Review for Final Exam

The final is comprehensive.

~15% of the final will cover material from earlier in the semester

- I will assume throughout the exam that you have consolidated the prior material (including things from last semester).
- Specific questions about earlier material from this semester will be relatively short and not require memorization of arbitrary details.

The remainder will cover material not yet tested.

Everything in the textbook covered during this semester is fair game.

Everything in my notes should be considered important.

Here are the essentials to know (items in bold are the most central):

Chapter 25: DNA metabolism

Semi-conservative replication (including experiments to test it)

Origins of replications & replication forks

Enzymology of DNA polymerases (DNA pol I & pol III)

Continuous & discontinuous synthesis, Okazaki fragments

The process of replication and roles of all the players:

- subunits of DNA pol
- exonuclease activities
- sliding clamp & loading complex
- helicase & topoisomerase
- SSBs
- primase
- ligase

Initiation of replication

Repair of DNA

- mismatch repair
- base excision
- nucleotide excision

- DNA recombination
  - Holliday structures: how they are made & resolved
  - Rec system
- Telomeres & telomerase

Chapter 26: RNA metabolism

- Types of RNA
- transcription
  - **prokaryotic**
    - **stages**
  - **pol II (eukaryotic)**
    - factors involved
  - pol I & III
- Post-transcriptional processing
  - 5' cap
  - poly-A addition
  - **splicing**
    - group 1 & 2 introns & their relation to spliceosome
    - pol II transcripts (spliceosome)
- **Elements of a gene (enhancers, promoter, start site, splice sites, etc…)**
- Catalysis by RNA

Chapter 27: Translation & beyond

- **Genetic code**
  - How it was deciphered
  - How it makes sense
  - Exceptions
- **Translation**
  - **The process in prokaryotes** & eukaryotes
  - **tRNA structure & function**
  - **Amino acyl-tRNA synthetases**
  - **Initiation, elongation, termination & role of the factors**
  - **Proofreading**
- Post-translational processes
  - Folding & chaperones
  - Post-translational modifications
  - Translocation across bacterial membrane & ER membrane
  - Import into mitochondria & nucleus
  - Movement within the endosecretory system
  - Degradation (ubiquitin system, N-end rule)

Chapter 28: Regulation of gene expression

- **General principles**
  - **transcriptional, activators, repressors, operon model, etc.**
- Examples
  - **The *lac* operon (lac repressor & catabolite repression)**
  - **The *trp* operon (attenuation)**
  - arabinose operon
  - Ribosome synthesis (stringent response, r-proteins)

- DNA-binding proteins
  - **General mode of action**
  - Helix-turn-helix
  - DNA-binding proteins in eukaryotes
    - **Modular structure (DNA-binding, protein interaction, transactivation)**
    - Homeodomain (helix-turn-helix)
    - Zinc finger
    - Leu zipper
    - Helix-loop-helix
- General concerns of transcriptional regulation in eukaryotes
  - **Effect of chromatin & chromatin remodeling**
  - **Transcriptional activation**
    - Enhancers
    - Transactivators
    - Coactivators
- **The *GAL* system in yeast**
- Post-transcriptional regulation (splicing & translation)

Presentations

- Chromatin's involvement in repression and activation of transcription
  - Histone acetylation/deacetylation
  - remodeling
- Student presentations