The Principles, Theories & Precepts of Biology

ACTIVITIES



Chapter 4

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PROFESSIONAL CREDITS

The Principles, Theories & Precepts of Biology

Chapter 4, Activities

Publisher
Gene Hood
Ronald E. Johnson, C.Ph.D.

Managing Editor
Ronald E. Johnson, C.Ph.D.

Writer
Mary Ames

Editor
Nancy Johnson

Consulting Editor
Mindi Tapp

Activities, Lessons, Quizzes & Tests
Mindi Tapp

Page Composition
Jeff Carr
Lydia Seals

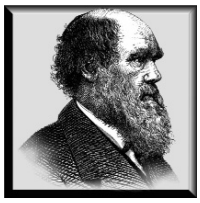
Graphics
Lydia Seals
Jeff Carr

Quality Assurance
Carolyn Hood
Nancy Johnson
Nora Young

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ACTIVITIES
Lesson 1:

SCIENTIFIC METHOD AND UNCONFIRMED HYPOTHESES

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. _____ is defined as the process by which all living creatures were designed and created in fully functional and completely developed form.

2. The proposal that life evolved from a primordial mixture at its earliest beginnings to the complex diversity that exists today is known as_____.

3. *The Origin of Species* was authored by:_____.
   (a) Gregor Mendel (c) Galileo Galilei
   (b) Charles Darwin (d) Francis Bacon

4. Darwin set about to explain life strictly from the standpoint of ***naturalism*** which does not allow for any _____ input.

5. *The Origin of Species* was similar to most other scientific works of the same period.
   _____ (a) True or (b) False

6. Most of the founders of modern science believed in a _____.

7. Initially, *The Origin of Species* was readily accepted by most members of the scientific community. _____ (a) True or (b) False

8. Place an "X" in front of all that apply. Darwin's theory was originally embraced by scientists and others who:
   ____ (a) were founders of various branches of modern science.
   ____ (b) were very religious.
   ____ (c) did not want to be accountable to God or His system of morality.
   ____ (d) embraced a philosophy of meaninglessness.

9. The theory of evolution was gradually accepted by most scientists only after about _____ years and much _____.

10. The idea of evolution has been ***validated*** by the scientific method and is therefore a ***scientific law***. _____ (a) True or (b) False

11. A ***theory*** supported by many lines of evidence and many years of successful experiments and observations is known as a(n): _____.
   (a) hypothesis (c) scientific law
   (b) scientific method (d) scientific fact

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12. The process by which a general statement is written and tested through experimentation in order to reach a conclusion regarding the statement is called the:_____ _____.

(a) hypothesis (c) scientific law
(b) scientific method (d) experimental method

13. A scientifically acceptable and tested statement offered to explain observed facts is a(n) _____.

14. A(n) _____ is an assumption made in order to test and prove a logical conclusion.

15. When testing a ***hypothesis***, the scientist's question must always be:_____ _____.

(a) "What do I believe?" (c) "What is the evidence?"
(b) "What fits prevailing scientific theory?" (d) "What is logical?"

16. One who studies prehistoric life forms is known as a(n)_____ _____.

17. Many concepts taught as scientific truth have been proven to be wrong._____
(a) True or (b) False

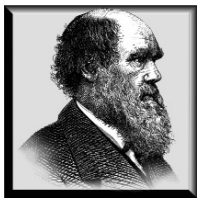
18. What response did Colin Patterson receive from geologists and evolutionists when he questioned the validity of the evolutionary theory?_____ _____

(a) anger, followed by several lines of evidence supporting the theory
(b) quotes from *The Origin of Species* supporting evolution
(c) silence; followed by a call not to teach evolution in high schools
(d) none of the above

19. The theory that all living things appear to reflect planning and purpose is known as _____.

20. Write the **Life Principle**: "_____ _____ _____."

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ACTIVITIES
Lesson 2:

THE DEVELOPMENT OF AN HYPOTHESIS

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Charles Darwin graduated from Cambridge University with a degree in:_____.
   (a) theology (b) biology (c) geology (d) geography

2. Following a geology field trip in 1831, Darwin took a position as a(n)_____ _____ on the *HMS Beagle*.
   (a) theologist (b) biologist (c) naturalist (d) sailor

3. During his voyage on the *Beagle*, Darwin collected a variety of plant and animal specimens which he called "_____".

4. Contemporary scholars estimate that the Earth is home to approximately_____ _____ species of living things.
   (a) 5 thousand (c) 5 million
   (b) 50 thousand (d) 50 million

5. Charles Darwin's work was influenced by economist_____ _____, the author of *An Essay on the Principles of Evolution.*

6. Malthus' observations led Darwin to consider:_____ _____.
   (a) the factors that determine which organisms survive and reproduce and which do not
   (b) ways to prevent war, famine, and disease
   (c) the causes of an increased birth rate in humans
   (d) the factors that cause global dominance by species such as trees and oysters

7. Sir Charles Lyell speculated that:_____ _____.
   (a) the world is less than ten thousand years old
   (b) the Earth's topography was formed by a world-wide catastrophe
   (c) processes such as erosion, that are observable today, shaped the topography of the modern world
   (d) the modern world is a consequence of design

8. The _____ states that the Earth experienced a major catastrophe in which most of Earth's creatures and plants were destroyed, and that the few remaining species represented today have changed very little over time.

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9. The hypothesis called ***natural selection*** states that the individuals or groups best suited for their environment will:_____ _____.
   (a) support individuals and groups ill-suited to their environment
   (b) enhance the environment, causing advantageous changes to occur
   (c) survive, while those ill-suited to their environment will not survive
   (d) none of the above

10. Darwin waited twenty-three years to publish his work because:_____ _____.
   (a) he wanted to perfect it
   (b) his wife did not agree with it
   (c) he respected his wife's wishes
   (d) all of the above

11. Although trained in theology, Darwin later became a(n):_____ _____.
   (a) very religious naturalist
   (b) serious atheist
   (c) self-proclaimed agnostic
   (d) aspiring anesthetist

12. Darwin invested money in the cultural and spiritual development of the natives on which island? _____

13. Darwin was concerned that geological evidence for his theory was lacking._____
   (a) True or (b) False

14. Darwin was beset with doubts about his theory of evolution._____
   (a) True or (b) False

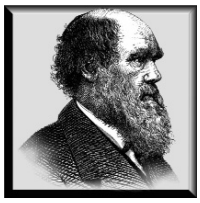
15. Darwin considered his hypotheses in *The Origin of Species* to be scientific law. _____
   (a) True or (b) False

16. Write the **Life Principle**: "_____ _____ _____."

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Name: _____

Date: _____ Grade: _____



ACTIVITIES
Lesson 3:

DARWIN'S CONCLUSIONS

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Darwin's fascination with the Galapagos ***Archipelago*** centered around:_____
_____.
(a) each island having species that were distinctly different from each other
(b) volcanic activity being responsible for the formation of the islands
(c) species on each island being essentially the same
(d) the islands being 600 miles west of Equador

2. _____ reached the same conclusions as Darwin while studying in Malaysia and published a work very similar to *The Origin of Species*.

