**Cell Communication**

1. How does *Saccharomyces cerevisiae* cells communicate with each other to find cells of the opposite mating type? How does this species mate?
2. How do plant an animal cells communicate with other cells using that they are directly connected to?
3. How are paracrine, synaptic and endocrine signaling used in animals? And how does each signaling method work?
4. What are the three stages of cellular signaling?
5. What is the process for signaling used by GPCRs?
6. What is the process for signaling used by Receptor tyrosine Kinases?
7. What is the process for signaling used by ion channel receptors?
8. How do intracellular receptors work in cell signaling? What ligands do they bind?
9. Describe how a phosphorylation cascade leads to a cellular response.
10. How is cAMP generated in a cell? What is cAMP used for?
11. How does the Calcium and IP3 signaling pathway occur?
12. What are scaffolding proteins? And what are their roles in cell signaling?
13. Describe apoptosis and explain a benefit to this process?

**Mitosis and Meiosis**

1. What are the stages of the cell cycle and what are the relative lengths of each stage?
2. What happens in each stage of the cell cycle?
3. Describe the process of binary fission. What type(s) of cells use this method to reproduce?
4. Would binary fission be a good method of reproduction for cells with multiple chromosomes? Why or why not?
5. Describe the structure of eukaryotic chromosomes starting at the DNA level and working your way up to the actual chromosome (see figure 10.5)
6. What is the composition of chromatin
7. Define karyotype, haploid, and diploid. The human karyotype consists of 46 chromosomes. What is the haploid number and the diploid number?
8. What is difference between sister chromatids and homologous pairs? Explain using words and an illustration
9. Is chromosomal number related to organismal complexity?
10. What are the five phases of the cell cycle and briefly describe what occurs during each phase?
11. What events occur during interphase?
12. List and describe the phases of mitosis
13. Illustrate the different phases of mitosis
14. Compare cytokinesis and animals and plants. How is it the same, how is it different?
15. What is function of checkpoints during the cell cycle? Where are the checkpoints in the cell cycle?
16. What is cancer? What are protooncogenes and tumor supressors? How do each work to prevent/promote cancer?
17. What is the difference between germ line and somatic cells? Why do these cell types differ?
18. Describe how homologous chromosomes pair during meiosis? How is this different than mitosis
19. Why is meiosis I called reductive division
20. If sister chromatids separated at the first division, instead of homologous chromosomes, would meiosis still work?
21. What are the steps of meiosis I and meiosis II? What events are occurring at each step
22. Illustrate meiosis I and meiosis II
23. What is the function of crossing over?
24. Compare and contrast mitosis and meiosis. How are they different, and how are they the same? (starting products, end products, number of divisions, number of DNA replications etc)
25. What features of meiosis lead to genetic variation?

**Genetics**

1. Define the following terms: true-breeding, hybridization, segregating, reciprocal cross, first filial generation, dominant, recessive, second filial generation, allele
2. What was the biggest difference in Mendel’s experimental approach to genetics?
3. Why was the garden pea chosen for Mendel’s studies?
4. You have a true breeding white flower (dominant) and a true breeding purple flower (recessive). When you cross those, what do you get in your F1 generation? When you take two plants from the F1 generation and cross them, what do you get?
5. What is the difference between homozygous and heterozygous?
6. Explain Mendel’s principles of segregation
7. What is the difference between genotype and phenotype? Can two individuals have the same phenotype and a different genotype? Can two individuals have the same genotype and different phenotypes?
8. What is a pedigree and what is it used for?
9. You have a plant with the genotype RRYY (round and yellow seeds) and you cross it with a plant that has the genotype rryy (wrinkled and green seeds). What types of plants do you get in your F1 generation? What happens when you cross two plants from the F2 generation, what do you get?
10. Explain the Mendel’s principle of independent assortment
11. What is the rule of addition? What is the rule of multiplication? Give an example for each
12. What is a testcross and when would you perform one?
13. Define and give an example of polygenic inheritance, pleitropy, more than two alleles for one gene, incomplete dominance, codominance, epistasis