

AP Biology 2017-2018

STAND BACK



I'M GOING TO TRY
SCIENCE

Supplies Needed Next Year:

- (1) Composition Book (MUST be *college ruled*, wide ruled is NOT acceptable)
- (4) *college ruled* single subject notebooks (at least 70-100 pages each)
- (2) 1.5in 3 Ring Binders (2 dividers each)
- Basic 4 function calculator (+, -, ×, ÷, √, x²)
- Graph paper and regular paper (*college ruled*)
- Ruler, Color pencils
- *Blue or Black* ink pens and pencils
- **HIGHLIGHTER**

Expectations:

- Be motivated to learn
- Accept new challenges
- Read and study material EVERY night
- Come in for help as needed (do NOT wait until it's too late-the day before the test IS too late)
- Complete all assignments ON TIME
- Manage your time wisely

INSTRUCTIONS FOR SUMMER ASSIGNMENT

1. VISIT OUR CLASS WEBSITE:

- Become familiar with the design of the class site: <http://lacrowe3.wix.com/hortonapbio>
- Password: **Lillian13**
- Once school starts we will switch to our eClass page!

2. Join Remind101:

Mrs. Horton will be sending out reminders and tips throughout the summer, and you will be able send her messages and ask questions you may have!

- Simply text **@horton16 to 81010** (message and data rates apply)

3. SUMMER AP BIO ASSIGNMENT OVERVIEW:

This assignment should be completed on college-ruled notebook paper and placed into a **3-prong portfolio folder** when submitted for grading. THE STUDENTS NAME MUST BE CLEARLY VISIBLE ON THE OUTSIDE OF THE FOLDER. NOTE: There are 3 parts, the virtual lab of part III may be completed on the printed pages provided to each student and placed in portfolio when completed – students DO NOT need to copy this information onto notebook paper.

- Each numbered component within a section should have a *dedicated page*, should be well supported or described, and diagrams or graphs should accompany discussion when appropriate. When used, diagrams, models, representations and graphs should be in color, labeled, and clearly explained or supported. Always use a ruler when making graphs and tables! **Please number your pages.**
- **YOU MAY NOT PLAGARIZE ANY PART OF THIS ASSIGNMENT** – all responses should be constructed in your own words – DO NOT COPY directly from any source, including the PPT presentations! All work submitted must be original!

4. GENERAL INSTRUCTIONS FOR COMPLETION OF SUMMER ASSIGNMENT:

Items should be placed into your 3-prong portfolio folder in the following order:

- Table of Contents, all pages numbered, all Parts and Tasks CLEARLY labeled.
- Part I: Bozeman Video Reflections-AP Biology Practices (**dedicated page** for each video reflection, must be hand written)
- Part II: Reading Guide Tasks for Intro Review ppt (found on website under Big Idea 1)
- Part III: Bozeman Video Reflections: Hardy-Weinberg (<http://www.bozemanscience.com/solving-hardy-weinberg-problems>), Population Genetics Virtual Lab (use copies provided to place in portfolio)
- Extra Credit: Book Study from *Your Inner Fish*, by Neil Shubin
- All materials can be found on our class website in Big Idea 1

5. DUE DATES and GRADING FOR SUMMER ASSIGNMENT:

- *This summer project counts as a **PROJECT GRADE** and you will have a Summer Project Quiz the first Friday of the semester. The extra credit book study portion will count as an additional **project grade.***
- **DUE Second day of class, August 8th (if you turn it in during open house you will receive extra credit!)**

Part I: Bozeman Video Review on AP Biology Practices

To be completed on your own paper

A practice is a way to coordinate knowledge and skills in order to accomplish a goal or task. The AP Biology science practices enable you to establish lines of evidence and use them to develop and refine testable explanations and predictions of natural phenomena. Because content, inquiry, and reasoning are equally important in AP Biology, each learning objective combines content with inquiry and reasoning skills described in the science practices. The science practices capture important aspects of the work that scientists engage in, at the level of competence expected of you, an AP Biology student.

