Study Guide for Test #1

***Biology 100***

**Lab Book Assignment on
“Science and Human Perception”**

(Chapter 1)

1. Define animism.
2. What is the difference between totemism and the other forms of animism?
3. What are the two types of animism that perceive the spiritual force of the world as “outside” of the immediate scene and objects?
4. Define the differences between each of the above two views.
5. Give modern examples of each type of animism.
6. No matter which world view of animism is used there will be questions and confusions about how some things happen in nature. How does each type of animism resolve these questions and confusions?
7. In science, what kind of evidence is used to test a hypothesis? (Be specific about the term.)
8. In order for an idea or question to become a proper hypothesis in science, what must be true about that idea?
9. Are there some human ideas or questions that can not be a proper scientific hypothesis?
10. Does science say that those untestable ideas are of no value to humans?
11. In science, what is the only source of validity to determine whether a hypothesis is true or false?
12. What is the difference between a theory and a hypothesis?
13. What is the difference between a theory and a scientific principle?
14. Does science agree with the following statement: “Experience has revealed that many ideas from animism produce value for humans”?
15. Does science say that *in science* the only good idea is one that can be tested?
16. Is the strict form of the scientific method the predominant method used in business, government, and social institutions?

**Lab Book Assignment on**

**“Statistics” (Chapter 4)**

***You are only responsible for Ex. #1 and #5.***

***Exercise #1***

1. Describe the differences in the situations where you would use probability as compared to the situations where you would use statistics.
2. Probability begins with knowing everything. Statistics begins with knowing \_\_\_.
3. What is the difference between a sample and the population?
4. What is the probability of an absolutely certain event?
5. What is a compound event?
6. What is the multiplication rule for compound events?
7. When do you use the multiplication rule for calculating probability?
8. Be able to answer any of the questions on p. 36-37.
9. When do you use the addition rule for calculating probability?
10. What is the addition rule in probability?
11. Be able to answer the questions on p. 38.
12. Be able to recognize when the addition rule and the multiplication rule can be used for planning personal or business success.
13. Define data.
14. Define statistics.

***Exercise #5***

1. Define null hypothesis.
2. Define the two different kinds of *research error* when testing the null hypothesis.
3. Which kind of error is science most vulnerable to?
4. How does science protect against the Type I error?
5. How does science protect against the Type II error? (This refers to how the hypothesis is stated.)
6. Be able to answer any of the questions on p. 58-59.

Textbook Assignment on
“The Cell and Its Structure” (Chapter 4)

1. The first person to see cells was looking at what kind of tissue?
2. What is the cell theory?
3. Define *prokaryotic* and *eukaryotic.* Which are oldest, and which have organelles?
4. What is the value of an organism being many-celled with specialization of cells?
5. Why not be an organism made up of a few large cells rather than consisting of many very small cells? (What is the relationship of cell size to its relative surface area?)
6. What kind of cell has a cell wall, and what is the wall made of?
7. Describe the general appearance and function of each of the following organelles:

cell membrane golgi bodies

cilia and flagella lysosomes

mitochondria chloroplasts

ribosomes vacuole

endoplasmic reticulum nucleus

1. What is the endosymbiosis hypothesis? Which two organelles are possible examples of this theory?
2. Define *diffusion* and *active transport*.
3. Be able to label these structures of the human cheek cell: cell membrane, nucleus, and cytoplasm.
4. Be able to label these structures of the onion cell: cell wall, cell membrane, nucleus (and possible endoplasmic reticulum attached to the nucleus), and cytoplasm.
5. Be able to label these structures of the Elodea leaf cell: cell wall, cell membrane, chloroplasts, nucleus, and central vacuole.

Film—*Architecture of Cells*

This film is presented as a visual aid for any students who have not had a biology class previous to this course. Any test questions on cell structure are covered in the textbook assignment (chapter 4).

**Lab Book Assignment on**

**“Chemistry Concepts”**

**(Chapter 7)**

Lab Book chapter 7 and the textbook assignment on chemistry will help you to be able to answer all of the following questions.

