I) **Chapter 2 A brief history of epigenetics in Epigenetics by Allis, Jenuwein and Reinberg CSHL Press 2007 Ch2BriefHistoryEpigenetics.pdf**

1. What is chromosome-effect variegation? How did this first provide insight to how chromatin modifications can regulate gene expression?
2. Histones are involved in regulating gene expression. What might I expect you to know about this.
3. What does histone acetylation do? Where does it occur?
4. The location of core promoters are recognized by what?
5. Activators bind enhancers and do what?
6. How do HATs stimulate transcription?
7. How do remodeling enzymes activate transcription?
8. How does methylated cytosine appear in the DNA?
9. Let's say that a CpG at a particular place in a chromosome is methylated. One-hundred cell divisions go by and you look at the CpG at the EXACT same place. It is still methylated. How can methylation be maintained over so many generations?
10. What were the previous definitions of epigenetics?
11. Why would anyone ever wish to extend the traditional (circa 1996 - ooh, so old) definition of epigenetic to NON-dividing cells?
12. You should be warned that Dr. Atkinson favors the definition that epigenetic modifications are chemical modifications to DNA and histones that produce lasting changes in DNA expression. Basically memory written on the chromatin in the form of chemical modifications.
13. What historical important contribution did the organism Tetrahymena make to the field of epigenetics? What type of organism is Tetrahymena.
14. What is position-effect variegation?
15. Please describe the histone code hypothesis. The code can be there at one point in time or it can be read over time. What do I mean? THINK!

II) **Chapter 3 Overview and Concepts in the book Epigenetics by Allis, Jenuwein and Reinberg CSHL Press 2007 Ch3 Overview Concepts.pdf**

1. Definition:

   Epigenetics can be molecularly (mechanistically) defined as the "The sum of the alterations to the chromatin template that collectively establish and propagate different patterns of gene expression (transcription) and silencing from the same genome."
2. Tell me everything about the composition of a nucleosome. I want numbers when possible.
3. Constitutive, facultative heterochromatin, euchromatin - define.

4. Which of the above three do you expect to be in 11 nm beads-on-a-string format?
5. Which probably has greater histone acetylation - 11 nm beads-on-a-string or 30 nm fiber?
6. The various epigenetic histone modifications that we are interested in are found on the amino terminal tail of all of the histones. Is this correct?
7. Where are the histone marks made: amino-terminal tail, carboxy-terminal tail, or histone-fold region?
8. What modification to a histone neutralizes some of the histone's positive charge. So what? What happens when you do this?
9. How can you modify the histone tail to make it negatively charged? What would the consequence be?
10. What is the acetylation state of centromeres and telomeres?
11. Nucleosome free regions are likely to be where?
12. **Allis Ch 3 page 35-36 Ch 3 Allis talks in detail about how heterochromatin is formed. You do not have to understand all of this for the exam. This will be a specific topic of exam 2.
13. ** Allis Ch 3 page 37 - you should learn the general names of things that add and remove groups from histones.
14. **Allis Ch 3 page 40 - level of detail - are histones really only added during the S phase of DNA replication. Are histone variants H3.3. and H2A.Z associated with active or inactive chromatin? Which histones
15. What residues of a histone tail are acetylated?
16. What is meant by the term 'residue' in this context?
17. You should know what other residues can be modified and give examples (obviously not 100 but at least 4).
18. How do nucleosomes at a core promoter affect transcription initiation?
19. Can you give name some purposes of DNA methylation in vertebrates? There is more than one.
20. Cytosine methylation occurs in vertebrates, plants and Neurospora. This does NOT mean that CpG islands occur in all three places.
21. Polycomb and Trithorax family proteins - Which one is associated with active genes and which one is associated with silencing of genes?
22. **Allis Ch 3 page 42 RNAi and RNA-directed gene Silencing
    Save the details of this for the next exam.
23. **Chapter 3 page 42 Allis scan to end

24. **Allis X inactivation page 47 - save this for Exam 2.

III) **Chapter 1 from Sweatt, J. David, MJ Meaney, EJ Nestler, and S Akbarian (2013) Epigenetic Regulation in the Nervous System. Basic Mechanisms and Clinical Impact, Academic Press Ch 1 Overview.pdf <-- Entire book is available on the UT library website.**

1. Epigenetic marks tend to be persistent but not necessarily permanent
2. Epigenetic mechanisms are in play in non-dividing cells
   "For this reason, the term epigenetic is undergoing a redefinition to accommodate the fact that epigenetic molecular changes can occur in cells but not necessarily be heritable in the traditional sense."
3. Nature vs Nurture is a famous saying. Which part is represented by epigenetics?
4. DNMTs are what?
   "The five proteins that are known to bind to methylated CpGs are MeCP2, MBD1, MBD2, MBD4 and Kaiso.[22,23]"
5. How can methylation of CpGs lead to histone deacetylation? see Notice Figure 1.4!!!!
6. What is 5-hydroxy-methyl cytosine? - involved in active demethylation
7. **Skim page 18 - 20 Restart reading at Epigenome Org and higher order Chrom Struc
8. **Read Page 20 and learn that loops are thought to be regulatory in nature
9. **Skim 21 to end but note that epigenetic mechanisms appear to be important in circadian rhythms, adult neurogenesis, memory, cognition,
10. Learn to draw Cytosine and methylated cytosine. Learn which is the C5 carbon of cytosine.

IV) **Ch 13 Chromatin structure and transcription Weaver emb.pdf**
**Notice that the PDF of this one has been marked up telling you what to read and pay attention to in PINK boxes.

V) **Lecture Notes**

1. **Everything in the lectures is fair game.**
   Having said this here are some things to know:
2. Core promoter is what?
3. What does it do what it does?
4. How is it recognized?
5. What does an enhancer do?
6. The Chromatin Immunoprecipitation Assay – so important!!!!
7. Nucleosomes are made up of what?
8. HATA, HATB, what are they?
9. Why are bromodomains so intriguing?

10. Tell me two things that TBP does.
11. CpG islands are what?
12. I randomly pull out a 5me-CpG from a vertebrate genome. From where did it most likely originate?
13. Draw Cytosine and methylated cytosine. Learn which is the C5 carbon of cytosine.

VI) **Review article: Heintzman, ND, Ren, B (2007) The gateway to transcription: identifying, characterizing and understanding promoters in the eukaryotic genome. Cell Mol Life Sci, 64:386–400. Heintzman & Ren 2007.pdf <---- In this paper TAF1=TAFII150 and TAF2=TAFII250.**

This can be very useful just to understand the general concepts. Be careful to not the Taf1 and Taf2 redefinitions labelled above.