3. In *The Origin of Species*, Darwin inferred that all species had resulted from environmental _____ over time.
(a) creations (b) migrations (c) adaptations (d) resolutions

4. The largest division of geologic time is the: _____.
(a) millennium (b) decade (c) eon (d) century

5. ***Artificial selection,*** also known as_____, is a method of breeding organisms to produce offspring with desirable characteristics.

6. ***Natural selection*** is the process that results in the survival of individuals or groups that are: _____.
(a) largest in size or number
(b) best suited to the environment
(c) the most intelligent
(d) the most aggressive

7. Darwin believed that life is a(n) _____ to survive, and often in the face of limited resources.

8. According to your text, all living things must do all of the following, **except:**_____
_____.
(a) compete for food and space
(b) evade the dangers of predators and disease
(c) deal with unpredictable climate changes
(d) compete for social acceptance

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9. Throughout several generations in the struggle for existence, the most fit individuals in nature survive and reproduce. This process is known as_____ _____.

10. Creationist Edward Blyth believed that natural selection is used by nature to:_____ _____.
    (a) remove defective organisms, thus conserving the health of the population
    (b) produce a genetically identical population
    (c) determine the course of evolutionary change
    (d) remove critical survival characteristics from a population

11. The term "young Earth" refers to an Earth of_____ _____.
    (a) less than one-million years in age
    (b) less than one-hundred thousand years in age
    (c) less than ten thousand years in age
    (d) more than one eon in age

12. The hypothesis suggesting that species have descended from a common ancestor is known as _____.

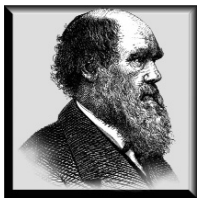
13. Place an "X" in front of all of the following that are considered by the evolutionary theory to be human ancestors.
    _____ (a) chimpanzee
    _____ (b) bacteria
    _____ (c) non-living primordial mixture

14. Darwin's theories have been periodically modified and updated to reflect new biological and geologic discoveries. _____ (a) True or (b) False

15. Evolutionists and catastrophists continue to debate the validity of the theory of evolution. _____ (a) True or (b) False

16. Write the **Life Principle**: "_____ _____ _____."

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ACTIVITIES
Lesson 4:

DARWIN AND DNA—THE MODERN MECHANICS OF EVOLUTION

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. When Charles Darwin formulated his ideas on natural selection and evolution, he had extensive knowledge of genes and DNA. _____ (a) True or (b) False

2. A group of similar-looking organisms that can breed with one another and produce fertile offspring is called a(n) _____.

3. Humans cannot interbreed with apes. This restriction is an example of: _____ _____.
   (a) restrictive reproduction (c) reproductive isolation
   (b) selective breeding (d) breeding restriction

4. All the alleles of all the genes of the members of a population that interbreed are called a(n): _____.
   (a) common sequence (c) population code
   (b) gene pool (d) genetic fingerprint

5. A genetic change in one ***species*** will affect the neighboring specie group. _____
   (a) True or (b) False

6. Sexual reproduction alone cannot be responsible for evolution because:_____ _____.
   (a) it does not change the relative frequency of alleles in the gene pool of a species
   (b) it does not change the combination of alleles in the gene pool of a species
   (c) it removes alleles from the gene pool of a species
   (d) it shuffles the alleles in the gene pool of a species

7. The process that produces variations due to the crossing-over mechanism of gamete formation is known as: _____.
   (a) gene reformation (c) gene shuffling
   (b) gene pooling (d) gene rearranging

8. A significant percentage of genes have at least two different forms called:_____.
   (a) chromosomes (c) codons
   (b) chromatids (d) alleles

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9. In fishes, reptiles, and mammals, about _____ percent of all genes have more than one allele.
   (a) 15 (c) 5
   (b) 10 (d) 20

10. ***Gene flow*** occurs when:_____.
   (a) individuals from one group interbreed
   (b) individuals from different species interbreed
   (c) individuals do not breed
   (d) individuals migrate from one group to another and interbreed

11. With the pressure of natural selection, ***gene shuffling*** and gene flow can lead to a change in allele frequency. _____ (a) True or (b) False

12. The process which results in the survival of individuals or groups best suited for their environment is known as _____.

13. Natural selection acts directly on the genes of an organism to change its genotype.
   _____ (a) True or (b) False

14. In the example used in your text, which dogs have the better ***evolutionary fitness***?
   _____
   (a) those with short fur
   (b) those with medium fur
   (c) those with long fur
   (d) none of the above

15. Once the dog/wolf population has adapted to a cool climate in which only long-furred dogs survive to reproduce, what would likely happen if the climate were to become hot?
   _____
   _____
   (a) Long-furred dogs would breed to produce medium and then short-furred dogs.
   (b) Long-furred dogs would be unable to produce offspring with short fur.
   (c) The population would easily adapt to the climate change.
   (d) Due to need, the genes for short-fur would be expressed in the dogs with long fur.

16. Polygeneic traits are controlled by: _____.
   (a) two alleles
   (b) one gene
   (c) two or more genes
   (d) all of the above

17. The bell-shaped curve associated with the range of phenotypes in polygenic inheritance is known as a(n) _____.

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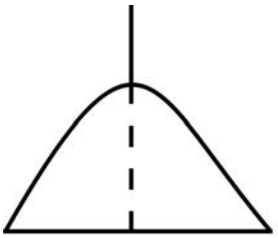
Matching:

18. _____ ***disruptive selection*** (a) natural selection process when the environment continually eliminates individuals at extremes of a population

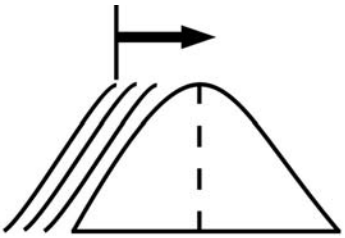
19. _____ ***stabilizing selection*** (b) natural selection process when the environment favors extreme types in a population at the expense of intermediate forms, thereby splitting the population into two or more populations

20. _____ ***directional selection*** (c) natural selection process when the environment acts for or against an extreme characteristic and the likely result is replacement of one gene group with another

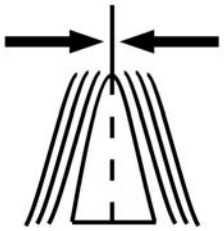
Label each diagram below as stabilizing, disruptive, directional selection, or normal distribution.