**1**. If you were shown a Periodic Table of Elements, be able to figure out the following descriptions for any element shown:

Atomic number

Atomic mass

# of protons

# of neutrons

# of electrons

which groups could form positive ions

which groups could form negative ions

which groups lose electrons in a reaction

which groups gain electrons in a reaction

which groups share electrons in a reaction

1. Be able to use group numbers and the Rule of Eight to predict how many of one element will combine with how many of another element. (p. 89-90)
2. Remember the three important values of covalent bonds to living organisms as discussed on p. 89.

Textbook Assignment on
“The Chemistry of Life” (Chapter 3)

All of these questions are answered in Chapter 3 of the textbook, and many are also answered in Chapter 7 of your Lab Book (Chemistry Concepts).

1. Define and describe the difference between *element, atom,* and *molecule*.
2. If you were given the chemical formula of any molecule, then be able to tell me how many different elements, atoms, and molecules are present. For example, try the molecule C2NO2H5.
3. List the three subatomic particles.
4. Define and describe the difference between *atomic number* and *atomic mass.*
5. Do all electrons have energy?
6. Where are the “higher energy” electrons found in the atom, and can they change energy levels?
7. How is “life energy” related to electron energy?
8. How do the electrons of atoms and molecules get “charged up” during the life process?
9. What then happens to that electron energy during the life process?
10. What is the difference between an isotope and an ion?
11. Which subatomic particle is most closely associated with the chemical properties of an element?
12. Define oxidation.
13. When two hydrogen atoms react with an oxygen atom, why is there an unequal sharing of the electrons among the atoms?
14. How does the unequal sharing of electrons in the water molecule contribute to the hydrogen bond?
15. What is happening to the hydrogen bond as water is heated?
16. What is happening to the hydrogen bond as water evaporates and becomes steam?
17. What kind of molecule is the enzyme?
18. Where in the cell are enzymes made?
19. What molecule has the instructions for making an enzyme?
20. How is the shape of an enzyme important to its function?
21. How are enzymes related to the “energy of activation”?
22. How specific are enzymes?
23. Do enzymes influence the speed of reactions?
24. Is carbon versatile in the ways that it can combine with other elements?
25. What are hydrocarbons?
26. Remember the following examples of carbohydrates: sugars, starch, and cellulose.
27. A saturated fat has more . . . (an element) than an unsaturated fat.
28. Are steroids protein, fat-like, or carbohydrate?
29. The subunits of a protein molecule are called …
30. What determines the biological character of the protein molecule?
31. List the two nucleic acids.

**Study Guide for Test #2**

***Biology 100***

**Lab Book Assignment on Intuition**

**(Chapter 2)**

The questions below cover the parts of the lab chapter that you will be tested on***. Important: You are responsible only for Exercises #2, #3, and #6 in the Lab Book chapter “Are Humans Doomed to Intuition?”.***

***Exercise 2:***

1. Define empirical, intuitive, and counter-intuitive.

2. Be able to identify examples of counter-intuitive processes.

3. Can human intuition be wrong?

4. Are there always serious consequences when intuition is wrong?

***Exercise 3:***

1. Which choice did most students make – Button A or Button B (Remember which actual choices these were.)

2. Which choice did most students make – Button C or Button D (Remember which actual choices these were.)

3. Define low-risk and high risk situations.

4. Be able to answer questions 1-7 on p. 11.

5. Which choices (A,B,C, or D) are overall winning strategies in life, and which are losing or limiting strategies?

6. What are the four results discovered when researchers studied decisions made during problem solving? (This is the City Council example.)

***Exercise 6:***

1. What have researchers discovered about the intuitive feeling of “knowing that you are right” ?
2. Be able to apply the research discoveries to the example of city redevelopment.