To review the AP Biology science practices, log onto <http://www.bozemanscience.com/ap-biology/>. Scroll down to “AP Biology Practices.” Complete the video review activities listed below for the seven AP Biology practices. REMEMBER, EACH NUMBERED COMPONENT SHOULD HAVE A DEDICATED PAGE (that is, summarize each video on a separate piece of paper, all handwritten): It really helps to take notes as you go before your summarize! **Highlight key terms**

1. Watch Bozeman Video #1: *Models & Representations* – summarize key concepts and related illustrative examples in your own words. Support your understanding with diagrams when appropriate.
2. Watch Bozeman Video #2: *Using Mathematics* – summarize key concepts and related illustrative examples in your own words. Support your understanding with diagrams when appropriate.
3. Watch Bozeman Video #3: *Scientific Questioning* – summarize key concepts and related illustrative examples in your own words. Support your understanding with diagrams when appropriate.
4. Watch Bozeman Video #4: *Data Collection Strategies* – summarize key concepts and related illustrative examples in your own words. Support your understanding with diagrams when appropriate.
5. Watch Bozeman Video #5: *Analysis & Evaluation of Evidence* – summarize key concepts and related illustrative examples in your own words. Support your understanding with diagrams when appropriate.
6. Watch Bozeman Video #6: *Scientific Explanations & Theories* – summarize key concepts and related illustrative examples in your own words. Support your understanding with diagrams when appropriate.
7. Watch Bozeman Video #7: *Scales, Concepts & Representations* – summarize key concepts and related illustrative examples in your own words. Support your understanding with diagrams when appropriate.

The following words will be important throughout the entire year. When writing your free responses and lab reports you must be able to recognize and determine the appropriate course of action. On a sheet of paper, demonstrate your knowledge of the following words. You may define, diagram, or illustrate an appropriate response for full points.

Words Commonly used in Free Response Questions and Class Discussion	Words commonly used and seen in <u>lab reports</u> as well as FRQ's and discussions
Explain	Independent Variable
Discuss	Dependent Variable
Describe	Constant Variable
Predict	Experimental Group
Justify	Control Group
Analyze	Hypothesis and Rationale
Identify	Theory
Model	Statistical Analysis

Part II: Intro Review Reading Guide

For this section you will use the IntroReview ppt found on our class webpage (click Big Idea 1 and it is under notes). After you have read and studied the ppt, **choose 5** of the following tasks to complete. For each task chosen please label your paper with the task number and a paraphrased question. Please use ONE dedicated page per task. **HIGHLIGHT Key Terms!**

Task 1: Discuss the following statement: “Proteins are the link between genotype and phenotype.” Your discussion should include the following: Definition and description of the terms “genotype” and “phenotype”, the process that synthesizes the proteins coded for and WHY proteins link the two together. Diagrams are encouraged. 1 page minimum.

Task 2: Describe a pair of homologous chromosomes. Label each component and discuss the meaning of “haploid” and “diploid”. Minimum of one paragraph.

Task 3: Explain the statement “Alleles cause variation in inherited characteristics among offspring.” Include a diagram and a minimum of one paragraph for a complete explanation.

Task 4: Find the genotypic and phenotypic ratios of the following crosses where Tall is dominant over Short. (Punnett squares are helpful)

- Heterozygous tall x Homozygous short
- Heterozygous tall x Heterozygous tall
- Heterozygous tall x homozygous tall

Task 5: Diagram and label the process of meiosis. Be sure to include meiosis I, meiosis II, reduction division, equational division, crossing over, diploid cells, haploid cells, tetrads, homologous chromosomes, sister chromatids (you may include more, this is the minimum). In complete sentences discuss the process of meiosis and how this process leads to genetic and phenotypic variation within a species of sexually reproducing organisms. (1 page minimum)

Task 6: Based on what you have learned throughout the ppt discuss the following. (one paragraph each, 1 page total, diagrams encouraged).

- a. Discuss how sexual reproduction leads to more genetic diversity than asexually reproducing organisms. (discuss at least 3 reasons)
- b. Asexually reproducing organisms (i.e. bacteria) are prevalent organisms on this planet. Even though sexual reproduction may lead to greater genetic variation, discuss several reasons why asexual reproduction has been conserved through evolution and may be more advantageous. (discuss at least 3 reasons)

Part III: Bozeman Video Reflections Hardy-Weinberg and Virtual Lab

**Watch the following video. Take notes, summarize, and write a reflection. Diagrams and examples are helpful!
(minimum one page)**

<http://www.bozemanscience.com/solving-hardy-weinberg-problems>

You should also read through the ppt notes for Big Idea 1A to further your understanding. We will start with 1A the first week of school.

