
   c. Does epinephrine stimulate glycolysis in liver?
   d. Does epinephrine stimulate glycolysis in skeletal muscle?
   e. Please account for the similarities and differences for the responses in the two tissues.

3. In Type I Diabetes Mellitus pancreatic insulin secretion ceases due to destruction of the β-cells.
   a. Is it likely for untreated Type I Diabetes Mellitus patients to have glycogen in their liver? How is this mediated?
   b. Is it likely for untreated Type I Diabetes Mellitus patients to exhibit high levels of gluconeogenesis? How is this mediated?

4. The kidney normally returns glucose from the fluid that will become the urine to circulation. In untreated Diabetes Mellitus, glucose is frequently observed in the urine. Please describe the mechanism responsible for this observation.

Study questions (these do **not** have to be turned in).
Lehninger: Chapter 23 problems