**Lab Book Assignment on “Photosynthesis and Respiration”**

**(Chapter 10)**

1. Describe the first and second laws of thermodynamics.
2. If you are shown an energy flow diagram like the example on p. 114 (perhaps with different numbers), be able to answer questions 1-6 on p. 115.
3. Define respiration as stated in bold on p. 115.
4. If an animal takes in more food energy than it releases in heat during a day, then does that animal lose or gain weight?
5. If a plant absorbs more light energy than it releases in heat during a day, then where does that unaccounted for energy go?
6. Define photosynthesis as stated in bold on p. 116.
7. Be able to work out an energy flow through the ecosystem problem like the one on p. 117 only with different numbers (for example, practice with Sun Energy = 50,000 units).
8. Be able to answer questions like those on p. 117-118.
9. Define herbivore, first carnivore, second carnivore, etc.
10. What is the % energy conversion efficiency from sunlight energy to plant energy?
11. What is the % energy conversion at all of the other energy transfers between food levels following the plants?
12. Define photosynthesis as stated at the bottom of p. 119.
13. Be able to answer questions 1-4 on p. 120.
14. What is chlorophyll.
15. During the beginning of photosynthesis light energy is first converted into what kind of energy?
16. What then happens to that energy? (Into what kind of energy is it transformed?)
17. Which cell organelle is specialized for doing photosynthesis?
18. What are grana?
19. What is the electromagnetic spectrum?
20. How much of the EMS is visible light?

***(continued on next page)***

1. Which wavelengths have the most energy?
2. Ultra-violet has too much \_\_\_\_\_\_\_ for photosynthesis.
3. Infra-red light does not have enough energy to \_\_\_\_\_\_ electrons.
4. Be able to answer questions 1-6 on p. 123.
5. Respiration produces \_\_\_ energy from food.
6. During respiration the mouse loses weight. What two substances are given off during this process that equals the mouse’s loss in weight?
7. The air used up during respiration is lighter in weight than the air given off during respiration. Which substance is the “heavy air”?
8. Which substance is the “light air”?
9. After you have added the molecular formulas for all of the substances in the reaction for respiration (question #4 on p. 124), memorize that reaction.
10. Be able to answer questions 5-7 on p. 125.
11. Be able to answer questions 1-6 on p. 125.
12. Do plants do respiration?
13. Be able to answer the three questions on p. 126.
14. Be able to answer questions 1-4 on p. 127.
15. ATP carries what kind of energy? (That is, what kind of electrons?)
16. Define aerobic and anaerobic respiration.
17. Be able to answer all of the questions in the table at the bottom of p. 128.
18. Which cells evolved first – eukaroytic or prokaryotic?
19. Which cells have mitochondria – eukaroytic or prokaryotic?
20. Be able to answer questions 1-3 on p. 129.

**Lab Book Assignment on**

**Patterns in Nature**

You are responsible for completing chapter 27 in your lab book titled “Patterns in Nature”. Test questions will come from questions in the chapter, “**bolded**” terms and phrases, and basic concepts covered.

**Film on “The Shape of Things”**

This film covers some of the topics presented in Chapter 27 “Patterns in Nature”. Watch for examples shown in the film, and pay attention to what is responsible for creating particular shapes and patterns. Test questions include the following:

1. Are there many basic themes, or many variations of a few basic themes?
2. List the six basic themes of pattern presented in this film.
3. What creates the basic shape of the ice crystal? What is that shape? The variation of shape of the ice crystal is created by the variation in \_\_\_\_\_\_\_.
4. Which form is the most compact?
5. When a bunch of spheres (blow bubbles in soap water) are packed together, what pattern emerges?
6. What is the pattern in wasp and bee nests?
7. Turbulence in flow (different speeds of water for example) creates what pattern?
8. When the flower buds are being created in the center of a daisy, what pattern emerges? Are the buds being produced on the inside or the outside part of the pattern? Is the pattern of buds created by them growing in that pattern?
9. If a spiral occurs in a 3-D space rather than on a 2-D surface, what pattern is formed?
10. Oscillation of flow creates what pattern? Where is the water flowing fastest in the river – outside or inside of the river bend?
11. Can hard materials flow in a meander pattern? Give an example.
12. What are the three variations of branching presented in this film? Give an example of each.
13. Which variation of branching uses the most wood to hold the leaves? Where would you see this variation?
14. What example of multiple explosion was shown? How big was this plant?
15. Which variation of branching is the most efficient to hold leaves?

