**PART II - Bioenergies & Metabolic Pathways Reading List**

Chapter 11 – The Composition and Architecture of Membranes

11.1 Composition Architecture of Membranes

The following sub-sections are important:

* The Introduction
* Each Type of Membrane Has Characteristic Lipids and Proteins
* All Biological Membranes Share Some Fundamental Properties
* A Lipid Bilayer is the Basic Structural Element of Membranes
* Three Types of Proteins Differ in the Nature of Their Association with the Membrane
* Many Integral Membrane Proteins Span the Lipid Bilayer
* Hydrophobic Regions of Integral Proteins Associate with Membrane Lipids
* Covalently Attached Lipids Anchor Some Membrane Proteins

11.2 Membrane Dynamics

The following sub-sections are important:

* The Introduction
* Acyl Groups in the Bilayer Interior Are Ordered to Varying Degrees
* Transbilayer Movement of Lipids Requires Catalysis
* Lipid and Proteins Diffuse Laterally in the Bilayer
* Spingolipids and Cholesterol Cluster Together in Membrane Rafts

11.3 Solute Transport Across Membranes

The following sub-sections are important:

* The Introduction
* Transport May Be Passive or Active
* Transports and Ion Channels Share Some Structural Properties But Have Different Mechanisms
* The Glucose Transporter of Erythrocytes Mediates Passive Transport. You do not need to know all the kinetics that are discussed in the text of this section, it is more important that you understand the importance of the structure of the protein to its function. Therefore, pay the most attention to Figure 11-29 and 11-30.
* The Chloride-Bicarbonate Exchanger Catalyzes Electroneutral Cotransport of Anions Across the Plasma Membrane
* Active Transport Results in Solute Movement against a Concentration or Electrochemical Gradient. Just the first part of this section is important, don’t worry about all the thermodynamics in the worked examples at the end. Really just understand the difference between primary and secondary active transport, Figure 11-33.
* Ion Gradients Provide the Energy for Secondary Active Transport. You don’t need to know all the information in this section, just the part regarding the Na+-glucose symporter (pg. 421 & Figure 11.41)
* Aquaporins From Hydrophilic Transmembrane Channels for the Passage of Water
* Ion-Selective Cannels Allow Rapid Movement of Ions across Membranes

Chapter 13 – Bioenergies and Biochemical Reaction Types

13.1 Bioenergies and Thermodynamics

The following sub-sections are important:

* The Introduction
* Biological Energy Transformations Obey the Laws of Thermodynamics
* Cells Require Sources of Free Energy
* Standard Free-Energy Change is Directly Related to the Equilibrium Constant
* Actual Free-Energy Changes Depend on Reactant and Product Concentrations
* Standard Free-Energy Changes are Additive

13.2 Chemical Logic and Common Biochemical Reactions

The following sub-sections are important:

* The Introduction and all Reactions

13.3 Phosphoryl Group Transfers and ATP

The following sub-sections are important:

* The Introduction
* The Free-Energy Change for ATP Hydrolysis Is Large and Negative
* Other Phosphorylated Compounds and Thioesters Also Have Large Free Energies of Hydrolysis
* ATP Provides Energy of Group Transfer, Not by Simple Hydrolysis
* ATP Donates Phosphoryl, Pyrophosphoryl, and Adenylyl Groups

13.4 Biological Oxidation-Reduction Reactions

The following sub-sections are important:

* The Introduction
* The Flow of Electrons Can Do Biological Work
* Oxidation-Reduction Can be Described as Half-Reactions
* Biological Oxidation Often Involved Dehydrogenation
* A Few Types of Coenzymes are Proteins Serve as Universal Electron Carriers
* NADH and NADHP Act as Dehydrogenases as Soluble Electron Carriers
* NAD has Important Functions in Addition to Electron Transfer
* Dietary Deficiency of Niacin, the Vitamin Form of NAD and NADP Causes Pellagra
* Flavin Nucleotides and Tightly Bound in Flavoproteins

Chapter 14 – Glycolysis, Gluconeogenesis, and the Pentose Phosphate Pathway

14.1 Glycolysis

The following sub-sections are important:

* The Introduction
* An Overview: Glycolysis Has Two Phases
* The Preparatory Phase of Glycolysis Requires ATP
* The Payoff Phase of Glycolysis Yields ATP and NADH
* The Overall Balance Sheet Shows a Net Gain of ATP
* Glycolysis is Under Tight Regulation

14.2 Feeder Pathways for Glycolysis

* This section contains more information that you need, your slides really contain all you will

need.

14.3 Fates of Pyruvate under Anaerobic Conditions: Fermentation

The following sub-sections are important:

* The Introduction
* Pyruvate Is the Terminal Electron Acceptor in Lactic Acid Fermentation
* Ethanol Is the Reduced Product in Ethanol Fermentation

14.4 Gluconeogenesis

The following sub-sections are important:

* The Introduction
* Conversion of Pyruvate to Phosphoenolpyruvate Requires Two Exergonic Reactions
* Conversation of Fructose 1,6-Bisphosphate to Fructose 6-Phosphate is the Second Bypass
* Conversion of Glucose 6-Phosphate to Glucose is the Third Bypass

14.5 Pentos Phosphate Pathway of Glucose Oxidation

The following sub-sections are important:

