1. Homework 2-5, 7-11. Know the structure of glycogen, and that it is found in the cytoplasm of both liver and muscle cells. Know that an average person has about 280 Cal of liver glycogen, and 480 Cal of muscle glycogen, where one nutritional "Calorie" equals one biochemical "kilocalorie" (not in chapter!). What do these numbers imply about the functions of glycogen in the body? Glucose-6-phosphate is at a metabolic crossroad – know the various ways that it can be used (Fig 21.3). The breakdown of glycogen involves (a) phosphorolysis releasing glucose-1-P, (b) remodeling of glycogen for further breakdown, and (c) changing glucose-1-P into glucose-6-P. Phosphorolysis requires an enzyme with an active site that excludes water, otherwise hydrolysis would occur instead. Glycogen Phosphorylase is a complex and interesting enzyme which is discussed at length in the chapter. The remodeling is done by a bifunctional enzyme (in eukaryotes) – transferase and debranching enzyme (580). Note that the free glucose released by debranching enzyme represents about 10% of the glucose released from catabolism of normal glycogen. Phosphoglucomutase converts G1P into G6P.

2. Understand the material about the structure and regulation of glycogen phosphorylase (582-588). Phosphorylase is a dimer which can be activated either allosterically (by AMP, not cAMP) or covalently – each half of the dimer has a serine residue which can receive a phosphate. Covalent modification is triggered by hormonal stimulation, G-proteins, and adenylate cyclase producing cAMP. This activates protein kinase A which turns on phosphorylase kinase. Know the entire cascade (587, 592) and the fact that phosphorylase kinase can be partly activated by Ca^{+2} ions. The "local" process of allosteric activation is more important in muscle cells, whereas the hormonal activation is more important in liver cells. Read about the evolution of regulation of glycogen phosphorylase (588).

3. Understand the details of glycogen synthesis (589-591). "Important" hexose reactions tend to use the UDP derivatives. Here UDP-glucose must be synthesized and used as the substrate for glycogen synthase. Then, because glycogen synthase only makes α 1-4 linkages, the resulting linear molecule must again be remodeled into glycogen's branchy shape using branching enzyme – which is related to debranching enzyme and other members of the α-amylase family. Branching enzyme moves 7 residues from a chain of at least 11 residues, to an interior site which is at least 4 residues from the nearest branch. Know how glycogen synthase is controlled (593). Understand how insulin favors glycogen synthesis by activating Protein Phosphatase I. Finally, you should have a general understanding of how the various glycogen storage diseases work – without memorizing names or numbers. What difference should it make if a patient lacks branching enzyme, or debranching enzyme? What about G6Pase?