**Study Guide for Test#3**

**Textbook Assignment on “The First Life” (Chapter 9)**

**1**. What is the difference between mechanism and vitalism?

**2**. What is the best estimate of how long ago since the universe began to expand?

**3** How old is the Earth?

**4.** How old are the oldest fossil cells?

**5**. Which two gases are the most common in our atmosphere today?

**6.**  Which common atmospheric gas of today probably didn’t exist until a billion years or more after the origin of the Earth?

**7.** What process produced the first oxygen gas of our atmosphere?

**8.** Because there was none of this gas, how was the environment different for organic molecules existing then compared to those of today?

**9.** How did oxygen gas change the direction of evolution? (That is, where does evolution of organic molecules happen today as compared to 4 billion years ago?)

**10.** In the 1950s, Stanley Miller attempted to show that the organic molecules in the structure of living organisms could form spontaneously from small inorganic molecules. What was the energy source for his experiment?

**11.** What molecules formed during Miller’s experiment?

**12.** Later, another scientist, Sidney Fox, performed an experiment involving the product molecules of Miller’s experiment. He duplicated conditions on the early earth. What kind of molecules formed during his experiment?

**13.** What was the energy source for Fox’s experiment?

**14.** The book discusses structures such as *coacervate droplets, liposomes,* and *microspheres,* which we will call microspheres in this class. Do these structures require a living organism in order to form?

**15.** Describe the way these microspheres grow and reproduce. In general, how are they like living cells?

**Lab Book Assignment on “Genes and Protein Synthesis”**

You are responsible for completing the lab book Chapter 13 titled, “Genes and Protein Synthesis.” After answering all questions below you should read your textbook Chapter 6 p. 112-117 as a review of your understanding.

1. What is the most basic difference in the functions of DNA and RNA?
2. What are the subunits of DNA?
3. What are the complementary nucleotide pairs in DNA?
4. What are the complementary nucleotide pairs in RNA?
5. Be able to answer questions 1-7 on p. 149.
6. What is the one gene – one enzyme hypothesis?
7. Messenger RNA is a copy of what molecule?
8. Define transcription.
9. What is the function of transfer RNA?
10. What is a codon? How many nucleotides in one codon?
11. Where are mRNA and tRNA made?
12. How many different amino acids are there in living organisms?
13. Define translation. Where does it happen?
14. Describe how a specific protein is synthesized at the ribosome under the influence of DNA, mRNA, and tRNA.
15. Are all of your genes “on” in all of your cells at the same time?
16. Define and give an example of a single-gene trait and a multiple-gene trait.
17. Define mutation.
18. What happens (be very specific) when a codon is changed as a result of a mutation in the DNA?
19. Define evolution.
20. Be able to answer questions 1-4 on p. 157.

**Textbook Assignment on “DNA Fingerprinting” (Chapter 8)**

1. What is meant by the term *recombinant DNA?*
2. How is this technology being used today?
3. What kind of cell is commonly used as a “host” organism for receiving a new gene from a donor organism? (Human growth hormone is made this way.)
4. How was recombinant DNA technology used in the commercial synthesis of human insulin?
5. Very basically, what happens during PCR (polymerase chain reaction)?
6. What is DNA fingerprinting?
7. How can this technology be used to determine paternity, and how is it being used in criminal cases?
8. What happens to DNA when “restriction enzymes” are added?
9. How is gel electrophoresis used to analyze the pieces of DNA that have been “cut up” by restriction enzymes?
10. How are radioactive probes used in DNA analysis?

**Lab Book Assignment on “Sameness and Variety”**

Lab Book chapter #14 titled, “Sameness and Variety” in your *Laboratory Investigations* is a complete coverage of this lecture topic. In addition, chapter 6 in your textbook “The Cell and Its Cycles” is an excellent review after you have done the lab chapter.