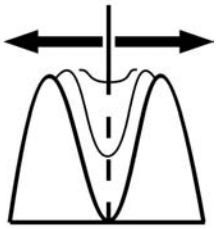
21. _____
_____



22. _____
_____



23. _____
_____



24. _____
_____

25. A random change in allele frequency that often produces offspring that will be different from the original population simply by chance is called_____.

26. The change in allele frequencies produced when a new population arises from one or a few colonizing individuals is called the _____.

27. ***Mutations*** are: _____.
(a) inheritable alterations in the genetic information of a cell
(b) alterations, deletions, or insertions of one or more DNA nucleotides
(c) rare in nature
(d) all of the above

28. Mutations are the only method by which nature can add information to existing genetic material. _____ (a) True or (b) False

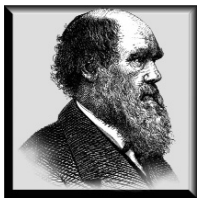
29. An ***adaptation*** is the development of physical and behavioral traits that make an organism _____ to survive in their environment.

30. Write the **Life Principle**: "_____
_____
_____."

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ACTIVITIES
Lesson 5:

SPECIATION--THE BIRTH OF A NEW SPECIES

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. The formation of a new species through evolutionary processes is called_____ _____.

2. ***Horizontal evolution*** (***microevolution***) is_____, whereas ***vertical evolution*** (***macroevolution***) is _____.
   (a) variation within a species; development of a new species
   (b) development of a new species; variation within a species
   (c) extinction of a species; development of a species
   (d) development of a species; extinction of a species

3. Most of the evidence for evolution has been for macroevolution. _____
   (a) True or (b) False

4. A scientist trained to classify organisms is a(n) _____.

5. Scientists have documented the macroevolution of several species into other species.
   _____ (a) True or (b) False

6. When abnormal crosses are attempted between species, _____ almost always results.

7. The more a species is pushed from its normal breeding pattern, the_____ _____ the offspring become.
   (a) more fertile (c) stronger
   (b) better adapted (d) none of the above

8. Although plant and animal breeders can manipulate genes already operative in a species, they cannot manufacture new genes. _____ (a) True or (b) False

9. Ample evidence exists for _____ evolution, but absolute evidence for _____ evolution is lacking.
   (a) horizontal; vertical (c) animal; plant
   (b) plant; animal (d) vertical; horizontal

10. Peter and Rosemary Grant noted a(n) _____ in a finch population after a sever drought in the Galapagos Islands.
    (a) change in beak shapes (c) decrease in beak length
    (b) increase in beak size (d) increase in beak strength

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11. When rains returned to the Galapagos Islands after a severe drought, what happened to the beaks of the finch population? _____
    (a) They remained in the drought form.
    (b) They returned to normal.
    (c) They provided even more evidence for vertical evolution.
    (d) none of the above

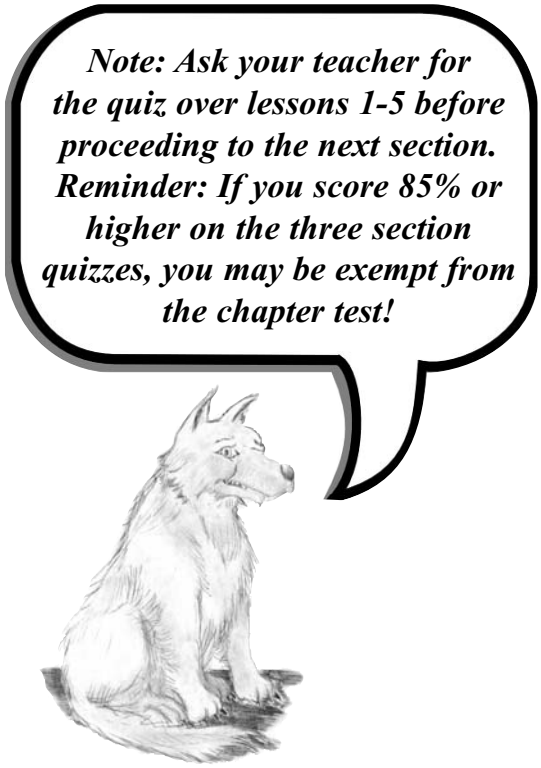
12. The National Academy of Sciences' booklet indicated that a series of droughts could speed up the evolutionary process for finches._____ (a) True or (b) False

13. _____, or merging, of several finch species is opposite of how evolution is supposed to occur, which is ***divergence*** of species through natural selection.

14. According to evolutionary theory, the term _____ is given to a newly evolved species or a group of organisms in a new area that evolve into different species that live in different ways.

15. In the evolutionary model, _____ refers to the process by which unrelated species independently evolve superficial similarities because of adaptations to similar environments.

16. Write the **Life Principle**: "_____
_____
_____."



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ACTIVITIES
Lesson 6:

MUTATIONS & EVOLUTION

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. _____ is the only conceivable process that could add genetic material to a population, thereby contributing to a higher form of species.
   (a) gene shuffling (c) mutation
   (b) gene flow (d) reproductive isolation

2. The _____ is an updated Darwinian hypothesis which proposes that over eons of time mutations coupled with natural selection led to the evolution of simple life forms into modern complex life forms.

3. Mutations could be described as: _____.
   (a) rare, but usually beneficial
   (b) common, and usually beneficial
   (c) rare, and usually harmful
   (d) common, but usually harmful

4 If mutations are to be part of an evolutionary process, they must be beneficial by:
   _____.
   (a) subtracting genetic information
   (b) rearranging genetic information
   (c) adding genetic information
   (d) none of the above

5. Almost all mutations produce organisms that are:_____
   _____.
   (a) stronger and at an advantage to compete for survival
   (b) conserved by the natural selection process to survive and reproduce
   (c) more fit to evolve
   (d) weaker and at a disadvantage to compete for survival

6. Dr. Lee Spetner calculated the odds of developing a single new species through mutation as one chance in: _____.
   (a) $3.6x10^{50}$ (c) $3.6x10^{2000}$
   (b) $3.6x10^{20}$ (d) $3.6x10^{2738}$

7. Scientists usually consider anything with odds greater than one in _____ to be impossible.

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8. Place an "X" before each item that, according to Theodosius Deobzhansky, mutations produce.
   _____ (a) natural populations
   _____ (b) deterioration of viability
   _____ (c) heredity diseases
   _____ (d) monstrosities
   _____ (e) evolutionary building blocks

9. A disease causing organism is called a(n): _____.
   (a) microbe (b) pathogen (c) warfarin (d) pesticide

10. Organisms that have developed resistance have developed it as a result of:_____ _____.
    (a) the death of organisms lacking resistance
    (b) new genetic information introduced into the population
    (c) evolution of a new species
    (d) the survival of less-fit organisms