Part III Continued: Virtual Lab, Population Genetics

You may remove this portion from the packet and include it in your portfolio

The ppt for 1A on the class website will also be useful



Virtual Student Guide

http://www.phschool.com/science/biology_place/labbench/index.html

AP® Biology Laboratory 8
Population Genetics

Introduction

The Hardy-Weinberg law of genetic equilibrium provides a mathematical model for studying evolutionary changes in allelic frequency within a population. In this laboratory, you will apply this model by using your class as a sample population.

Key Concepts

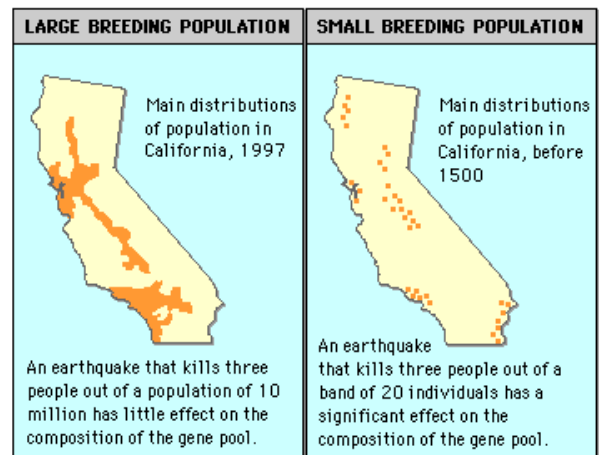
In 1908 G. Hardy and W. Weinberg independently proposed that the frequency of [alleles](#) and genotypes in a population will remain constant from generation to generation if the population is stable and in genetic equilibrium. Five conditions are required in order for a population to remain at [Hardy-Weinberg equilibrium](#):

1. A large breeding population
2. Random mating
3. No change of allelic frequency due to mutation
4. No immigration or emigration
5. No natural selection

Let's look more closely to see how each factor functions to maintain genetic equilibrium and how the opposite condition can bring about a change in the [gene pool](#).

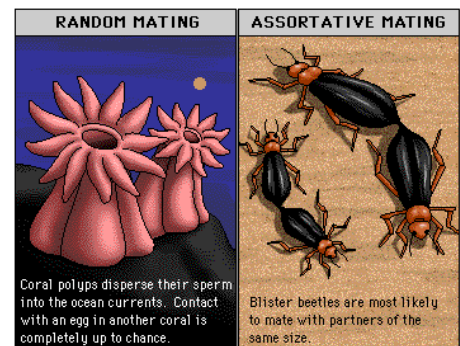
#1 - A Large Breeding Population

A large breeding population helps to ensure that chance alone does not disrupt genetic equilibrium. In a small population, only a few copies of a certain allele may exist. If for some chance reason the organisms with that allele do not reproduce successfully, the allelic frequency will change. This random, nonselective change is what happens in [genetic drift](#) or a bottleneck event.



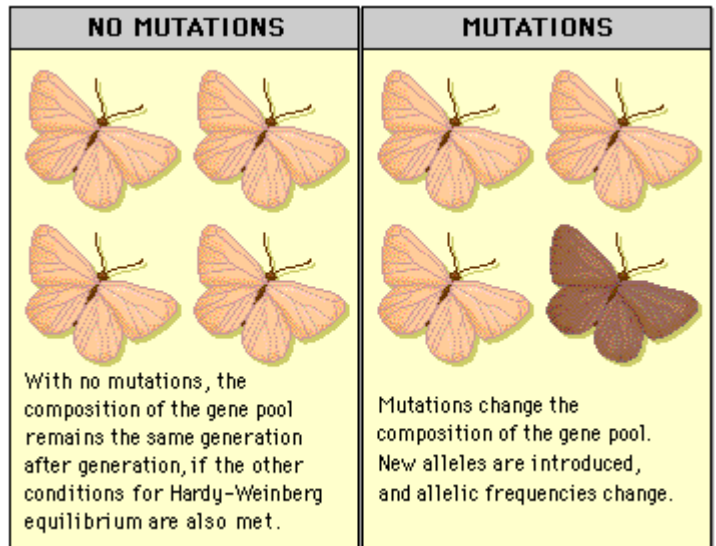
#2 - Random Mating

In a population at equilibrium, mating must be random. In assortative mating, individuals tend to choose mates similar to themselves; for example, large blister beetles tend to choose mates of large size and small blister beetles tend to choose small mates. Though this does not alter allelic frequencies, it results in fewer [heterozygous](#) individuals than you would expect in a population where mating is random.