1. Why does it pay off for a species to have a lot of genetic variety?
2. Define asexual reproduction and sexual reproduction.
3. Which cell division mechanism – mitosis or meiosis – is the primary process for sexual reproduction?
4. List the four nucleotides of DNA.
5. Which nucleotides pair with each other?
6. Is DNA a single strand or double-stranded?
7. If you are shown a sequence of nucleotides on one DNA chain TATCAG, be able to list the complementary nucleotides?
8. What is chromatin, and when do you see it during the cell cycle?
9. What is a chromosome, and when do you see it during the cell cycle?
10. Define chromosome set.
11. Define haploid.
12. Define diploid.
13. Define homologous chromosomes.
14. How many homologous pairs in a normal human?
15. What are the haploid and diploid number of chromosomes in a normal human?
16. When the process of mitosis is used for organism reproduction, are the new organisms exact genetic duplicates of the parent organism?
17. What would be the disadvantage of reproducing asexually?
18. What is the name of the phase before cell division?
19. Before mitosis occurs, what has to happen to the amount of DNA?
20. Describe the appearance of the chromosomes after the DNA is replicated (You see these chromosomes during prophase).
21. In the most general way, describe what happens to each doubled chromosome during mitosis.
22. In terms of number of chromosomes, how do the daughter cells of mitosis compare to the original cells? Is there any change in the mix of genes during mitosis?
23. List and describe the most general events (four phases) of mitosis.
24. What is a chromatid?
25. What happens to chromosomes during metaphase?
26. What happens to chromosomes during anaphase?
27. What happens during telophase?
28. Define meiosis and fertilization.
29. Define *meiosis* in terms of the number of chromosomes in the original cell and the product cells. How many chromosome sets are in the original and product cells?
30. How many sets of chromosomes are in a human egg or sperm?
31. How many chromosomes are there when a human egg and sperm fuse?
32. What is one value of being diploid if you are a complex organism with many genes?
33. Define the difference between maternal and paternal chromosomes.
34. Do maternal chromosomes go only to daughters?
35. We know that humans have 46 chromosomes. How many pairs do you have in a cell?
36. How many chromosomes did you get from your mother?
37. How many chromosomes did you get from your father?
38. List the three events during sexual reproduction that create genetic variety in the next generation.
39. Define synapsis, and how do the chromosomes look during this event?
40. Describe how crossing-over and independent alignment of tetrads are the outcomes of synapsis. Compare this with the chromosome activities during mitosis.
41. Define tetrad.
42. Define crossing-over. When does it happen? What does it do to genetic variability?
43. Describe independent assortment. How does it influence genetic variability in the offspring?
44. During production of gametes (either eggs or sperm), what happens to your maternal and paternal chromosomes as a result of crossing-over and independent alignment of tetrads?
45. How does random fusion of gametes (fertilization) influence genetic variability in the offspring?
46. What is the value of producing many sperm?
47. What is the value of only one large egg produced by meiosis?

**Study Guide for Test #4**

**Lab Book Chapter on “Genetics”**

Lab Book Chapter #15 titled “Genetics” is a complete coverage of this lecture topic. By completing this tutorial and answering the questions below you will be ready for the test questions. Any genetic problems on your test will either be the same problems as you work out in the lab chapter, or they will be other examples just like those problems.

1. What is a gene?
2. Define homologous chromosomes.
3. How many homologous pairs of chromosomes does a human have?
4. How many genes for one trait does a diploid organism possess?
5. How many genes for a trait would a haploid organism possess?
6. What is an allele?
7. Where are alleles located?
8. What process creates the various alleles in a species?
9. Define genotype.
10. Define homozygous and heterozygous.
11. Define phenotype.
12. What is the Rule of the Gene?
13. What is the Rule of Segregation?
14. What is the Rule of Dominant and Recessive Alleles?
15. What is the Rule of Incomplete Dominance?
16. Be able to solve genetic questions like those presented in Exercise #3 and #4.
17. What is a test cross?
18. Explain how gender is inherited in humans.
19. Define each sex in terms of X and Y chromosomes.,
20. What is meant by sex-linked and X-linked traits?
21. Be able to solve sex-linked genetic questions like those presented in Exercise #5.

