1. Although animals can not synthesize glucose from acetyl-CoA, if a rat is fed $^{14}$C-labelled acetate, some of the label will appear in the glycogen extracted from its muscles. Explain.

2. How many ATPs are consumed in the conversion of each of the following to a molecule of glucose?
   a) 2 molecules of DHAP
   b) 2 molecules of pyruvate
   c) fructose 1,6-bisphosphate
   d) glucose-6-phosphate
   e) 2 molecules of alanine
   f) 2 molecules of oxaloacetate

3. Name all of the sources that can be used as sources of carbon in gluconeogenesis.

4. Tell whether the following molecules activate or inhibit gluconeogenesis.
   a) ATP
   b) AMP
   c) Glucagon
   d) Ethanol

5. Insulin is a hormone that inhibits gluconeogenesis by deactivating key enzymes in the cycle. List the enzymes that could be targets of deactivation through phosphorylation.

6. Tell how much net ATP is generated or consumed for the following metabolic pathways. O$_2$ is present in every case.
   a) glycolysis
   b) gluconeogenesis
   c) glycogenolysis
   d) glycogenesis
   e) conversion of 1 molecule of pyruvate to acetyl-CoA
   f) 3 complete cycles of the TCA cycle.
   g) In the alanine cycle in a cell with only the α-glycerol phosphate shuttle system.
   h) In the Cori cycle.

7. You are planning to go on a strenuous hike and are advised to eat plenty of high-carbohydrate foods, such as bread and pasta, for several days beforehand. Suggest a reason for the advice.

8. Would it be advisable to consume a candy bar with high-refined sugar content immediately before you start the strenuous hike in problem 7?

9. Why does the body store glycogen, instead of storing all energy reserves as fat?

10. Explain the function of the hormone epinephrine in the body.