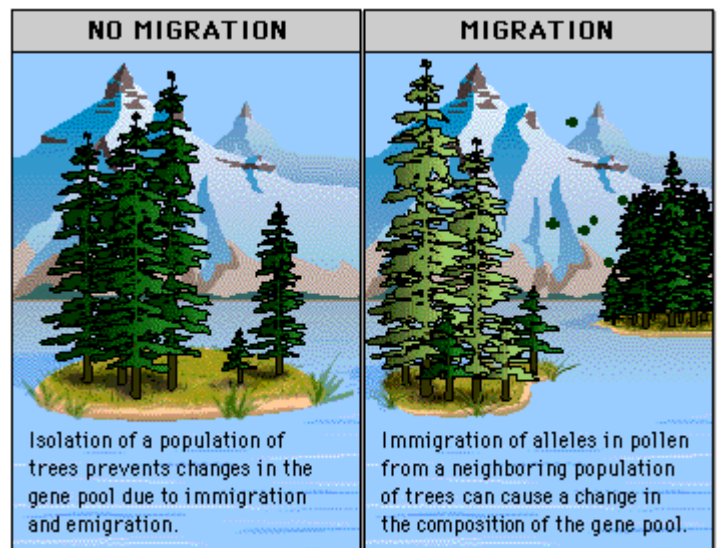
#3 - No Change in Allelic Frequency due to Mutation

For a population to be at Hardy-Weinberg equilibrium, there can be no change in allelic frequency due to [mutation](#). Any mutation in a particular gene would change the balance of alleles in the gene pool. Mutations may remain hidden in large populations for a number of generations, but may show more quickly in a small population.



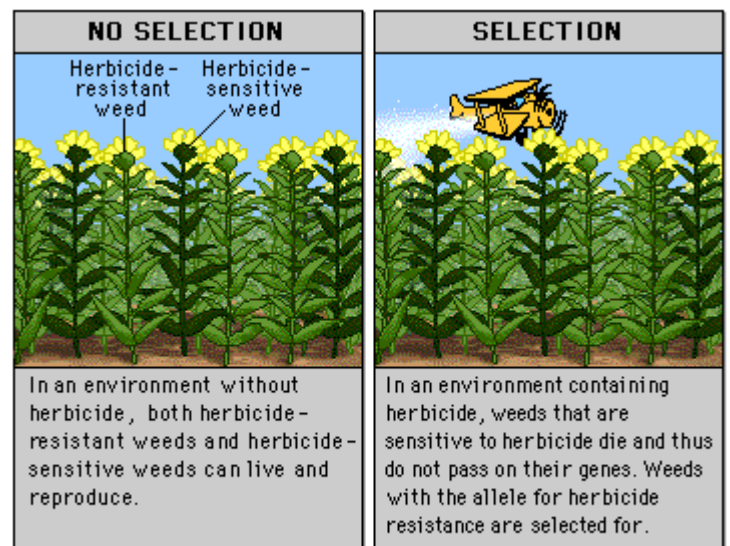
#4 - No Immigration or Emigration

For the allelic frequency to remain constant in a population at equilibrium, no new alleles can come into the population, and no alleles can be lost. Both immigration and emigration can alter allelic frequency.



#5 - No Natural Selection

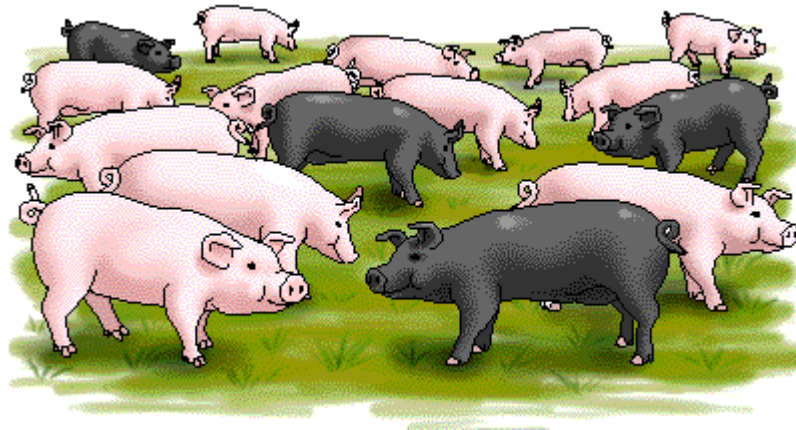
In a population at equilibrium, no alleles are selected over other alleles. If selection occurs, those alleles that are selected for will become more common. For example, if resistance to a particular herbicide allows weeds to live in an environment that has been sprayed with that herbicide, the allele for resistance may become more frequent in the population.



replay

Estimating Allelic Frequencies

If a trait is controlled by two alternate alleles, how can we calculate the frequency of each allele? For example, let us look at a sample population of pigs.



