AP Biology – Fall 2019 Edward R. Murrow High School
Exam 5 Review Sheet Mr. Sprague

Format:

Section I 21 multiple choice questions
Section II 1 essay question and 2 short free response questions

Reading: Hillis chapters 8 and 9 (and all previous readings)

Concepts to Review:

- EVERYTHING FROM EXAMS 1–4

- Patterns of Inheritance
  - Understand the terms *gene*, *allele*, *dominant*, *recessive*, *homozygous*, *heterozygous*, *genotype*, and *phenotype*.
  - Be able to solve genetics problems/calculations using a *Punnett Square*.
  - Understand the following modes of inheritance: *autosomal dominant*, *autosomal recessive*, *incompletely dominant*, *codominant*, *multiple alleles*, *sex-linked*, *cytoplasmic*, *epistatic*, and *polygenic*.
  - Understand how blood types are inherited and be able to solve genetics problems involving blood type.
  - Understand the role of *crossing over* in meiosis.
  - Be able to use data on the *frequency of recombination* (crossing over) to determine how the order of a set of genes on a chromosome.
  - Be able to determine the mode of inheritance of a particular gene from a pedigree or data set.
  - Be able to determine the probability of two or more simultaneous events.
  - Be able to recognize the ratio of phenotypes associated with a *monohybrid cross* and *dihybrid cross*.

- DNA and Replication
  - Be able to describe the structure of DNA.
  - Know the DNA base pair rules.
  - Be able to describe the process of DNA *replication* and the roles of the enzymes *primase*, *DNA polymerase*, *DNA ligase*, and *telomerase*.
  - Be able to explain why the leading strand and lagging strand must be synthesized in different ways.
  - Be able to explain how the *Polymerase Chain Reaction* (*PCR*) method is used to copy DNA in a lab.
  - Be able to describe the following types of mutations: *chromosomal*, *substitution* (*point*), *insertion* (*addition*), *deletion*, *inversion*, and know what a *frame-shift mutation* is.
  - Be able to explain the differences between *silent*, *loss-of-function*, *gain-of-function*, and *conditional* mutations.
  - Be able to explain how DNA can be transferred from one bacterium to another by *transformation*, *transduction*, and *conjugation*.
  - Be able to describe how DNA is organized into chromosomes/chromatin in eukaryotes.
  - Be able to explain why organisms that are very different can have such similar DNA (e.g., humans and bananas sharing approximately half their DNA).
  - Be able to describe the experimental evidence showing: DNA as the genetic material, DNA as a helix, DNA as double-stranded, base pair rules, and semiconservative replication.

- Labs
  - Be able to graph data, including labeling both axes with units.
  - Be able to write a null hypothesis and use a chi-square test to reject or fail to reject the null hypothesis.

Overarching Questions to Consider:

Suggestion: Answer all of these questions in writing, then compare answers with a classmate. I promise that taking the time to do so will be well worth it and much more useful then memorizing facts and definitions.

1. What is a gene? What does it mean for a gene to be expressed? How is an allele different from a gene?
2. How is a dominant allele different from a recessive allele? How would you be able to tell if an allele is dominant or recessive?
3. What does a Punnett square represent? How is the number of boxes in the square determined?
4. How is it possible for a trait to "skip generations" (i.e., one of your traits was also in one of your grandparents, but not in either of your parents) when every piece of DNA in you was also in one of your parents? How do meiosis and fertilization play a role in this phenomenon?
5. What is meant by "independent assortment" of chromosomes? How does this lead to genetic variation?
6. How does crossing over lead to genetic variation? Why is crossing over also called "recombination"?
7. How is the dihybrid cross phenotype ratio (9:3:3:1) related to the monohybrid cross ratio (3:1)? How are the incomplete dominance and codominance ratios (1:2:1) related to the monohybrid cross ratio (3:1)?
8. Why is it that males are more likely to get a sex-linked disorder?
9. What would you look for in a pedigree to determine if a particular gene was autosomal or sex-linked? What would you look for in a pedigree to determine if a particular gene was found in nuclear or mitochondrial DNA? What would you look for in a pedigree to determine if a particular gene was dominant or recessive?
10. Why is it that Punnett squares are not good for making predictions about most complex animal traits? Why is it that Punnett squares are not good for making predictions about bacterial traits?
11. Why do linked genes not follow the expected Mendelian frequencies? What is the role of crossing over in gene linkage?
12. Mr. Sprague's lovely wife, Mrs. Sprague, is the youngest of four sisters. Using a Punnett square, we would predict that in a family of four children, we expect approximately two girls and two boys. Why is it NOT that strange that the observed sex ratios in Mrs. Sprague's family do not fit the predicted ratios?
13. How do conjugation, transformation, and transduction contribute to variation in prokaryotes?
14. Why must DNA be replicated before cell division?
15. How do continuous replication on the leading strand and Okazaki fragments on the lagging strand address the directional (5′ to 3′) nature of DNA polymerase?
16. Why do chromosomes get shorter when telomerase is not present?

Practice Exam Questions:

Visit the course website and click on the "Multiple Choice Practice" link. Complete all practice questions for the relevant chapters and check your work against the answer key. Note: these items are password protected.

Practice multiple choice and partial versions of free response questions are also available through the College Board by logging into AP Central with the class code.