Review questions for the second test, Biology 107, Sparling

Cell cycle
1. What kind of material is in chromosomes and how is it duplicated for cell division?
   What raw materials and enzymes are essential for duplication?
2. How do chromosomes line up on the spindle, and at which stage of mitosis does this happen? What is the mechanism of their movement to the poles?
3. How does colchicine prevent completion of mitosis?
4. What are microfilaments and what is their likely function in cell division?
5. What did the experiments of Taylor with radioactive nucleotides tell us about the way chromosome material is synthesized? Did the labeling over the chromosomes appear differently in the first and second divisions? Why?
6. At what stage of mitosis does the nuclear membrane break down and when does the centriole duplicate and start to migrate?
   What are cyclins and what is their function?

Meiosis
What are some differences between meiosis and mitosis?
What is the difference between division 1 and division 2 of meiosis?
How are the divisions different in sperm and eggs?
When does crossing over occur, and between what?

Molecular genetics
24. What is a codon, and an anticodon, and how do these determine amino acid sequence?
25. What determines whether or not a gene is active?
8. What is the difference between DNA and RNA (more than one),
19. What is the difference between ribosomal, transfer and messenger RNA? (Structural, frequency of genes for them, function.)

Protein synthesis
20. What is a polyribosome? What holds the ribosomes together in one?
21. What do ribosomal subunits contain besides ribosomal RNA?
22. What is the function theorised for these proteins? (more than one)
23. What is an activated amino acid, and how does it become activated? What role do activated amino acids play in protein synthesis?
How do some proteins get synthesized into ER?

Viruses
26. How does protein synthesis occur in viruses which have no ribosomes, no metabolic machinery, and no stored nucleotides or amino acids?
27. What is the difference in the way DNA and RNA single and double stranded viruses reproduce?
27. How can molecules (or pieces of them) such as DNA or RNA be separated by electrophoresis? How can digestion of DNA with restriction enzymes allow crime labs to identify the culprit?
28. What was the first protein to be sequenced (amino acids) and how was it done?
36. How does tissue culture tell us some differences between normal and cancer cells?
DEVELOPMENT

what are the three germ layers and how they are formed?
The process is called gastrulation, what kinds of cells move to the inside and which stay outside?
What are the extraembryonic membranes- what are their functions?
How do we know the nervous system is induced by the chordamesoderm once it has moved inside?
How can we draw fate maps, that is to plot what will become of cells in particular regions.
Embryonic development results from a set series of signals.

the signal released when the sperm touches the egg- Calcium is released starting from that point.
What might result from that in frog eggs?
What are cytoplasmic determinants?

particles in the egg which store RNA or protein or vesicles with material to be secreted which will effect the nearby cells

germs plasm- concentrated in one area and later put only into future germ cells

How are bicoid and nanos, these are called maternal genes, instrumental in turning on other genes like

hunchback, kruppel,

This localization leads to setting up the pattern of the embryo so bicoid is at the head in the fly, nanos is at the tail. What is a rescue experiment with injection of cytoplasm?

Discuss homeobox containing genes HOX genes and their effect on brain, vertebrae, limb development. Where do they bind to the DNA?

Explain how cell death is important to development.

How does study of mutants help us to understand normal development?
How is pattern set in plant meristem for certain organ formation?

Plants

Be able to label diagrams of plant structure- whole plants and sections of the various parts.
How is the proton pump important to plant transport of water and minerals and nutrients?
What is the structural difference between xylem and phloem?
How are they formed?

What is water potential and how is it used to move sap? How is transpiration involved, and what part does adhesion and cohesion play in transport of sap?

What are aquaporins and what other kinds of transport proteins are there in plants?

What is root pressure?

Discuss a signal transduction pathway in plants which is influenced by: light;

What is a G-protein, what is adenylyl cyclase, guanylyl cyclase, calmodulin?

How is kinase activity important in regulation of gene activity? Is it plus or minus regulation?

What causes phototropism and how? What is produced by coleotiles? Does it pass down only the side opposite the light?

Which hormones have effects on cell division, which on elongation, which differentiation? Do they act alone?

How is gravity detected in plants so that roots grow downward?
Chap 40-41
What is homeostasis and what mechanism are used to maintain it?
What is the difference between heterotrophs and autotrophs?
What is the main function of water soluble vitamins?
Where are fat-soluble vitamins stored?
Discuss specialized functions of the organs of the digestive system.