# Part 1:  Prokaryotic Regulation

## Questions to answer:

1. Why do prokaryotes need to be able to regulate their metabolism quickly?
2. What is the advantage to prokaryotes grouping related metabolic gene products into a single operon?
3. Diagram a typical operon.  Include and label structural genes, promoter, RNA polymerase, and repressor protein.
4. What determines if the repressor protein for an operon will be attached or detached from the operator?
5. Compare a repressible operon with an inducible operon.  How are they similar?  How are they different?  What determines if an operon will be repressible or inducible?  Give an example of each type of operon in a typical prokaryotic cell.
6. Explain the function of the CAP/cAMP system.  Why is it necessary?

## Things you should make sure you understand:

**(feel free to ask questions about them in class)**

* How operons specifically, and gene regulation in general is used in prokaryotes to modulate their metabolism.
* The major similarities and difference of repressible and inducible operons.

# Part 2:  Eukaryotic Regulation

## Questions to answer:

1. Why do eukaryotic cells need to be able to turn genes on and off as necessary?
2. How does the control of gene expression lead to differentiation of cell function in multicellular eukaryotes?
3. Define each of the following terms and explain how each provides a eukaryotic cell with the ability to regulate gene expression:
   1. Nucleosomes
   2. DNA methylation
   3. Transcription factors/enhancers
   4. alternative splicing
   5. mRNA degradation
   6. RNA interference (RNAi)
   7. Protein processing and degradation.
4. Explain the following statement:  "Generally speaking, the faster a eukaryotic cell needs to regulate gene expression, the more downstream from transcription that regulation will occur."
5. How is it possible that only 1.5% of the human genome can code for gene products, but humans can be so complex in their physiology?

## Things you should make sure you understand:

**(feel free to ask questions about them in class)**

* The major similarities and differences in how eukaryotes regulate their gene expression compared to how prokaryotes regulate their gene expression.
* Why eukaryotes have more levels of regulation of their genome than prokaryoes do.