

Review Questions
Lectures 6 & 7

1. Describe the anatomy of a gene. What are the regulatory regions and what regions found in nRNA/mRNA? How are nRNA and mRNA different? What are the regulatory regions of mRNA?
2. What are the basic steps of generating a protein from a gene?
3. What is a nucleosome? What would happen if a eukaryotic cell had defective histones? Explain.
4. When chromatin is repressed are genes being transcribed or not?
5. Repressed chromatin is characterized as having nucleosomes that are _____ (condensed or uncondensed). What histone modifications cause this? How does this modification influence histone structure?
6. When chromatin is active are genes being transcribed or not?
7. Active chromatin is characterized as having nucleosomes that are _____ (condensed or uncondensed). What histone modifications cause this?
8. What is the mechanism of histone acetylation and deacetylation?

9. What would happen if a lysine residue that was normally affected by acetylation was mutated to glycine (which is not acetylated)? How might that affect gene expression?
10. Does histone methylation promote transcription, inhibit transcription, or both?
11. Histone modification can influence gene transcription, so what is one mechanism for different genes to be expressed in different cells (i.e., differential gene transcription)?
Hint: cells can express different _____.
12. What is the histone-code hypothesis?
13. What does the term “epigenetic regulation” mean? Why is covalent modification of histones considered a type of epigenetic regulation?
14. Would a eukaryotic cell survive without RNA Pol II? Why?
15. What occurs during the initiation phase of transcription? What are the two subsequent steps of transcription?
16. What is the transcription initiation complex composed of? How do tissue specific transcription factors influence the transcription initiation complex?
17. What are the differences between TF II transcription factors and tissue specific transcription factors? (i.e., What cells are they found in and what parts of DNA do they bind?)

18. Why is it important that we have different tissue specific transcription factors?
19. What does the core promoter consist of and what binds there?
20. What are the major roles of tissue-specific transcription factors?
21. Describe enhancers. Where do they reside? Do genes only have one enhancer? Can only one TF bind to an enhancer?
22. What is the purpose of reporter genes? What are the two most common reporter genes? How do they aid in the study of gene expression?
23. Does only one RNA Pol II molecule transcribe a gene at a time?
24. What determines the efficiency of transcription? (And what does “efficiency of transcription” mean?)
25. Does DNA methylation inhibit transcription, activate transcription, or both? What are the two possible mechanisms used to accomplish this?
26. What enzyme methylates DNA?

27. For methylation to be heritable (passed on during cell division to the new DNA), why must DNA be methylated on cytosines at CpGs? How is the pattern of DNA methylation maintained when DNA is replicated?

28. What is epigenetic memory? What modification provides epigenetic memory?

29. Describe X inactivation. What modification is responsible for the Barr body? What's the significance of the Calico cat example?

30. Why will the clone of an individual never be exactly the same as the original individual?