* The Introduction
* The Oxidative Phase Produces Pentose Phosphate and NADPH

Chapter 15 – Principles of Metabolic Regulation

15.1 Regulation of Metabolic Pathway

The following sub-sections are important:

* The Introduction
* Cells are Organisms Maintain a Dynamic Steady State
* Both the Amount and the Catalytic Activity of the Enzyme can be Regulated
* Reactions Far from Equilibrium in Cells are Common Points of Regulation
* Adenine Nucleotides Play Special Roles in Metabolic Regulation

15.3 Coordinated Regulation of Glycolysis and Gluconeogenesis

The following sub-sections are important:

* The Introduction
* Hexokinase Isozymes of Muscle and Liver are Affected Differently by Their Product, Glucose 6-Phosphate
* Hexokinase IV and Glucose 6-Phosphatase Are Transcriptionally Regulated
* Phosphofructokinase-1 Fructose 1,6-Bisphosphatase are Reciprocally Regulated
* Fructose 2,6-Bisphosphate is a Potent Allosteric Regulator of PFK-1 and FBPase-1
* Transcriptional Regulation of Glycolysis and Gluconeogenesis Changes the Number of Enzyme Molecules

Chapter 16 – The Citric Acid Cycle

16.1 Production of Acetyl-CoA

The following sub-sections are important:

* The Introduction
* Pyruvate is Oxidized to Acetyl-CoA and CO2
* The Pyruvate Dehydrogenase Complex Employs Five Coenzymes
* The Pyruvate Dehydrogenase Complex Consists of Three Distinct Enzymes
* The Substrate Channeling, Intermediates Never Leave the Enzyme Surface

16.2 Reactions of the Citric Acid Cycle

The following sub-sections are important:

* The Introduction
* The Sequence of Reactions in the Citric Acid Cycle Makes Chemical Sense
* The Citric Acid Cycle Had Eight Steps
* The Energy of Oxidation in the Cycle is Efficiently Conserved
* Citric Acid Cycle Components are Important Biosynthetic Intermediates
* Anaplerotic Reactions Replenish Citric Acid Cycle Intermediates
* Biotin in Pyruvate Carboxylase Carries CO2 Groups

16.3 Regulation of the Citric Acid Cycle

The following sub-sections are important:

* The Introduction
* Production of Acetyl-Coa by the Pyruvate Dehydrogenase Complex is Regulated by Allosteric and Covalent Mechanisms
* The Citric Acid Cycle is Regulated at its Three Exergonic Steps

Chapter 17 – Fatty Acid Catabolism

17.1 Digestion, Mobilization, and Transport of Fats

The following sub-sections are important:

* The Introduction
* Dietary Fats are Absorbed in the Small Intestine
* Hormones Trigger Mobilization of Stored Triacylglycerols
* Fatty Acids are Activated and Transported into Mitochondria

17.2 Oxidation of Fatty Acids

The following sub-sections are important:

* The Introduction
* The β-Oxidation of Saturated Fatty Acids Has Four Basic Steps
* The Four β-Oxidation Steps Are Repeated to Yield Acetyl-CoA and ATP
* Acetyl-CoA Can Br Further Oxidized in the Citric Acid Cycle
* Oxidation of Unsaturated Fatty Acids Requires Two Additional Reactions
* Complete Oxidation of Odd-Number Fatty Acids Requires Three Extra Reactions
* Fatty Acids is Tightly Regulated

Chapter 18 – Amino Acid Oxidation and the Production of Urea

18.1 Metabolic Fates of Amino Groups

The following sub-sections are important:

* The Introduction
* Dietary Protein is Enzymatically Degraded to Amino Acids
* Pyridoxal Phosphate Participates in the Transfer of  -amino groups to -ketoglutarate
* Glutamate Releases its Amino Group as Ammonia in the Liver
* Glutamine Transports Ammonia in the Bloodstream
* Alanine Transports Ammonia from Skeletal Muscles to the Liver
* Ammonia is Toxic to Animals

18.2 Nitrogen Excretion and the Urea Cycle

The following sub-sections are important:

* The Introduction
* Urea is Produced from Ammonia in Five Enzymatic Steps
* The Citric Acid and Urea Cycle Can be Linked
* The Activity of the Urea Cycle is Regulated at Two Level

Chapter 19 – Oxidative Phosphorylation

19.1 Electron-Transfer Reactions in Mitochondria

The following sub-sections are important:

* Electrons Are Funneled to Universal Electron Acceptors
* Electrons Pass Through A Series of Membrane-Bound Carriers
* Electron Carriers Function in Multienzyme Complexes. Make sure you understand what is occurring at each complex
* Mitochondrial Complexes Associate in Respirasomes
* Other Pathways Donate Electrons to the Respiratory Chain via Ubiquinone

19.2 ATP Synthesis

The following sub-sections are important:

* The Introduction
* ATP Synthase Has Two Functional Domains, FO and F1
* The Proton Gradient Drives the Release of ATP from the Enzyme Surface
* Each β-Subunit of the ATP Synthase Can Assume Three Different Conformations
* Rotational Catalysis Is Key to the Binding-Change Mechanism for ATP Synthesis
* How Does Proton Flow Through the FO Complex Produce Rotary Motion?
* The Proton-Motive Force Energizes Active Transport
* Shuttle Systems Indirectly Convey Cytosolic NADH into Mitochondria for Oxidation