11. "Survival of the fittest" is another term for evolution of a new species.
    _____ (a) True or (b) False

12. With the advance of the Industrial Revolution, the percentage of dark-colored moths: _____.
    (a) decreased (c) increased
    (b) remained constant (d) none of the above

13. The shift in the populations of the dark versus light colored moths was a result of:_____ _____.
    (a) new genetic information
    (b) increased complexity and organization
    (c) evolutionary change
    (d) natural selection

14. The peppered-moth study in England was flawed by the fact that peppered moths do not normally rest on tree trunks. _____ (a) True or (b) False

15. Write the **Life Principle**: "_____ _____ _____."

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ACTIVITIES
Lesson 7:

THE GEOLOGIC COLUMN AND INDEX FOSSILS

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. The field of science in which fossils are located, catalogued, and interpreted is known as: _____.
   (a) geology (b) paleontology (c) taxonomy (d) archeology

Matching:

2. _____ fossils — (a) form when salt, sand, or clay builds up in the bottom of a river, lake, or ocean
3. _____ ***strata*** — (b) preserved remains of once living organisms
4. _____ ***sedimentary rocks*** — (c) continuum of geologic strata in the Earth's crust with a presumed time scale based on the types of fossils found in each of the strata
5. _____ ***geologic column*** — (d) distinct layers of rock in Earth's crust

6. In the geologic column, _____ forms of fossils are found in the lower strata and: _____ forms of fossils are found near the surface of the Earth.
   (a) simple and unspecialized; higher and complex
   (b) smaller and more fragile; larger and stronger
   (c) higher and complex; simple and unspecialized
   (d) larger and stronger; smaller and more fragile

7. The study of the history of Earth's crust and surface features is known as:_____ _____.
   (a) paleontology (b) geology (c) archeology (d) taxonomy

8. The hypothesis that minimizes the impact of catastrophic events and states that the origin and development of all things can be explained exclusively in terms of the same natural laws and processes operating today is called_____ _____.

9. The concept of uniformitarianism was first introduced by _____ in 1785 and was known as the _____.

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10. Hutton recognized design in nature and did not view the possibility of macroevolution as a viable option._____ (a) True or (b) False

11. ***Uniformitarianism*** is responsible for the assumption that the Earth is approximately _____ years old.
(a) 10 thousand (b) 4.6 thousand (c) 10 billion (d) 4.6 billion

12. _____ is the hypothesis that the same processes which work in microevolution can, over eons of time, transform an organism into a completely different organism.
(a) macroevolution
(b) horizontal evolution
(c) natural selection
(d) survival of the fittest

13. Marker fossils, also known as _____ which are easily recognized, are assumed to have been widespread in occurrence, and are assumed to have lived a limited duration of time.

14. The geologic column is built around four great eras:_____ _____ and then subdivided into_____ periods and further into_____ _____.

15. Primitive, one-celled organisms are supposed to have evolved in the_____ _____ era and all the more complex animal phyla in the: _____ era.
(a) Precambrian; Cambrian (c) Cambrian; Pleistocene
(b) Pleistocene; Mesozoic (d) Mesozoic; Precambrian

16. The full geological column cannot be observed at any particular locality. _____
(a) True or (b) False

17. No correlation seems to exist between rock characteristics and the age of the rock.
_____ (a) True or (b) False

18. The geological column has been confirmed by radioactive dating. _____
(a) True or (b) False

19. Dating rocks by the fossils they contain and fossils by the strata in which they occur is known as _____.

20. Presently, scientists are unable to determine conclusively whether the formation of geologic strata and relative fossil positions was caused by macroevolution or a major catastrophe. _____ (a) True or (b) False

21. Write the **Life Principle**: "_____ _____ _____."

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ACTIVITIES
Lesson 8:

EVOLUTION AND THE FOSSIL RECORD

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. The "Cambrian Explosion" is best described by which of the following?_____
_____
_____

(a) Each of the major invertebrate forms of life appear abruptly in the fossil record with no preliminary or intermediate forms leading up to them.
(b) Billions of evolutionary ancestors of the Cambrian life forms have been found in Precambrian rocks.
(c) Millions of transitional fossils have been found in the Cambrian sedimentary deposits.
(d) The fossil record consists of several fine graduations.

2. According to David B. Kitts:_____
_____.

(a) paleontology has provided intermediate forms between species to validate evolution
(b) transition between major fossil groups is smooth and graduated
(c) evolution requires intermediate forms that are not provided by paleontology
(d) paleontologists are not cooperating with the advancement of the evolutionary theory

3. Why do the protozoa present a significant puzzlement in the fossil record?_____
_____

(a) They are the life form from which higher life forms evolved.
(b) They have remained unchanged throughout the course of presumed evolutionary history.
(c) They confirm that vertical evolution is the universal law of nature.
(d) They are unicellular and their ancestors are multicellular.

4. Transitional body parts do not support the concept of evolution. _____
(a) True or (b) False

5. One problem that arises as the fossil records are examined is that a great many modern animals appear to have _____, rather than evolved to higher forms, as evolution proposes.

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6. Fossilization as found in the geological strata of the Earth seems to be evidence of a worldwide catastrophe involving water because:_____
_____.
(a) fossilization is not taking place today in mass as is found in the geological strata
(b) fossilization as seen in the geological strata is very abnormal
(c) fossilization is evidence of a quick burial
(d) all of the above

7. How do fossil graveyards suggest that a worldwide catastrophe is responsible for the present topography of the Earth?_____
_____
(a) They display fossilized remains of animals from widely separate climates in tangled groups.
(b) They display fossilized remains of animals from similar climates in an orderly fashion.
(c) They display fossilized remains of transitional animal forms in tangled groups.
(d) none of the above

8. How do the mammoths preserved in Siberia and Alaska support the occurrence of a sudden aquatic catastrophe?_____
_____
(a) They have been found intact, standing or kneeling with food in their mouths.
(b) Their eyes and red blood cells have been preserved.
(c) Their condition must have resulted from abrupt, dramatic, environmental changes.
(d) all of the above

9. Fossilized tree remains that extend upright through several layers of geological strata are known as _____.

10. In the evolutionary model, fossilized tree remains extend over strata that allegedly took millions of years to form. _____ (a) True or (b) False

11. Researchers have discovered actual soft tissues in the fossil record in even the oldest levels of Earth's strata. Why is this significant?_____
_____
(a) It is evidence of a normal and gradual process as described by the uniformitarianism model.
(b) It is evidence that the fossils are very young.
(c) It is evidence of a hydraulic catastrophe that kept tissues from decaying before fossilization could occur.
(d) all of the above

