Section A. How does the structure of chromosomes control the availability of genes?

1. How many chromosomes are in your somatic cells? Your sex cells? Your dog’s cells?

   A. Your somatic cells:
   
   B. Your sex cells (gametes):
   
   C. Your dog’s somatic cells:

2. How can each chromosome have both heterochromatin and euchromatin?

   A. What are the two major biochemical components of a eukaryotic chromosome? What percentage does each make up of the total in humans?

   B. How are these components arranged (physically and spatially) with respect to one another?
3. **How do euchromatin and heterochromatin effect gene expression?**

   A. How does the open nucleosome structure allow transcription initiation?

   B. How is transcription impeded in condensed/closed nucleosome structure?

**Section B. How does histone protein structural modification create change in chromosome structures?**

1. **How do the modifiable amino acid sequences in the histone tails control their shape?**

   A. What do an individual histone protein and a histone octomer look like?
B. Describe and draw the effects of acetylation on position of nucleosomes.

C. Describe and draw the effects of methylation.

2. Explore the impacts of the “Histone Code Hypothesis”

A. List all molecules that can be covalently added to histone proteins

B. List all of the functions of the chromosome that are thought to be regulated by histone modification.
Section C. How does a cell use euchromatin and heterochromatin to create its phenotype?

1. How can two cells with the same DNA use chromatin structure to create two different gene expression patterns?
   
   A. How could one cell close off a gene, while its neighbor uses it to make proteins?
   
   B. What are the kinds of enzyme proteins that control covalent changes on histones?

2. How can the epigenetic pattern of histone modification be heritable in the mitotic offspring of a cell?
   
   A. Explain the function of polycomb proteins
   
   B. Explain the function of trithorax proteins