Principles of Biology Bio103 Final Exam Exam A

1. Examination of the animals that are vertebrates, a group that includes organisms such as humans, birds, and frogs, demonstrates that through evolution, one basic body plan can give rise to organisms with very different features and forms. What is the significance of this?
   a. Vertebrates may all be members of the same species.
   b. Vertebrates may all be producers.
   c. Vertebrates may all share a common ancestor.
   d. Vertebrates are evolutionarily unrelated.

2. Which of the following Kingdoms contains prokaryotic organisms?
   a. Archaea b. Fungi c. Protista d. Plantae

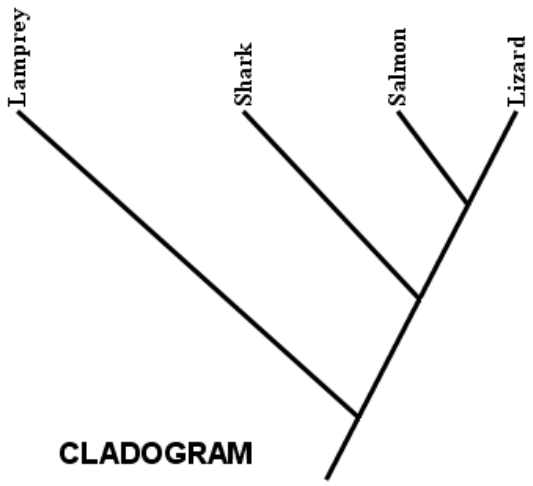
3. Each and every living thing on Earth needs a source of ____ in order to survive.
   a. oxygen and electricity
   b. energy and carbon
   c. carbon dioxide and fat
   d. cells and tissues

4. Lichens are formed by an association between
   a. algae and plants.
   b. fungi and plants.
   c. algae and fungi.
   d. protists and algae.

5. Life on Earth is believed to have begun in the oceans. The first organisms to successfully move from the water to grow on land were probably
   a. bacteria b. fungi c. plants d. animals

6. Based on the cladogram shown to the right, which of the following pairs of organisms would have the greatest number of shared derived features?
   a. Lamprey eels and sharks
   b. Sharks and salmon
   c. Sharks and lizards
   d. Salmon and lizards

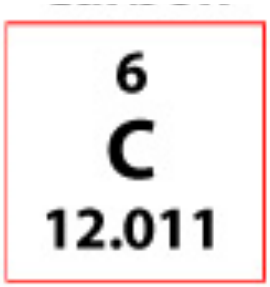
7. Based on the cladogram shown to the right, which organism appeared first in this evolutionary lineage?
   a. Lamprey eel
   b. Shark
   c. Salmon
   d. Lizard



CLADOGRAM

8. The number (6) at the top of the symbol for the element shown to the right is the ___ of this element.
   a. atomic number
   b. mass number
   c. atomic mass
   d. electron configuration

9. An atom of the element whose symbol is shown to the right will have ___ electrons.
   a. 2 b. 6 c. 12 d. 18



10. A solution that has a pH of ___ is a base.
    a. pH 3 b. pH 5 c. pH 7 d. pH 9

11. The difference between organic and inorganic compounds is that organic compounds always contain
    a. iron b. nitrogen c. carbon d. oxygen

Refer to the Periodic Table (shown in part to the right) to answer the next 4 questions.

12. Which of the following elements has a complete valence (outermost) shell filled with electrons?
    a. carbon
    b. oxygen
    c. neon
    d. chlorine

13. Which of the following elements is chemically reactive?
    a. nitrogen
    b. phosphorus
    c. silicon
    d. all of these are chemically reactive

14. An atom of which element has 14 neutrons in its nucleus?
    a. carbon c. phosphorus
    b. sulfur d. silicon

IVA (14)	VA (15)	VIA (16)	VIIA (17)	Helium 2 He 4.003
Carbon 6 C 12.01	Nitrogen 7 N 14.01	Oxygen 8 O 16.00	Fluorine 9 F 19.00	Neon 10 Ne 20.18
Silicon 14 Si 28.09	Phosphorus 15 P 30.97	Sulfur 16 S 32.07	Chlorine 17 Cl 35.45	Argon 18 Ar 39.95

15. Which element is shown as a radioactive isotope?
    a. fluorine b. chlorine c. argon d. Radioactivity can't be determined from this table.