12. Colin Patterson, senior paleontologist of the British Museum of Natural History _____ the existence of a single proof-positive transitional fossil.
(a) confirmed (b) denied (c) suggested (d) determined

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13. The Archaeopteryx appears to have had _____ like a reptile and _____ like a bird.
    (a) scales and claws; a beak and feet
    (b) a tail and teeth; wings and a beak
    (c) teeth and claws; wings and feathers
    (d) claws and a tail; feet and feathers

14. Today, the Archaeopteryx is no longer considered by most paleontologists to be an intermediary fossil. _____ (a) True or (b) False

15. Modern birds have been found in strata below the Archaeopteryx. _____
    (a) True or (b) False

16. Othaniel C. Marsh proposed an arrangement of "horse" fossils that was claimed to demonstrate:_____
    _____.
    (a) the evolution of a rodent into an eohippus horse
    (b) progression from a small, multi-toed horse (*eohippus*) to a larger, one-toed modern horse
    (c) fossil evidence of a catastrophic flood
    (d) that the arrangement of fossils from the smallest to the largest offers proof of evolution

17. Write the **Life Principle**: "_____
    _____
    _____."

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ACTIVITIES
Lesson 9:

EVOLUTION OF MAN—FOSSIL EVIDENCE

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Darwin proposed that humans are the descendants of a common ancestor, the _____.

2. Fossils and fragments of jaws found in Africa and Java are used to suggest that:_____ _____.
   (a) ancestors of monkeys, apes, and humans began their evolutionary journey some 50 million years ago
   (b) the origin of the human species is very different than that of every other species
   (c) the distinctive human features and brain capacities are due to design
   (d) none of the above

3. The study of ***hominid*** life based on fossil remains found in the earth is known as_____ _____.

4. Any of a family of two-legged ***primates***, including humans and closely related primates are known as _____.

5. ***Paleoanthropology*** has produced verifiable fossils that suggest man has evolved from the apes. _____ (a) True or (b) False

6. Drawings of man's supposed progression from ape to human are largely the product of:_____.
   (a) fossil evidence (c) soft-tissue evidence
   (b) DNA evidence (d) imagination

7. Many fossils of apes and men exist, but very few possible intermediate fossils exist. _____ (a) True or (b) False

8. Only a few bone fragments have been found that have been suggested to be some lower form of man. Why is this unusual?_____ _____
   (a) Millions of "ape-men" would have needed to live during the years that would have been required for man to evolve to his present state.
   (b) Many bone fragments have been found that are suggested to be some higher form of ape.
   (c) Lower forms of man did not leave fossil remains.
   (d) all of the above

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9. According to Henry Gee, arranging a line of fossils and claiming that they represent a lineage is not a scientific hypothesis that can be tested. _____ (a) True or (b) False

10. Place an "X" in front of all of the statements that correctly describe *Nebraska Man*.
_____ (a) It was based on a single tooth found among ancient tools.
_____ (b) It claimed to be intermediate between man and apes.
_____ (c) It was later proved that the tooth belonged to a member of the dog family.

11. Place an "X" in front of all of the statements that correctly describe *Piltdown Man*.
_____ (a) It was heralded as "Darwin's missing link".
_____ (b) It was based on fossils found in Piltdown, Sussex, England.
_____ (c) Bones, teeth, and tools were acclaimed to be 500,000 years old.
_____ (d) It was proven to be a fraud.
_____ (e) The jawbone was discovered to be from a very recent human.
_____ (f) The teeth had been filed down to appear human.

12. The fossil named "Lucy" was acclaimed to be a member of the first _____ group to appear about 4 million years ago. Her supposed bones were gathered from a depth of _____ and a distance of _____.

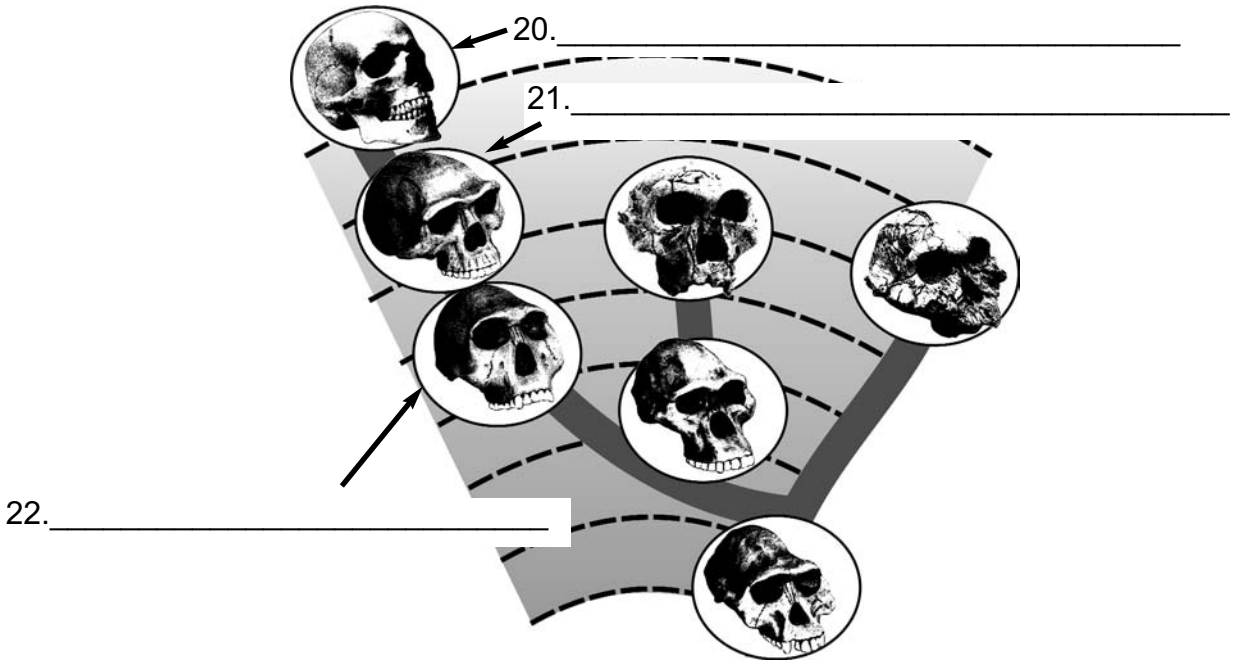
13. According to biologist Michael Denton, "_____ of the biology of any organism resides in its soft anatomy, which is inaccessible in a fossil."
(a) 20% (b) 50% (c) 75% (d) 99%

Matching:

14. _____ Australopitheus	(a) proposed to be a member of the first homnids; walked upright on two feet
15. _____Homo Habilis	(b) classification of modern humans
16. _____ Homo Erectus	(c) proposed to be the first homnid to migrate from Africa to Europe
17. _____ Homo Sapiens	(d) oldest fossils characterized as Homo Sapiens, called “cavemen”
18. _____ Neanderthals	(e) proposed to be the first Homo Sapiens to build great cities and begin to flourish
19. _____ Cro-Magnons	(f) at first proposed to be one of the first humans to evolve on Earth about 2 million years ago, now considered as a “junk” catagory

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Label the phylogenic tree hominids according to your text.