More Practice Genetics Questions

 **1.** How many #12 chromosomes end up in a single gamete of a person?

 **2.** There can be different forms of each gene function. For example, one form of the eye color gene is blue-eye. Another form is brown-eye. What is the term used for these different forms?

 **3.** How many eye-color genes end up in a single gamete? If a person has both alleles for eye color – brown and blue, then what percent of this person’s gametes will carry the blue-eye allele? What percent will carry the brown-eye allele?

1. How many genetically different gametes can be formed if you are homozygous for a gene trait? How many genetically different gametes can be formed if you are heterozygous for a gene trait?
2. Suppose brown eyes in people (B) is dominant to blue (b). Could a marriage between two blue-eyed people produce a brown-eyed child? Could a marriage between a homozygous brown-eyed person and a blue-eyed person result in blue-eyed children? Could two-brown-eyed people have a blue-eyed child? Explain all of your answers.
3. Diabetes is thought to be inherited (at least in some cases) as a recessive (d) gene. Two normal people have a diabetic child. What are the genotypes of the parents and the offspring?

 **7.** In the problem above, what are the chances that their next child will be a non-diabetic? What about the third child?

 **8.** Explain how gender is inherited in humans.

 **9.** What is meant by sex-linked and X-linked traits?

1. \* Define *translocation,* and describe its potential harmful effects.
2. \* Define *non-disjunction,* and describe its potential harmful effects.

\* Covered in lecture – not in lab book chapter.

**Textbook Assignment on
“History of Evolutionary Theory” (Chapter 1)**

1. Was Darwin a young or middle-aged man when he traveled with the H.M.S. *Beagle*?
2. How long was he gone?
3. Did he see much of the world?
4. Was Darwin the first European scientist to suggest plants and animals might change over long periods of time?
5. Lamarck had an idea that explained how animals changed over time. Describe the force that he thought was responsible, and summarize his most famous example of such a change in an animal.
6. What did Lyell discover about the age of the earth? Was this very different from the ideas of the time?
7. What were two examples observed by Darwin that seemed to confirm Lyell’s theories?
8. Darwin got many of his insights on evolution by comparing related animals that lived on some islands with animals living on a large nearby continent. Name those islands and that continent.
9. Summarize Darwin’s explanation for how natural selection could account for the variety among the Galapagos Island’s finches.
10. What theory of Malthus gave a very important insight to Darwin?
11. Remember that Darwin thought there were four forces involved in evolution: natural variation (mutations), over-population, competition, and natural selection.
12. Define natural selection. (How is it related to reproductive success?)
13. When was the *Origin of Species* published?

**Lab Book (Chapter 16) on “Evolution”**

You are responsible for completing Exercises #1, #2, and #3 in the lab book chapter 16 titled, “Evolution.” ***(Note that we are not covering Exercise #4 on this test.)*** Be able to answer all of the following questions.

1. Define evolution.
2. Define mutation (very specifically).
3. If a codon is changed, what happens to protein synthesis? (Be specific.)
4. Define allele.
5. Define gene pool.
6. Assume that a particular human gene is 100 nucleotides long. How many different variations of this gene are possible?

a. less than 100

b. two or three hundred

c. many thousands

1. What process makes it impossible for all genes (DNA) to remain unchanged from generation to generation in a species?
2. What two processes prevent chromosomes from being passed on exactly from one generation to the next? (not mutation)
3. Is it possible for one generation of humans to pass on all of its alleles in exactly the same form and frequency (%) to the next generation?
4. Define micro-evolution.
5. From a scientific point of view, what is the one question about evolution that is no longer considered appropriate in an argument about evolution.
6. Can migration create evolution? Give an example.
7. Can luck create evolution? Give an example.
8. Does “survival of the fittest” explain evolution due to migration, luck, or small group phenomenon?
9. What is the small group phenomenon?
10. How does the small group phenomenon lead to fast changes in the gene pool?
11. How could natural disasters like fires and floods influence evolution?
12. What would you expect organisms to look like that live on islands compared to those of the same species living on the mainland? Explain.
13. Define natural selection.
14. Does natural selection create new alleles in the gene pool?
15. What does create new alleles in the gene pool?
16. In order for one species to evolve into two species, what must first happen?
17. What happens to genetic similarity when two groups become separated (no or very little interbreeding)?
18. Define geographical separation, and how is it related to speciation?
19. Describe the African East-Side/West-Side Story as it relates to the separation of a common ancestral primate into the chimp line and hominid line of evolution.
20. Be able to answer questions 1-4 on p. 199 of your lab book “Human Evolution”.
21. What is the Mitochondrial Clock?

