I. **Announcements**  
Anatomy & Physiology Lab today! Fun! Remember to complete p 3-7 dietary record in LM before Lab 3 next Thursday! Estimating serving sizes. Q?

II. **Adenosine Triphosphate (ATP)**  
ATP parts? Uses/functions?

III. **Anaerobic vs. Aerobic Metabolism**  
LS ch 2 pp 26-33, fig 2-15+
A. Cytosol vs. Mitochondria
B. Anaerobic: ATP-PC, Glycolysis
C. Aerobic: Mitochondrial matrix vs. crista
   Citric acid cycle vs. ETC purpose

IV. **Genetics Introduction**  
LS 2012 ch 2 pp 20-1 + Appendix C
A. What’s a gene? Where located? p A-18, fig C-2, C-3
B. Why are genes important? p A-18
C. What’s DNA & what does it look like? pp A-18 thru A-20
D. How does information flow in the cell? fig C-6
E. How does DNA differ from RNA? pp A-20 thru A-22
G. How are proteins made? Class skit! LS Appendix C
**ATP = Adenosine Tri Phosphate**
The Common Energy Currency or the Cash Cells Understand!!
Cleave One High Energy Phosphate Bond To Do Work!!

7 – 10 KiloCalories/KCal

1. **Synthesis of Macromolecules**
   Make big things from little things!

2. **Membrane Transport**
   Move things! Microscopic!

3. **Mechanical Work**
   Move things! Macroscopic!
Anaerobic vs. Aerobic Metabolism

**NB**: ATP-PC also anaerobic, also in cytosol!

**Anaerobic Glycolysis**
"sugar dissolving" without O$_2$. Net of 2 ATP per molecule of glucose

**Aerobic Metabolism**
+mitochondrial processing of glucose with O$_2$. Net of 32 ATP per molecule of glucose
AEROBIC w/O₂

MITOCHONDRIA

ANAEROBIC

Glycolysis

Immediate/ATP-PC
Stages of Cellular Metabolism/Respiration

**Anaerobic**
- Glycolysis
  - Cytosol
  - Glucose and other fuel molecules
  - Pyruvate

**Aerobic**
- Metabolism
  - Mitochondria
  - Matrix
  - Citric acid cycle
  - Electrons carried by NADH and FADH$_2$
  - Oxidative phosphorylation
    - Mitochondrial inner membrane
    - (electron transport system and chemiosmosis)
    - 28 ATP

*LS 2012 fig 2-9*
Glycolysis "sugar dissolving/splitting" produces small amounts of ATP.
Citric Acid Cycle produces pairs of electrons for cashing in at the nearby electron transport chain (ETC)
Cashing in electrons at the Electron Transport Chain (ETC) produces an abundance of ATP energy molecules!

Cytosol

Outer mitochondrial membrane

Rod Capaldi
U of O Biology
Goals of Aerobic Metabolism

AEROBIC = MITOCHONDRION

w/O₂

CITRIC ACID CYCLE

harvest electrons → e⁻ e⁻ e⁻ e⁻ e⁻ e⁻ e⁻

“cash in”

ELECTRON TRANSPORT CHAIN

for ATP Energy!!
Time-out for questions!
I'm the brain, or control center, of the cell. I carry most of the genetic material, so if you have red hair, it's probably because of me!
What are DNA’s major functions?

Hereditary + Day-to-Day Cell Function
What does DNA look like? Double-helix!!
Gene = Stretch of DNA that codes for a protein
What does DNA do, day-to-day?

```
DNA → RNA → Protein
```

Replication → Transcription → Translation

@ ribosomes

Nucleus → Cytoplasm

cf: LS fig C-6
I carry the genetic information that provides the blueprint for protein synthesis.

I transfer genetic information to the ribosomes, where protein synthesis occurs.

**DNA vs RNA?**

1. **Double-stranded**
2. **Deoxyribose** (without oxygen)
3. **A, T, C, G**
4. **Self-replicative** (can copy itself)
5. **Nucleus** (+mitochondria)

1. **Single-stranded**
2. **Ribose** (with oxygen)
3. **A, U, C, G**
4. **Needs DNA as template**
5. **1° Cytoplasm** (but Nucleus origin)
6. **mRNA, rRNA, tRNA**
**Triplets of bases code for amino acids, the building blocks of proteins**

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<th>tRNA anti-codon</th>
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Translation? Ribosomes Make Proteins

1. mRNA
2. Ribosome
3. First ribosomal binding site
4. Second ribosomal binding site
5. Leader sequence
6. First codon
7. Second codon
8. Steps 5 through 8 are repeated
9. Translation process

LS 2012 fig C-7
Transfer RNA (tRNA)

Amino acid attaches here

Region of base pairing

Anticodon

Codon

mRNA

LS fig C-8
A Polyribosome. Which Way is Synthesis?

LS fig C-9
Class Skit on Translation!

What’s a ribosome?

A protein synthesizing factory, where translation takes place!

You rock, baby!
Questions + Discussion