23. Write the **Life Principle**: "_____
_____
_____."

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ACTIVITIES
Lesson 10:

EVOLUTION, ANATOMY AND EMBRYOLOGY

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Body Parts that have a similar structure, but not necessarily a common function, are known as _____.

2. _____ has invalidated comparative anatomy as proof of macroevolution.
   (a) homologous structures (c) peleoanthropology
   (b) DNA sequencing (d) generational traits

3. The fact of homologous structures being specified by quite different genes in different species indicates that these structures could not have been inherited from a common ancestor. _____ (a) True or (b) False

4. Structures in an organism that seem to have little or no obvious use are called_____ _____.

5. Scientists have recognized which all of the once thought "useless" organs in humans actually have important functions. _____ (a) True or (b) False

6. The hypothesis which maintains that the development of an embryo retraces the evolutionary development of an organism is called the: _____.
   (a) law of speciation (c) law of common descent
   (b) biogenetic law (d) law of natural selection

7. The recapitulation theory can be summarized by the saying, "_____ _____."

8. ***Ontogeny*** refers to the _____ of an organism and ***phylogeny*** refers to the supposed _____ of an organism.
   (a) embryonic development; evolutionary development
   (b) early life stages; late life stages
   (c) genetic similarities; genetic differences
   (d) organ development; tissue development

9. Ernst Haeckel's series of embryo drawings were proven to be fraudulant. _____
   (a) True or (b) False

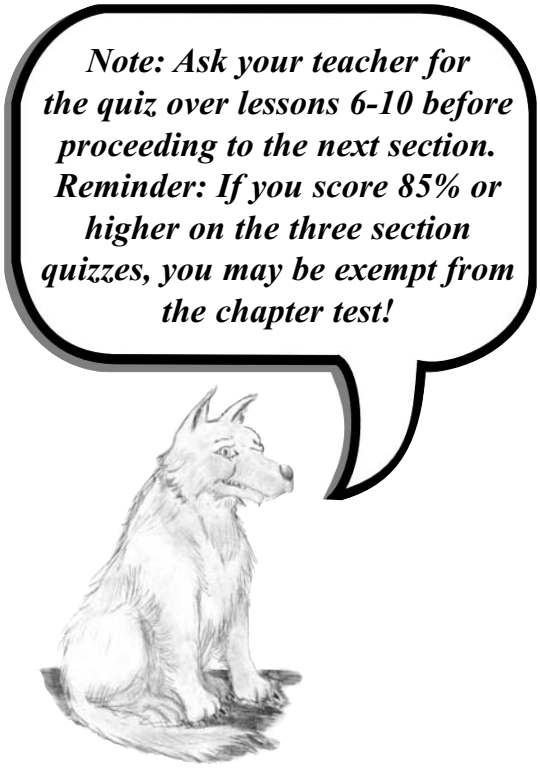
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10. Researchers have demonstrated conclusively that the various stages through which an embryo passes are:_____
_____.
(a) virtually identical to other classes of vertebrates in their earliest stages
(b) not all essential for the development of the organism
(c) evidence of the organism's evolutionary history
(d) essential for its development from a single cell into a highly-complex, ordered being

11. Embryologists now know that a species is distinct and distinguishable from other species from the very earliest stages and throughout the developmental process. _____
(a) True or (b) False

12. According to Dr. Michael Richardson, Haeckel's drawings were:_____
_____.
(a) an honest mistake (c) a joke
(b) deliberately misleading (d) completely legitimate

13. Write the **Life Principle**: "_____
_____
_____."



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ACTIVITIES
Lesson 11:

EVOLUTION AND MOLECULAR BIOLOGY

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Darwin's "Great Tree of Life" was characterized by:_____
_____.
   (a) a common ancestor as the tree and modern species as its nourishing soil
   (b) a common ancestor at its root and modern species as its branches
   (c) modern species at its root and a common ancestor as its leaves
   (d) a common ancestor at its root and modern species as its fruit

2. The evolutionary history of a group of organisms, based on DNA and protein comparisons, is known as: _____.
   (a) molecular anatomy
   (b) molecular embryology
   (c) molecular phylogeny
   (d) molecular ontogeny

3. Emile Zuckerkandl and Linus Pauling suggested that_____
_____could be used to determine how closely organisms are related.
   (a) DNA and protein synthesis
   (b) anatomical differences
   (c) embryological similarities
   (d) the sequence of organ and tissue development

4. The hypothesis that mutations in DNA occur at a constant rate that is used to estimate time frames of departure from a common ancestor is called the_____
_____.

5. The modern versions of the Darwinian tree of life are called:_____
_____.
   (a) polystratic trees
   (b) coniferous trees
   (c) phylogenic trees
   (d) ontogenetic trees

6. Modern versions of the Darwinian tree of life are based on:_____
_____.
   (a) anatomical differences
   (b) embryological development sequences
   (c) physiological differences
   (d) molecular clock calculations

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7. Most organisms have the hemoglobin protein which transports oxygen through the bloodstream to the cells. _____ (a) True or (b) False

8. Most organisms have the protein, _____,which takes part in cellular metabolism.

9. The same protein in two different species:_____.
   (a) may have varying amino acid sequences
   (b) performs the same function
   (c) is adjusted to work with the specific chemistry of each species
   (d) all of the above

10. Evaluating the differences between amino acid sequences of proteins is an accepted way of determining differences in: _____.
    (a) metabolic rates (c) neural innervation
    (b) DNA sequences (d) protein function

11. When researchers map the amino acid sequence of a protein and compare the differences among organisms that have that protein, the result is a macreoeveolutionary trend. _____ (a) True or (b) False

12. Why do the chromosome numbers of various species present a problem for the theory of macroevolution?_____
    _____
    (a) Organisms with the fewest number of chromosomes were the first to evolve, followed by organisms with a greater number of chromosomes, which does not follow the expected trend of macroevolution.
    (b) Organisms that are supposed to have evolved before humans have a greater number of chromosomes than do humans.
    (c) A human has 94 chromosomes, a chimpanzee has 78 chromosomes, a chicken has 48 chromosomes, and a goldfish has 46 chromosomes.
    (d) none of the above

13. Write the **Life Principle**: "_____
    _____
    _____."

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ACTIVITIES
Lesson 12:

EVOLUTION AND NATURAL LAW

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. The ***First Law of Thermodynamics*** is also known as the:_____
_____.
   (a) Law of Energy and Mass Conservation
   (b) Law of Mass Action
   (c) Law of Convergent Radiation
   (d) Law of Independant Assortment

2. The First Law of Thermodynamics states that:_____
_____.
   (a) total energy in a system is dependent upon its transformation from one form to another
   (b) the mass of a system is created as a result of the energy that is held constant through transformation
   (c) energy and mass can neither be created nor destroyed
   (d) none of the above

3. According to the Law of Mass Conservation:_____
_____.
   (a) matter cannot change in state, density or form
   (b) the mass of matter cannot change as a result of state, density, or form
   (c) mass is capable both of being created and destroyed
   (d) mass is a result of the conservation of matter

4. The ***Second Law of Thermodynamics*** is also known as the:_____
_____.
   (a) Law of Radioactive Decay
   (b) Law of Energy Uncertainty
   (c) Law of Infinite Energy
   (d) Law of Energy Decay or Deterioration

5. The Second Law of Thermodynamics states that:_____
_____.
   (a) the amount of usefulness and availability of energy is always decreasing
   (b) the entropy of the universe is constantly decreasing
   (c) energy is always decreasing but its usefulness is proportionally increasing
   (d) although energy is continually available, its usefulness is deteriorating

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6. The ***Law of Entropy Increase*** is interchangeable with:_____
_____.
(a) The First Law of Thermodynamics
(b) The Law of Energy Conservation
(c) The Second Law of Thermodynamics
(d) The Law of Mass Conservation

7. Which of the following illustrates the Law of Entropy Increase?_____
_____
_____
(a) A student who does his or her homework receives high grades on his or her exams.
(b) Many ingredients are mixed together in order to make a chocolate cake.
(c) A car that is not tuned regularly soon will no longer run.
(d) A child who cleans his or her room will receive his or her allowance.

8. The principle of nature that means "breaking down of structure" is known as_____
_____.

9. Left on its own, everything in life moves from: _____.
(a) disorder to order (c) order to disorder
(b) death to life (d) none of the above

10. According to the principle of ***Morpholysis***, eventually the Sun will burn itself out and all activity of life will cease. _____
(a) True or (b) False

11. What did Sir Arthur Eddington mean when he referred to the Second Law of Thermodynamics as "Time's Arrow"?_____
_____
(a) Energy, like an arrow from a bow, gains momentum as time proceeds.
(b) The arrow continually points to death, as disorder of the universe increases.
(c) The arrow points in the direction of the Sun which supplies the energy for life to exist.
(d) In time, energy like an arrow will be released from the universe to sustain life as we know it forever.

12. The theory of macroevolution contradicts the Second Law of Thermodynamics. _____
(a) True or (b) False

13. The argument that the Second Law of Thermodynamics does not apply to open systems such as Earth is invalid. _____ (a) True or (b) False

14. Man's attempt to defeat the law of increasing entropy always ends in:_____.
(a) success (b) failure (c) long life (d) sudden death

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15. The Big Bang theory states that:_____
_____.
(a) about 15 million years ago, a "cosmic egg" exploded, creating the universe
(b) in the beginning, a supreme being created the universe
(c) the universe will eventually end in a cosmic explosion
(d) mass and energy can neither be created nor destroyed

16. The Big Bang theory violates the first and second laws of thermodynamics. _____
(a) True or (b) False

17. Scientists agree that a cause exists for every effect. Why is this inconsistent with the Big Bang theory?_____
_____
(a) More than one cause exists for the introduction of life and order.
(b) It suggests that life and order happened without cause.
(c) Life and order are the cause but no effect is apparent.
(d) It suggests that the Big Bang had no effect on the existing universe.

18. Write the **Life Principle**: "_____
_____
_____."

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ACTIVITIES
Lesson 13:

IRREDUCIBLE COMPLEXITY— THE DILEMMA

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. The macroevolutionary scenario of early reptiles wanting to eat insects that were out of reach supposedly led to:_____
_____.
   (a) limbs that were eventually transformed into wings for flying
   (b) limbs that were eventually transformed for jumping
   (c) limbs that were eventually transformed for climbing
   (d) limbs that were eventually transformed for gliding

2. The macroevolutionary scenario of early reptilian, leaping tree-dwellers supposedly led to:
_____
_____.
   (a) gliders that eventually developed wings
   (b) the transformation of limbs for increased leaping ability
   (c) a change in the diet of reptiles from insects to meat
   (d) a significant loss in bone mass

3. The evolution of scales to feathers is quite difficult to imagine because:_____
_____.
   (a) scales are tough, thin plates, while feathers are soft and delicate
   (b) feathers grow from follicles like hair
   (c) unlike scales, feathers are intricately designed with an organized maze of hooks
   (d) all of the above

4. The evolution of reptile legs to bird wings defies the process of natural selection because:
_____
_____.
   (a) wings do not offer good benefits for survival
   (b) intermediate features would be so advantageous that further evolution would not occur
   (c) creatures with half-wing, half-leg characteristics would not fare well in nature
   (d) reptile legs and bird wings are not similar at all

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5. Place an "X" in front of all of the following statements that are true concerning the human eye.
   _____ (a) It is furnished with automatic aiming, focusing, and aperture adjustment.
   _____ (b) It functions from almost complete darkness to bright light.
   _____ (c) It only sees objects with large diameters.
   _____ (d) It produces colored, multi-dimensional pictures.
   _____ (e) It is fully understood by scientists.
   _____ (f) It must be in constant communication with the brain to function.
   _____ (g) It provides strong evidence of macroevolution.

6. Charles Darwin appeared to have had no doubt that the human eye was the product of mutation and natural selection. _____ (a) True or (b) False

7. The state known as_____ occurs when, by reducing the complexity of a functioning unit, the function is completely destroyed.

8. Which of the following is an example of ***irreducible complexity***?_____
   _____
   (a) blood clotting (c) the living body
   (b) immune system (d) all of these

9. ***Autoimmune diseases*** result in:_____
   _____.
   (a) the human body attacking its own cells
   (b) the human body attacking invading bacteria
   (c) a deficiency of white blood cells
   (d) an overproduction of antigens

10. The absence of antibodies or white cells in the immune system would result in:_____
    _____.
    (a) a perfected immune response
    (b) an increase in complexity
    (c) loss of immune function
    (d) autoimmunity

11. In order for organs such as the kidneys, liver, and heart to have developed through chance mutation, the mutations would have had to occur:_____
    _____.
    (a) in order (c) simultaneously
    (b) within a matter of years (d) in different organisms

12. Which is **not** an example of irreducible complexity?
    (a) body processes (c) vital organs of living organisms
    (b) geologic strata (d) dolphin/bat sonar

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13. Place an "X" in front of all of the following statements that describe the Bombardier beetle.