16. Which type of organic molecule contains long chains of nucleotides?
    a. protein b. fatty acids c. amino acids d. nucleic acids

17. In a single molecule of water (H_2O), the atoms of hydrogen and oxygen are joined by ___ bonds.
    a. organic b. ionic c. hydrogen d. covalent

18. With a pH meter, you measure the pH of solution A and find out that it is 6.8. You add a large quantity of a very strong acid to solution A and measure the pH again, and find that the pH didn't change. You can therefore conclude that solution A is a(n)
    a. isotope b. base c. buffer d. electrolyte

19. Monosaccharides are the building blocks of which organic molecule?
    a. proteins b. DNA c. lipids d. carbohydrates

20. Which of the following is something that fatty acids are not involved in?
    a. energy storage c. membrane construction
    b. storage of genetic information d. building blocks of fats

21. The “refined” form of chemical energy needed by all types of cells so that they may carry out cellular activities such as the rotation of flagella or the synthesis of proteins or DNA is
    a. iron b. ATP c. H_2O d. CO_2

22. Enzymes are a type of
    a. protein b. carbohydrate c. nucleic acid d. fatty acid

23. Which of the following is a characteristic that all living things have in common?
    a. Made of a cell or cells.
    b. Have the ability to sense and respond to their environment.
    c. Convert food into energy.
    d. All of these are characteristics of living things.

24. Cell-like structures called nanobes have been observed with an electron microscope, and are thought by some to be the smallest of living things. Which experimental result would support the hypothesis that nanobes are alive?
    a. Nanobes contain DNA.
    b. Nanobes appear to increase in size but have not been observed to reproduce.
    c. Nanobes do not appear to maintain constant internal conditions.
    d. Nanobes can be seen with an electron microscope.

25. The scientific method begins with
    a. experimentation.
    b. generating a hypothesis.
    c. an observation or observations.
    d. facts.

26. Changes in the genetic material that causes groups of organisms to change over time is called
    a. homeostasis. b. evolution. c. metabolism. d. development.

27. Which of the following correctly demonstrates a biological hierarchy?
    a. biome → organ → brain → organism → molecule → cell
    b. cell → molecule → organ → organism → ecosystem → tissue
    c. molecule → cell → tissue → organ → organ system → organism
    d. organism → tissue → cell → ecosystem → community → biome

28. The energy that flows through biological systems originally comes from which “power source?”
    a. organic molecules.
    b. carbon dioxide
    c. the sun, as well as from inorganic chemicals like iron.
    d. National Grid

29. In the evolutionary tree, sexual reproduction first appeared in which group of organisms?
    a. bacteria b. protists c. plants d. humans

30. The two animal lineages that evolved complete body cavities with a mouth at one end and an anal opening at the other are
    a. protostomes and deuterostomes c. algae and protozoa
    b. prokaryotes and eukaryotes d. worms and wolves

31. In a eukaryotic cell, the majority of the organelles are located in the
    a. nucleus b. cell wall c. coelom d. cytoplasm

32. Animal cells and plant cells are similar in that they BOTH have
    a. a nucleus b. centrioles c. chloroplasts d. a cell wall

33. "Worn out" cell parts are broken down for removal from the cell in the
    a. golgi apparatus c. nucleus
    b. endoplasmic reticulum d. lysosomes

34. For a plant cell, the "outermost" layer would be the
    a. cell wall b. cell membrane c. exoskeleton d. cytoskeleton

35. In a eukaryotic cell, the genetic material DNA is located in the
    a. rough endoplasmic reticulum c. nucleus
    b. cytoplasm d. golgi apparatus

36. In a plant or animal cell, the nucleolus is located
    a. in the cytoplasm c. in the nucleoplasm
    b. between the cell wall and cell membrane d. inside of ribosomes

37. You would NOT be able to find mitochondria in which type of cell?
    a. muscle cell b. skin cell c. plant cell d. bacterial cell

38. Chloroplasts
    a. capture energy from the sun and convert it to chemical energy.
    b. are found in plant cells but not animal cells.
    c. convert carbon dioxide and water to sugar molecules and oxygen.
    d. All of the above answers are correct.

39. In a eukaryotic cell, the Golgi apparatus
    a. stores energy in the form of fat.
    b. place chemical address "tags" to proteins and lipids to facilitate delivery to locations within the cell.
    c. synthesizes and delivers proteins to locations within the cell.
    d. breaks down worn out or used cell parts.

40. The nucleus of a eukaryotic cell is surrounded by a membrane made of which chemical?
    a. DNA b. phospholipid c. protein d. polysaccharide

41. You drop some cells into a solution and you observe that the cells swell up and burst. This means that you dropped the cells into a ___ solution.
    a. hypotonic b. isotonic c. hypertonic d. electrolyte

42. Water will move into or out of a cell by ___, depending on which side has a higher concentration of dissolved solutes.
    a. active transport b. diffusion c. translocation d. osmosis

43. Membrane-enclosed compartments in eukaryotic cells are called
    a. proteins b. tissues c. organelles d. organs

44. The export of materials from the inside of the cell to the outside that occurs when vesicles containing the material and the cell membrane merge is called
a. cyclosis b. diffusion c. pinocytosis d. exocytosis

45. A reasonable name for an enzyme that breaks down the amino acid tryptophan would be
a. aminoase b. trypenzyme c. tryptose d. tryptophanase

46. As it applies to biological systems, the second law of thermodynamics indicates that
a. if left unattended, an organized system tends to become more disordered.
b. an input of energy from the environment is needed to maintain order and structural organization.
c. energy not used by cells is released into the surrounding environment as heat.
d. All of the above answers are correct.

