NAME: _____KEY_____ SCORE: ____100_____/100

Notes:

1. Make sure you have your name on the test.
2. Make sure you have the correct number of pages — check now!
3. Be sure to show ALL your work on problems — credit is given for correct steps in solving the problem. The correct answer without a clear showing of the derivation of the answer will receive little or no credit.
4. Maintain silence throughout the test.
5. For multiple choice questions, put the letter of the correct answer in the blank to the left of the question number.
6. DO NOT GET UP — if you have a question, raise your hand and the instructor will come to you.
7. Read the questions carefully — misreading is a primary cause of point loss. Also be sure to answer the question that was asked.
8. If you run out of room to answer a question, please continue on the back of the same page.
9. Papers are due on the instructor's desk BY THE END OF THE SCHEDULED CLASS PERIOD. **NO LATE PAPERS WILL BE ACCEPTED!!** Class for today is over after you turn in your test.

1. (16) List, in order, ***starting with the most ancient***, the periods and the eras to which they belong Give the approximate dates for the start and end of each **era**. (Just do this for the three most recent eras)

FOR EACH ERA, list a typical life form that existed in that era. "Typical" means either a common form that lived in no other era, or a common form that may have lived in another era(s), but which was not a dominant life form except in the era in which you list it.

Paleozoic era	***~600-~225Ma***	***Trilobites***
Cambrian		
Ordovician		
Silurian		
Devonian		
Carboniferous		
Permian		
Mesozoic Era	***~225-65Ma***	***Dinosaurs***
Triassic		
Jurassic		
Cretaceous		
Cenozoic Era	***65Ma - present***	***large mammals & large birds***
Tertiary		
Quarternary		

2. (15) Having read Chapter 3 in your book carefully, explain what you think is the single best line of evidence for organic change through time (i.e., evolution in lineages of living organisms) — ***EXCLUDING THE FOSSIL RECORD AND EXCLUDING HOMOLOGIES***. Tell what the evidence is, and why you think it is the best evidence. Stay within the bounds of science in your explanation. Try to design your explanation like a scientific paper; in other words, do a thought experiment on paper. Set up an empirical test of the following sort: If lineages evolve through time, the following must happen; if they didn't change through time, we would find this alternative instead. Then tell what has actually been found.

(one possible answer)

Excluding the fossil record and homologies, I think ring species are the best evidence for evolution. In ring species, various geographic forms of a species live next to one another in a geographic ring. Each form can interbreed with the forms living on either side, except for the ends of the ring, which are generally the most different in form and cannot breed together. Thus, there is a continuum of variation, from individual variation within a form, to the variation among forms, to the variation of the forms that cannot breed together, which are then separate species. The importance of this is that it shows that the kinds of variation found within a form, is the same kind of variation found among forms, which is the same kind of variation found among speces. Species are therefore not different in kind from the differences that separate individuals; species simply have more of the same kind of variation. We rather artificially separate groups of individuals into subspecies and species based on the amounts, but not the kinds, of variation they possess. 1

3. (10) If one atom of out of every 3 billion atoms of ^{132}Qs decays to ^{130}Rz in a year, and you find a rock in which has 55% of the total atoms of (^{132}Qs + ^{130}Rz) are ^{132}Qs, how old is the rock ? (Assume all the ^{130}Rz present is decay product of ^{132}Qs that was originally present)

$$t = \frac{1}{r} \ln \frac{N_0}{N_t} \qquad r = \frac{1}{3{,}000{,}000{,}000}$$

$$t = 3,000,000,000 \ln \frac{1}{.55} = 3,000,000,000(.597837) = 1,793,511,002$$

or, about 1.8 billion years old.

4. (15) List, in order, 5 human ancestors, giving approximate dates when they lived, and for each, tell whether it made stone tools, used fire, and approximately what size its brain was compared to modern humans. Use the following table to record your answers.

Name of Ancestor	Approximate Dates	Made stone tools? (Y/N)	Used fire? (Y/N)	Small, medium or large brain?
Australopithecus afarensis	***~3.8-2.8 Ma***	***N***	***N***	***small***
Australopithecus africanus	***~3-2 Ma***	***N***	***N***	***small***
Homo habilis	***~2.2-1.6 Ma***	***Y(crude)***	***N***	***medium***
Homo erectus	***~1.6 - 0.4 Ma***	***Y (good)***	***Y***	***large***
Homo sapiens	***~0.4 Ma - present***	***Y (excellent)***	***Y***	***large***

5. (6) List the three processes by which genetic variation is recombined:

a. ____crossing over_____

b. ____independent assortment_____

c. ____gametic fusion_____

Multiple choice questions: worth 2 points each

__c___6. [lecture] A theory, as the term is used in science, is: a. just a guess about how something happened b. an initial, well thought-out explanation of an observation, but without much, if any, supporting evidence c. an explanation which has been tested and supported to a reasonable degree d. an explanation which has been thoroughly tested and disproved e. refers specifically to the cell theory, best expressed in the Latin phrase "*omnis cellula e cellula*"