The allele for black coat is recessive to the allele for white coat. Can you count the number of recessive alleles in this population?

- a) Yes
- b) No

The Hardy-Weinberg Equation

To estimate the frequency of alleles in a population, we can use the Hardy-Weinberg equation. According to this equation:

p = the frequency of the dominant allele (represented here by A)

q = the frequency of the recessive allele (represented here by a)

$$(p + q)^2 = 1$$

so

$$p^2 + 2pq + q^2 = 1$$

The three terms of this binomial expansion indicate the frequencies of the three genotypes:

p^2 = frequency of AA (homozygous dominant)

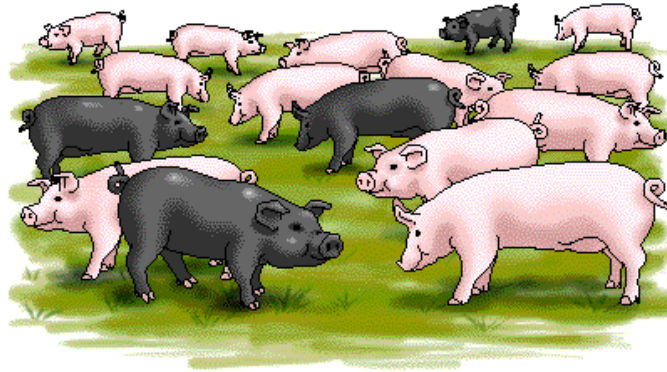
$2pq$ = frequency of Aa (heterozygous)

q^2 = frequency of aa (homozygous recessive)

This page contains all the information you need to calculate allelic frequencies when there are two different alleles. You may want to print the page so you can refer back to it as you do the rest of this laboratory. We start with some sample problems that will give you practice in using the Hardy-Weinberg equation.

Sample Problem 1

Let's return to our population of pigs. Remember that the allele for black coat is recessive. We can use the [Hardy-Weinberg equation](#) to determine the percent of the pig population that is heterozygous for white coat.



1. Calculate q^2 - Count the individuals that are homozygous recessive in the illustration above. Calculate the percent of the total population they represent. This is q^2 .

2. Find q - Take the square root of q^2 to obtain q , the frequency of the recessive allele.

3. Find p - The sum of the frequencies of both alleles = 100%, $p + q = 1$. You know q , so what is p , the frequency of the dominant allele?

4. Find $2pq$ - The frequency of the heterozygotes is represented by $2pq$. This gives you the percent of the population that is heterozygous for white coat:

Sample Problem 2

In a certain population of 1000 fruit flies, 640 have red eyes while the remainder have sepia eyes. The sepia eye trait is recessive to red eyes. How many individuals would you expect to be homozygous for red eye color?



Red eyes



Sepia eyes

Hint: The first step is always to calculate q^2 ! Start by determining the number of fruit flies that are homozygous recessive. If you need help doing the calculation, look back at the [Hardy-Weinberg equation](#).

Sample Problem 3

The Hardy-Weinberg equation is useful for predicting the percent of a human population that may be heterozygous carriers of recessive alleles for certain genetic diseases. Phenylketonuria (PKU) is a human metabolic disorder that results in mental retardation if it is untreated in infancy. In the United States, one out of approximately 10,000 babies is born with the disorder. Approximately what percent of the population are heterozygous carriers of the recessive PKU allele?

If you need help, look back at the [Hardy-Weinberg equation](#).

Allelic Frequency vs Genotype Frequency

Allelic Frequency

If you are told that the frequency of a recessive allele in a population is 10%, you are directly given q , since by definition q is the frequency of the recessive allele. This comprises all the copies of the recessive allele that are present in heterozygotes as well as all the copies of the allele in individuals that show the recessive phenotype. What is q for this population? If you need help, look back at the [Hardy-Weinberg equation](#).

