**AP BIOLOGY 2019-20 February 21, 2020**

**Today’s Agenda (Day 111)**

1. HOUSEKEEPING:

🡪 !!BRING TEDDY GRAHAM [2 TYPES]!! 🡪 Lab on THURSDAY

1. Homework Check:

🡪 Chapter 23 Vocabulary

🡪 Chapter 23 Notes

1. Class Activity:

**🡪 QUIZ: Chapter 22 & 23 Vocabulary Quiz**

**🡪** CONT’D: Chapter 24 PPT Review

1. **Section 24.1 – The biological species concept emphasizes reproductive isolation**
2. **Section 24.2 – Speciation can take place with or without geographic separation**
3. Section 24.3 – Hybrid zones reveal factors that cause reproductive isolation
4. Section 24.4 – Speciation can occur rapidly or slowly and can result from changes in few or many genes

HOMEWORK:

* Read Unit 3 – Chapters 22 - 25
* Complete Chapter 23 Vocabulary; Chapter 24 Notes AND Chapter 25 Vocabulary

Chapter 24 – The Origin of Species

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| allopatric speciation | allopolyploidy speciation | autopolyploidy speciation | biological species concept | ecological species concept | gene flow | hybrid zones |
| Hybrids | Macroevolution | Microevolution | morphological species concept | phylogenetic species concept | polyploidy speciation | postzygotic barriers |
| prezygotic barriers | punctuated equilibrium | reinforcement | reproductive isolation | speciation | Species | sympatric speciation |

Chapter 25 – History of Life on Earth

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Adaptive radiations | Alkaline vents | Cambrian explosion | Endosymbiont theory | Geologic record | Half-life |
| Heterochrony | Homeotic genes | Hydrothermal vents | Mass extinction | Paedomorphosis | Pangaea |
| Plate tectonics | Protocells | Radiometric dating | Ribozymes | Serial endosymbiosis | stromatolites |

REMINDERS:

* Chapter 23 Vocabulary – Feb 20; 11:59:59 pm
* Chapter 22& 23 Vocabulary Quiz **🡪 Feb 21 [NOTE CHANGE OF DATE DUE TO MIX UP OF VOCABULARY WORDS]**
* Chapter 24 Notes & Chapter 25 Vocabulary – Feb 22
* Lab Report: Teddy Graham AND Hardy-Weinberg Practice – Feb 23
* Chapter 25 Notes – Feb 24
* **Chapter 24 & 25 🡪 February 25**
* **Chapter 26 & 27 🡪 March 3**

**AP BIOLOGY 2019-20 LAB ACTIVITY**

# Teddy Graham Lab

**Introduction:**

*You are a bear-eating monster. There are two kinds of bears: happy bears and sad bears. You can tell the difference between them by the way they hold their hands. Happy bears hold their hands high in the air, and sad bears hold their hands down low. Happy bears taste sweet and are easy to catch. Sad bears taste bitter, are sneaky, and are hard to catch. Because of this, you eat only happy bears.*

New bears are born every 'year' (during hibernation) and the birth rate is one new bear for every old bear left from the last year. The happy trait is recessive, so the happy bears are homozygous recessive. In addition, because the sad trait is dominant, the sad bears are either homozygous or heterozygous dominant.

**Make a prediction** ​about what will happen to the phenotypic and genotypic frequencies in the population after a few generations. Explain your reasoning.

**Procedure:**

1. Obtain a population of 10 bears and record he number of happy and sad bears and the total population number. Assume that the genotypes in your beginning population are homozygous dominant or recessive (there are no heterozygotes).

Using the equation for Hardy-Weinberg equilibrium, calculate the frequencies of both the dominant and recessive alleles and the genotypes that are represented in the population.

## p2​ ​ + 2pq + q2​ ​ = 1 p + q = 1

**Example:**​ If 5 of the 10 bears are happy, then 10 out of 20 alleles would be happy alleles. Therefore, the ​q​2​number would​ be 0.5. You must then determine the q ​number by taking the square of 0.5.​

1. Eat three happy bears. (If you do not have three happy bears, then eat the difference in sad bears.) You will use the remaining bears to produce offspring during breeding season. Each remaining bear will produce one new bear.