__c___7. [lecture] The one thing that sets science most apart from other ways of knowing, and is referred to as the criterion of demarcation, is: a. having a progression from hypothesis to theory to law b. the building of new science on previous knowledge c. empirical falsifiability d. science being internally consistent e. scientific hypotheses having explanatory value

__d___8. [Ch. 1.2] A living thing which appears well-fitted to its environment in terms of form, physiology and behavior is said to possess: a. divergences b. equilibria c. advantages d. adaptations e. parthenogenesis

__b__9. [Ch. 1.5] Darwin's contemporaries mainly accepted the evidence that evolution had occurred, but not Darwin's ideas on: a. coral reefs b. natural selection c. pigeons d. South American mammals e. orchids

__a__10. [Ch. 1.6] When Mendel's ideas were rediscovered in 1900, they were initially taken as evidence that: a. natural selection couldn't occur in the way stated by Darwin b. Darwin was correct in his descriptions of artificial selection c. Darwin was correct in his theory of natural selection d. genetics and biometrics were incompatible e. genes were not on chromosomes

__d__11. [Ch. 1.7] Fisher, Haldane, and Wright are largely remembered for: a. proving Darwin wrong about natural selection b. taking the side of the Mendelians in the battle over how evolution occurs c. taking the side of the Biometricians in the battle over how evolution occurs d. unifying the mendelian and biometrics viewpoints e. rediscovering the Mendelian principles in 1900

__b__12. [Ch. 2.5] For a simple Mendelian trait, if a homozygote mates to a heterozygote, and half of their offspring look like each parent, the homozygote was: a. a dominant homozygote b. a recessive homozygote c. a codominant homozygote d. a pleiotropic plesiomorphic homozygote e. can't tell from information given

__e__13. [Ch. 2.2] The genetic code is deciphered in two stages or processes, called: a. transformation and conjugation b. meiosis and mitosis c. transcription and crossing-over d. translation and transformation e. transcription and translation

__b__14. [Ch. 2.3] Each human has how many copies of each gene? a. 1 b. 2 c. 3 d. 4 e. 5

__b__15. [Ch. 2.6] Blending inheritance would make natural selection: a. more powerful than particulate inheritance b. less powerful than particulate inheritance c. impossible d. much more dependent on the mutation rate e. able to work on dominant alleles, but not on recessive alleles

__a__16. [Ch. 3.3] Ring species are important because they show that: a. variation within a species can be extensive enough to produce a new species b. different species cannot interbreed c. species rarely form rings d. introgression may occur e. species hybridize in nature

__c__17. [Ch. 3] Which of the following is **NOT** a line of evidence for organic evolution: a. direct observation of microevolutionary changes b. the order of groups in the fossil record c. the fact that genes are on chromosomes in higher organisms d. homologous similarities among species e. imperfect adaptations

__d___18. [Ch. 3.5] Which of the following is an analogy, not a homology: a. bird wing and bat wing b. whale front flipper and human hand c. bee wing and wasp wing d. bat wing and bee wing e. 7 vertebrae in the neck of a giraffe and 7 vertebrae in the neck of a mouse

__e__19. [Ch. 3.4] Which of the following is ***NOT*** evidence for a common ancestor of all living tetrapod vertebrates? a. the morphology of the eukaryotic cell b. the genetic code c. the pentadactyl limb d. the recurrent laryngeal nerve e. the different environments in which they live

__e__20. [Ch. 3.2] New reproductively isolated species are easily formed both artificially and naturally by chromosome doubling in one major group of eukaryotes, which is the: a. fish b. euglenoids c. Basidiomycete fungi d. salamanders & newts e. flowering plants

__d___21. [Ch. 19.1] Fossils are found in what type of rock? a. igneous b. metamorphic c. cladomorphic d. sedimentary e. none of the preceding

__b___22. [Ch. 19.2] Most fossils are found in rock dating from: a. the Archaic era b. the past 600 million years c. 3.8 - 0.6 Million years ago d. the pre-Cambrian e. the era of the stromatolites

__b__23. [Ch. 19.4] Eukaryotic cells originated about how long ago? a. 3.8 billion years b. 1.8 billion years c. 0.8 billion years d. 600 million years e. 250 million years

__c__24. [Ch. 19.5] The completeness of the fossil record is defined by: a. the observed thickness divided by the timespan of the rock b. the observed thickness divided by the short-term rate of deposition c. the observed thickness divided by the product of the short-term rate of deposition and the timespan of the rock d. the timespan of the rock divided by the product of the short-term rate of deposition and the observed thickness e. none of the preceding