**Film on *Mendel’s Laws***

*Mendel’s laws of inheritance are also discussed at the beginning of chapter 7 in your textbook.*

***Principle of Dominance***

 **1.** Mendel experimented with pure-breeding pea plants. What is meant by “pure-breeding”? When he crossed parental plants (P1) that were round seed and angular seed (wrinkled), he saw only round in the first generation offspring (F1). When he crossed green seed with yellow seed, he saw only yellow in the offspring.

 **2.** Because one trait appeared and the other trait did not, what is the term used to describe the trait that *didn’t* appear in the second-generation? What is the term used to describe those traits that *did* appear in the second generation?

***Principle of Segregation***

 **3.** When Mendel crossed second-generation plants (F1 x F1 ), he discovered that they produced both traits again in the third generation. What was the ratio of traits in the third generation (F2)?

1. The conclusion is that the two hereditary particles (round and angular) started out separate from each other in the first generation (P1), and then somehow came together in the second generation (F1). (However, only the dominant heredity particle was expressed in the F1 generation.) Then the two heredity particles (round and angular) separated again in the third generation (F2). Today, we know that the traits are separated during the production of eggs and sperm, and re-unite during fertilization.

What did Mendel call this principle?

**5.** What is the name used for the heredity particle?

***Principle of Independent Assortment***

1. Mendel’s next experiment was to cross different forms of *two separate* traits at the same time. He crossed pea plants that had round green seeds with pea plants that had angular yellow seeds. What four types did he observe two generations later?
2. What did Mendel call this principle of all possible combinations of parental genes in the offspring?

**Lab Book Chapter 17 on Human Evolution**

The test will cover the following questions:

1. Be able to make a “time map” like the examples in Exercise #1 and #2.
2. What happens to genes over time?
3. What happens to gene similarity when a group separates into two non-interbreeding populations?
4. How is mitochondrial DNA passed onto the next generation?
5. What happens to mitochondrial DNA over time?
6. Be able to answer questions on p. 214 and 215.
7. Be able to answer questions on p. 216, and make a “time map” for modern human migration.
8. How well does the anthropological evidence agree with the mitochondrial DNA evidence?
9. Where were the oldest Australopithecus fossils found, and what kind of habitats were they living in?
10. About how many species of Australopithecus have been discovered?
11. Define hominid.
12. Describe the general appearance of Australopithecus.
13. Which species is the oldest to be included in the Homo genus line of evolution?
14. What does Homo habilis mean?
15. About how old are the oldest Homo habilis fossils?
16. About how old are the oldest Homo erectus fossils?
17. What are the main differences between Homo erectus and Homo habilis?
18. In what group are the Neanderthals placed?