_____ (a) It mixes chemicals to produce an explosion when in danger.

_____ (b) It shoots benzoquinones at 212 degrees F from twin rear nozzles.

_____ (c) It uses an anti-inhibitor to prevent its own destruction and an inhibitor to allow explosion.

_____ (d) It presents difficulty in explaining how it could have evolved without exploding.

14. Evolution suggests that nothing evolves until it is needed. Why is this inconsistent with the development of the Bombardier beetle?_____

_____

(a) The beetle had no need for the explosive defense mechanism before it evolved.

(b) The beetle would not recognize its need for an inhibitor until it had already exploded.

(c) The beetle evolved a protection mechanism for itself before it had need of it.

(d) none of the above

15. Write the **Life Principle**: "_____

_____

_____."

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ACTIVITIES
Lesson 14:

EVOLUTION AND MATHEMATICS

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. The mathematical calculation of the likelihood of an event occurring is called_____ _____.

2. The Laws of ***Probability*** could best be described as: _____.
   (a) abstract (b) dependable (c) arbitrary (d) undefined

3. The laws of probability are strongly in favor of macroevolution. _____
   (a) True or (b) False

4. Macroevolution is a valid possibility, as illustrated by hypothetical monkeys randomly poking at typewriters for millions of years._____ (a) True or (b) False

5. The probability of forming a simple protein of 200 amino acids by the process of macroevolution is one in: _____.
   (a) 10
   (b) 10^{10}
   (c) 10^{50}
   (d) 10^{375}

6. Anything with odds greater than one in 10^{50} is considered by mathematicians to be effectively impossible. _____ (a) True or (b) False

7. A simple, single-celled bacterium contains _____ of different proteins.
   (a) hundreds (b) thousands (c) millions (d) billions

8. According to Carl Sagan, "The information of a simple cell has been established as around 10^{12} bits, comparable to about a _____ pages of the Encyclopedia Britannica."

9. In the "Watchmaker Argument", William Paley says that the indication of design in nature: _____.
   (a) is negligible
   (b) is less than that of the watch
   (c) is greater than we can measure
   (d) none of the above

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10. Following William Paley's reasoning in his "Watchmaker Argument", it would be logical to conclude that:_____
_____.
(a) if a watch was made by design, one should logically assume that the wrist that wears the watch was also made by design
(b) although a rock does not move, it should be considered a product of design
(c) a watch on the ground has more value than a rock on the ground
(d) a watch is a much more complex machine than the human wrist

11. Cells are not irreducibly complex. _____ (a) True or (b) False

12. According to John Horgan, "...protein cannot form without _____, but neither can _____ form without _____."
(a) DNA; protein; DNA
(b) protein; protein; DNA
(c) DNA; DNA; protein
(d) protein; DNA; protein

13. John Horgan's statement would seem to suggest that:_____
_____.
(a) cells are products of design
(b) development of a cell by mutation and natural selection is impossible
(c) cells are irreducibly complex
(d) all of the above

14. Sir Fred Hoyle compared the probability of higher life forms emerging by random, unaided chance to: _____.
(a) a monkey on a typewriter
(b) a tornado in a junk-yard
(c) a million dollar life insurance policy
(d) the Encyclopedia Britannica

15. Write the **Life Principle**: "_____
_____
_____."

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ACTIVITIES
Lesson 15:

EVOLUTION TODAY

You are making progress! ***Answer the following questions. Circle the correct answers or fill in the blanks with words, letters or numbers as each question indicates. Check your answers from the Answer Key. Correct all errors, then complete your next goal.***

1. Based on the scientific method, many aspects of the evolutionary theory are not _____ but remain _____.
   (a) hypotheses; scientific law
   (b) scientific law; hypotheses
   (c) hypotheses; theories
   (d) scientific law; theories

2. When we use observations in the natural world and experimental world to draw conclusions, we are using the _____.

3. Which of the following is the correct progression through the scientific method process?
   _____
   (a) hypothesis, scientific law, theory
   (b) theory, hypothesis, scientific law
   (c) hypothesis, theory, scientific law
   (d) scientific law, hypothesis, theory

4. The fossil record and the field of molecular biology offer solid evidence supporting macroevolution. _____ (a) True or (b) False

5. The punctuated equilibrium hypothesis proposes that evolution occurs by means of a pattern of long periods of stability that are interrupted by episodes of rapid, evolutionary change._____ (a) True or (b) False

6. Place an "X" in front of all of the following statements that correctly describe punctuated equilibrium.
   _____ (a) A small segment of a species becomes isolated and rapidly evolves.
   _____ (b) The parent species dominates over the newly evolved species.
   _____ (c) It requires an increase in mutation rates.
   _____ (d) It helps to explain absence of transitional fossils.
   _____ (e) It is supported by several lines of hard evidence.

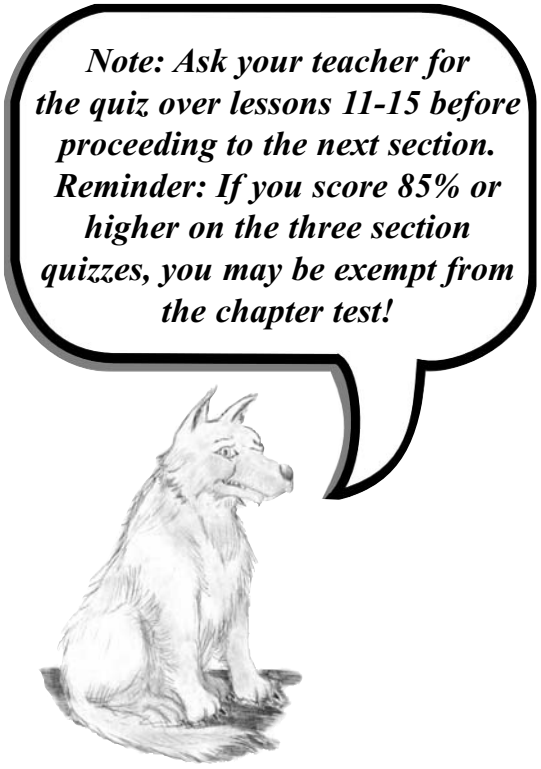
7. The theory that an intelligent force was responsible for the origin of all life forms is called _____.

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8. Scientists have demonstrated conclusively that information does not and cannot arise spontaneously. _____ (a) True or (b) False

9. The bacterial_____ is a microscopic, motor-like appendage that gives bacteria the ability to move from place to place.
(a) receptor (b) flagellum (c) microvillus (d) pilum

10. Write the **Life Principle**: "_____
_____
_____."



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