47. In biology, a chemical reaction that is catabolic
a. will release energy.
b. will store energy.
c. requires an input of heat.
d. has nothing to do with energy.

48. If you decrease the concentration of enzyme that you use in a chemical reaction, the rate of the reaction will
a. increase. b. decrease c. first increase, then decrease d. remain the same

49. In a chemical reaction catalyzed by an enzyme, the enzyme
a. is converted into the product.
b. is destroyed.
c. does not change and is recycled.
d. becomes the substrate.

50. The location on an enzyme where the substrate binds is called the ___ site.
a. catalytic site b. enzyme c. active d. reaction

51. In a biological system (meaning, a living thing), a metabolic pathway
a. consists of a single chemical reaction.
b. will only occur in mitochondria.
c. is a multi-step sequence of chemical reactions.
d. are reactions that occur without the assistance of enzymes.

52. In a living system, chemical reactions must occur quickly. Therefore, chemical reactions in biology are catalyzed by
a. genes b. metal ions c. enzymes d. fatty acids

53. The general (unbalanced) chemical equation for photosynthesis is:

$$CO_2 + H_2O \longrightarrow \_\_\_\_\_$$

a. $CHO_2 + CO_2$
b. $C_6H_{12}O_6 + H_2O$
c. $C_6H_{12}O_6 + O_2$
d. $CO_2 + H_2$

54. In plants, photosynthesis occurs in
a. the leaves b. the roots. c. flowers. d. cones.

55. In a leaf, the cell layer known as the ___ contains numerous chloroplasts.
a. epidermidis b. stomata c. cuticle d. mesophyll

56. In the “veins” of a leaf, the xylem transports ___, which is necessary for ___ .
    a. phloem; respiration
    b. sugar; photosynthesis
    c. water; photosynthesis
    d. chlorophyll; respiration

57. In the first set of reactions (the light reactions) of photosynthesis, ___ is absorbed by chlorophyll molecules to begin the steps leading to production of ___ .
    a. water; CO_2
    b. radiant energy; ATP
    c. glucose; electricity
    d. oxygen; glucose

58. Heterotrophs, like us, depend on autotrophic organisms, such as plants, because plants produce ___ as a result of photosynthesis.
    a. food and carbon dioxide
    b. oxygen and carbon dioxide
    c. food and oxygen
    d. water and carbon dioxide

59. The light reactions of photosynthesis occur in the ___ which (is)are located in ___ .
    a. inner membranes; mitochondria
    b. cell membrane; cytoplasm
    c. thylakoids; chloroplasts
    d. xylem; leaves

60. Which of the following is required for photosynthesis?
    a. a source of light
    b. thylakoid membranes
    c. chlorophyll molecules
    d. All of the above are required for photosynthesis

61. In all types of cells except bacteria, the biochemical reactions of respiration occur in
    a. the endoplasmic reticulum
    b. ribosomes
    c. mitochondria
    d. the Golgi apparatus

62. Respiration is a(n) ___ pathway of energy metabolism
    a. anabolic b. allosteric c. catabolic d. catastrophic

63. The biochemical process of fermentation may result in the production of
    a. ethanol b. lactic acid c. carbon dioxide d. All of the above may be produced.

64. Rubisco is an enzyme that catalyzes a chemical reaction in which ____ is linked with CO2 in the first step of the Calvin cycle.
    a. H2O b. NADPH c. RuBP d. starch

65. Photosynthesis is a(n) ___ pathway.
    a. anabolic b. analytical c. catabolic d. bipolar

66. Fermentation is considered an anaerobic pathway because
    a. carbon dioxide is given off as a byproduct of the pathway.
    b. energy is given off.
    c. sugar molecules are converted into ATP.
    d. oxygen is not required for this pathway.

67. Which type of cells would you expect to contain the largest number of mitochondria?
    a. red blood cell b. nerve cell c. muscle cell d. bacterial cell

68. $FADH_2$ and NADH are ___ that participate in the transport of electrons from food to oxygen during respiration.
    a. coenzymes b. chlorophylls c. sugars d. enzymes

69. In animal cells, glycolysis occurs in the
    a. mitochondrial inner membrane.
    b. stroma of the mitochondria.
    c. cell membrane
    d. cytoplasm.