**Study Guide for Final Exam**

**Lecture on the Natural History of San Diego**

***Climate and Weather Patterns***

1. How does heating at the equator generate global weather?
2. How is the heat at the equator carried to the poles? (two major mechanisms)
3. Describe the general features of the San Diego climate. (How much rain does San Diego have in a normal year, and during which part of the year does that occur? How does this compare to most other parts of the world?)
4. Describe if at each of the latitudes (equator, 300, 600, and poles) the air is generally rising or sinking.
5. Which are the low pressure latitudes, and which are the high pressure latitudes?
6. In which latitude zone is San Diego, and what does that indicate about climate?
7. Which latitude zones have a lot of rain compared to San Diego?
8. Name and describe the two huge air masses that dominate the weather of San Diego.
9. What can happen when a warm front “over-rides” a cold front?
10. What are jet streams, and how are they related to lower atmospheric disturbances and the movement of storms?
11. Compare the very general differences between jet stream patterns of San Diego winter and summer.
12. In what general way does the ocean influence the San Diego climate (costal effects) in the winter and summer?
13. During what part of the year is there a large marine layer off our coast?
14. How is desert heating in the early summer related to the development of “June gloom”?
15. What happens in rain clouds as they move up in elevation going over our inland mountains?
16. What is a rain shadow?
17. If winter night air cools on the slopes of inland mountains or neighborhood hills, where does that air flow?
18. What is a microclimate?
19. What process creates the conditions leading to Santa Anna winds, and how does this influence San Diego vegetation?

***Geology of the San Diego Area***

1. List the three general categories of rocks.
2. What types of geological processes were happening in San Diego about 150 million years ago? (What types of rocks were forming?)
3. Where does granite form, and how does it end up on the surface of the planet?
4. What is a geological plate?
5. Which plate carries the San Diego area, and what plate is it crunching against?
6. What is the name of the fault separating these two plates?
7. There are a series of San Diego faults parallel to and west of the San Andreas fault that form large blocks. What is the general tilt direction of these blocks, and how does this create our eastern San Diego mountains?
8. What happens to these blocks? (That is, what happens when a block is pushed upwards, and what happens when a block falls downwards?)
9. What is differential erosion, and how does it create the variation of landscape?
10. What is a rift valley, and how is its formation related to the Gulf of California and the San Diego deserts?
11. How were the San Diego mesas formed?
12. How many mesa levels are there in San Diego?
13. Why aren’t the mesas continuous across the San Diego area? (Why doesn’t the Linda Vista mesa connect with Otay mesa?)
14. How big is the continental shelf area off San Diego?
15. There are ridges offshore the San Diego area. How did they form? How are they related to the fishing industry?

***San Diego Habitats and Community Types***

**Ocean**

1. Which zone has the highest productivity of sea life – the open ocean or continental shelf?
2. Where did San Diego build its sewer outfall? Why there?
3. What about the location for the US/Mexico sewer outfall?
4. What unique ocean floor topography off San Diego contributes to excellent fish production, and how far off our coast does this topography extend?

**Shoreline**

1. Compare the most important physical features responsible for the differences in the communities of plants and animals living in each of the four shoreline habitats: Rocky Intertidal, Sandy Beach, Bays, and Estuaries.
2. Why are the estuaries and bays such an important natural resource to San Diego?
3. What are the names of the two San Diego bays, which is larger, and which one is really a human modified estuary?
4. In what direction does the sand move between Oceanside and San Diego?
5. Where does that sand eventually go?
6. In what direction does the sand move between San Diego Bay and the Mexican Border?
7. Where does that sand eventually go?
8. What is the source for all sand on San Diego beaches?
9. The sand on San Diego beaches is lowered 1-2 meters during the winter months. Where does that sand go?

**Riparian and Lakes**

1. What is a riparian environment, and why are these environments of interest to both environmentalists and developers? (Why is it so easy to argue about whether an area is riparian?)
2. What are vernal pools, and why are they of interest to both environmentalists and developers?

**Coastal Sage and Chaparral**

1. Describe the altitude zones of these two communities.
2. Describe their very general appearance.
3. What are the specific leaf adaptations of plants in these communities including thickness, color, orientation, size, and when leaves are dropped during the year?
4. What would be the advantage of annual plants?
5. What are the special root and seed adaptations that are related to fires?
6. What is the North/South slope effect?

**Mountain and Desert Communities**

1. Some trees in the Oak–Pine Woodland and Pine Forest communities lose their leaves during part of the year. When? Why is their leaf drop during a different season than the plants that drop leaves in the Chaparral and Coastal Sage communities?
2. What is the rain-shadow effect? (How is this related to creation of deserts?)
3. What can be said about the types of plants and animals that once occurred from shore to mountain areas in San Diego?