

BERG/STRYER VI STUDY GUIDE

CHAPTER 14

HOMEWORK – 1, 3, 5, 6, 12. Chapter 14 is full of fascinating material about **signal transduction**, which is one of the most interesting areas of biochemistry. You should understand the discussion of **7TM** receptors (e.g. **β -adrenergic**) and **G-proteins** (384-5) which leads to discussion of **Cyclic AMP**. The system we will discuss in class [later] is the Glycogen cascade (602). **Protein Kinase A** is turned on by cAMP and covalently modifies various enzymes in the cell (385-6). Details are on p. 287-8, in Chapter 10. Substrate RRGSE replace by RRGAE in regulatory protein. Know that parallel changes in **7TM** receptors drive many processes (Table 15.1). Another very important messenger system is generated by cleavage of **Phosphatidyl Inositol Bisphosphate** (388). The process begins when a hormone like vasopressin (91) stimulates a 7TM receptor, and then the G-proteins activate **Phospholipase C** (389). Cleavage by Phospholipase C removes the head group *with* phosphate – and both halves of the cleaved molecule have roles in the cell – **IP₃** opens **Calcium** channels, and **DAG** (Diacylglycerol) activates **Protein Kinase C** (see Fig 14.12). The influx of Calcium ion into eukaryotic cells is detected by the protein **Calmodulin**, (391) which binds 4 ions and dramatically changes its shape. Many eukaryotic proteins have Calmodulin as a subunit, which makes them sensitive to Calcium levels. The rest of the chapter goes into Tyrosine Kinase systems which may have a role in cancer. Those will not be covered this semester. PAY ATTENTION TO PICTURES esp. 7TM, G proteins, and Fig 14.12 Protein Kinase C.

CHAPTER 15

1. Homework 1-4, 7-9. Be able to **recognize** the various forms of significant **cofactors**: ATP, NAD⁺, NADH, NADP⁺, NADPH, FAD, FADH₂, FMN, FMNH₂, Coenzyme A, etc. Be able to **sketch** any of these as "stick and P" figures – that is, you should know where the phosphates are in CoA and NADP⁺. You don't need to memorize the flavine ring or the pantothenic acid moiety of CoA but you should be able to draw adenine and nicotinamide. Know how all of these cofactors are used in the cell, and that they come from vitamins.
2. Understand **ATP's** use as an energy "**currency**" in the cell – "**coupling**" ATP hydrolysis with another reaction changes the standard free energy change by -7.3 kcal/mol, and this causes a dramatic shift in the K_{eq} for the overall reaction. Review the **free energy equation** (411) and be able to calculate the overall standard free energy change for coupled reactions. Understand Krebs' diagram of **three stages** of catabolism (Fig 15.12) – know what happens at each stage and how much energy is produced by each. Understand **Atkinson's Energy Charge** and learn the equation on 428. The energy charge would be 1.0 (highest) with pure ATP in the cell and 0.0 (lowest) with pure AMP. The normal range is 0.80 to 0.95, and many processes cooperate to keep this number about the same.
3. Learn the "**key reactions**" (425ff) and compare Table 15.5 with Table 8.8. We will see all of this again, and soon.