Genotype Frequency

Genotypic frequency is the frequency of a genotype — homozygous recessive, homozygous dominant, or heterozygous — in a population. If you don't know the frequency of the recessive allele, you can calculate it if you know the frequency of individuals with the recessive phenotype (their genotype must be homozygous recessive).



Recessive



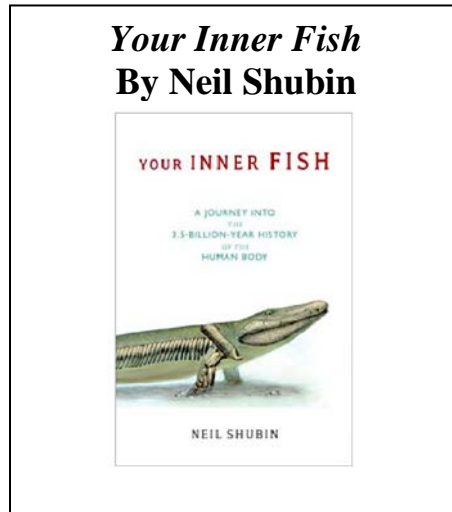
Dominant

Sample Problem

If you observe a population and find that 16% show the recessive trait, you know the frequency of the aa genotype. This means you know q^2 . What is q for this population?

Extra Credit: will count as a project grade. You may include this in your summer assignment portfolio.

I strongly encourage you to read this book whether or not you choose to complete the tasks for extra credit. Topics covered in the book will not only further your understand of Big Idea 1, these topics will also come up in class throughout the entire year!



As you read the book, please keep a reading journal. This must be hand written (this will be the last section in your portfolio). My suggestion is as you complete a chapter, journal about it instead of reading the entire book, then going back and trying to write about each chapter. For each chapter:

1. Provide a BREIF summary of the chapter and how it relates to you or something in your life. (Diagrams are a good idea!)
2. Consider the "disputable statement" for each chapter and respond to it based on what you have read in the book and know about evolution. Again, you can use additional sources but make sure to use citations.
3. Each chapter should have **one** dedicated page including the summary and statement.

Disputable Statements

Definition of dispute - A disagreement, argument, or debate (keep this in mind when you are discussing each statement)

Chapter 1 Finding Your Inner Fish

Dispute: Most living organisms fossilize after death, so fossils in exemplary condition are easily found all over the world. (*The introduction can be a littler dry, stick with it, the rest is amazing!*)

Chapter 2 Getting a Grip

Dispute: Humans and fish are nothing alike: we have hands with fingers, they have fins.

Chapter 3 Handy Genes

Dispute: Each cell in a human body contains a unique set of DNA. This allows some cells to build muscle or skin and some cells to become arms versus fingers.

Chapter 4 Teeth Everywhere

Dispute: Teeth evolved through time, after bones, as they became a beneficial adaptation for protection against predation.

Chapter 5 Getting Ahead

Dispute: Humans and sharks both have four gill arches as embryos, but the germ layers and arches develop into unrelated structures in each organism.

Chapter 6 The Best-Laid (Body) Plans

Dispute: Scientists work in isolation: it is counter-productive to repeat another scientist's experiments or to consider research that is not directly related to the organism you are studying.

Chapter 7 Adventures in Bodybuilding

Dispute: All tissues in the human body are made of similar cells that connect to each other in similar fashion.

Chapter 8 Making Scents

Dispute: There are few genes dedicated to olfactory sense and they are similar in all organisms capable of detecting smell.

Chapter 9 Vision

Dispute: All organisms with vision have similar eyes and similar vision genes.

Chapter 10 Ears

Dispute: In humans, eyes and ears function independently of one another; sensation in one does not affect sensation in the other.

Chapter 11 The Meaning of It All

Dispute: Maladies of the human body are not related to our evolutionary past.

Suggested Timeline Check List

Weeks	TASK	COMPLETE
1-2	Part I: Bozeman Videos and definitions	
1	Part II: Intro ppt tasks and studying	
1	Part III: Hardy-Weinberg Video and Virtual Lab	
3-4	Book Study (optional but highly recommended!)	

Please note the following:

YES! This class is rigorous and you will work harder than you ever have!

YES! All of your hard work will pay off when you take the AP Bio exam and pass it!

YES! this will be the best class you will ever take!