1. Repeat this process for four generations of bears and construct a data table to show how many of happy and sad bears are in the population for each generation. Data should reflect the ​**frequency**​ of each type of bear.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Generation  | p​2​ (sad)  | 2pq (sad)  | q​2​ (happy)  | p  | q  |
| 1 (initial)  |   |   |   |   |   |
| 2  |   |   |   |   |   |
| 3  |   |   |   |   |   |
| 4  |   |   |   |   |   |

1. Using your data, construct a graph that will show what happens to the bear population over time. Use percentages of happy and sad bears for each generation. Changes in frequencies should be shown on the same graph.



**Analysis**

Prepare a short summary of what you observed in this activity that addresses the following:

* + What is happening to the genotype and allele frequencies in the population of Teddy Grahams?
	+ What would you expect to happen if you continued the selection process for additional generations?
	+ How would the frequencies change if you were to now select for the sad bears?
	+ Why doesn’t the recessive allele disappear from the population? How is it protected?

**AP BIOLOGY 2019-20 CONCEPT PRACTICE**

**Hardy–Weinberg Principle**

The Hardy–Weinberg principle states that both allele and genotype frequencies in a population remain constant--that is, they are in equilibrium--from generation to generation unless specific disturbing influences are introduced. Those disturbing influences include non-random mating, mutations, selection, limited population size, random genetic drift and gene flow. It is important to understand that outside the lab, one or more of these "disturbing influences" are always in effect. That is a Hardy Weinberg equilibrium is unlikely in nature. Nonetheless, the idea of genetic equilibrium is a basic principle of population genetics that provides a baseline for measuring genetic change.

In the simplest case of a single locus with two alleles: the dominant allele is denoted A and the recessive a and their frequencies are denoted by *p* and *q*;

freq(A)=*p*; freq(a)=*q*; *p* + *q* = 1.

If the population is in equilibrium, then we will have

freq(AA)=*p*2 for the AA homozygotes in the population

freq(aa)=*q*2 for the aa homozygotes

and freq(Aa)=2*pq* for the heterozygotes.

The overall equation for the Hardy-Weinberg equilibrium is expressed in this way:

*p*2 + 2*pq* + *q2* = 1

Based on these equations, we can determine useful but difficult-to-measure facts about a population. For example, a patient's child is a carrier of a recessive mutation that causes cystic fibrosis in homozygous recessive children. The parent wants to know the probability of her grandchildren inheriting the disease. In order to answer this question, the genetic counselor must know the chance that the child will reproduce with a carrier of the recessive mutation. This fact may not be known, but disease frequency is known. We know that the disease is caused by the homozygous recessive genotype; we can use the Hardy-Weinberg principle to work backward from disease occurrence to the frequency of heterozygous recessive individuals.

This concept is also known by a variety of names: HWP, Hardy–Weinberg equilibrium, HWE, or Hardy–Weinberg law. It was named after G. H. Hardy and Wilhelm Weinberg.

**Problem 1**

In a population of mice, long hair (h) is recessive and short hair (H) is dominant. The population of the mice is 100, and there are 9 mice with long hair.
*Question A*: How many of the mice have short hair?

Answer: **** mice

*Question B*: What percentage of the alleles for hair length in this population are the long hair (h) allele?

Answer **** %

*Question C*: What percentage of the alleles for hair length in this population are the short hair (H) allele?

Answer **** %

*Question D*: How many of the mice are homozygous for the short-hair allele?

Answer **** mice

*Question E*: How many of the mice are heterozygous for the hair allele?

Answer **** mice

**Problem 2**

In snapdragons, there are two alleles for flower color, red flower color (R) and white flower color (r). The heterozygotes have pink flowers. In a particular population of snapdragons, 81% of the flowers are red.

*Question A*: What is the frequency of the red flower color allele in this population of snapdragons?

Answer ****

*Question B*: What is the frequency of the white flower color allele in this population of snapdragons?

Answer ****

*Question C*: What percentage of snapdragons in this population will exhibit white flowers?

Answer **** %

*Question D*: What percentage of snapdragons in this population will exhibit pink flowers?

Answer **** %

**Problem 3**

In humans, unattached earlobes are dominant, and attached earlobes are recessive. In China, it is reported that 64% of the population exhibit unattached earlobes.

*Question A*: What percentage of the Chinese population exhibit attached earlobes?

Answer **** %

*Question B*: What is the frequency of the recessive (attached earlobe) allele in the Chinese population?

Answer ****

*Question C*: What is the frequency of the dominant (unattached earlobe) allele in the Chinese population?

Answer ****

*Question D*: What percentage of the Chinese population are homozygous for the dominant allele (unattached earlobe)?

Answer **** %

*Question E*: What percentage of the Chinese population are heterozygous for the earlobe allele?

Answer **** %