70. During the transcription of DNA into a molecule of RNA, the sequence … G A T … in DNA would be transcribed into which RNA sequence?
    a. T A G b. G A U c. C T A d. C U A

71. Messenger RNA
    a. is single stranded
    b. contains codons
    c. is produced during transcription.
    d. All of these are true of mRNA.

72. Which of the following is a "start" codon?
    a. AAA
    b. AUG
    c. CAG
    d. All of these are start codons

73. A "stop" codon
    a. signifies the amino acid methionine.
    b. tells ribosomes when to stop protein synthesis.
    c. tells DNA polymerase to stop the replication process.
    d. is a termination sequence for transcription and ends production of mRNA.

74. The job of a ribosome is to
    a. make an mRNA transcript of DNA.
    b. make an ordered chain of amino acids in translation.
    c. synthesize a new strand of DNA using the old one as a template.
    d. Ribosomes do none of the above.

75. During the synthesis of proteins in an animal cell, the process of transcription occurs in the
    a. cytoplasm.
    b. ribosome.
    c. nucleus.
    d. endoplasmic reticulum.

76. Which cell structure is involved in the translation of an mRNA molecule into protein?
    a. endoplasmic reticulum
    b. nucleus
    c. lysosome
    d. ribosome

77. Replication of a DNA molecule is considered ____ because each of the newly made DNA molecules contains one old strand and one newly made strand.
    a. discontinuous b. redundant c. semi-conservative d. complementary

78. How many amino acids would there be in the protein produced from the mRNA molecule below?

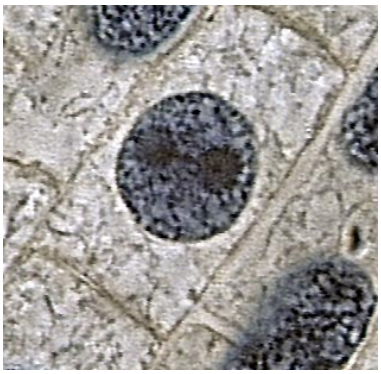
    A U G U C G U U U A G U C U G A A U C A A A C C G G G C G U U A G

    a. 3 b. 4 c. 10 d. 11

79. The plant cell shown to the right is seen in which phase of cell division?
    a. prophase
    b. metaphase
    c. anaphase
    d. telophase

80. Chromosome number ___ during meiosis.
    a. increases b. decreases c. remains the same

81. The X and Y chromosomes in humans are
    a. the largest chromosomes.
    b. identical to one another.
    c. the sex chromosomes.
    d. autosomes.



82. The plant cell shown to the left is seen in which phase of the cell cycle?
    a. interphase
    b. prophase
    c. metaphase
    d. anaphase

83. The nuclear material as seen in the plant cell shown to the left is collectively referred to as
    a. chromatin
    b. chromatid
    c. chromosome
    d. centriole

84. In animals and humans, the gametes (egg and sperm) contain ___ chromosomes as all of the other cells of the body.
    a. twice as many
    b. the same number of
    c. half the number of
    d. one-tenth as many

85. A skin cell in a cat contains a total of 38 chromosomes. How many DNA molecules would therefore be found in the nucleus of the skin cells?
    a. 1 b. 12 c. 19 d. 38

86. DNA replication occurs ___ cellular reproduction.
    a. before b. during c. after

87. Chromosomes can be observed lining up along the middle of a dividing cell during which stage of mitosis?
    a. prophase b. metaphase c. anaphase d. telophase

88. Cytokinesis occurs ____ mitosis.
    a. before b. during c. after

89. Genetic recombination (crossing over) usually occurs during
    a. mitosis b. meiosis c. cytokinesis d. interphase

90. The longest stage in the life of most cells is
    a. interphase b. prophase c. anaphase d. telophase

91 In humans, the allele for brown eye color (B) is dominant to the allele for blue eyes (b). For the eye-color gene, the genotype of a person with brown eyes may be
a. BB b. Bb c. bb d. either a or b

92. An ovum produced by a human female will carry
a. only one X chromosome
b. only one Y chromosome
c. two X chromosomes
d. either an X or a Y chromosome

93. In doodoo birds, feather color is determined by a gene located on one chromosome, and eye color is determined on a gene located on a different chromosome. For this bird, the red feather allele (F) is dominant to yellow feathers (f), and black eye color (E) is dominant to blue eye color (e). A bird that was homozygous recessive for both traits
a. will have red feathers and black eyes.
b. will have yellow feathers and black eyes.
c. will be most numerous among the offspring.
d. will have yellow feathers and blue eyes.

94. Based on the previous question, the genotype for a doodoo bird that has red feathers and black eyes may be
a. FFEE b. FFEe c. FfEe d. All of the above are correct

95. The probability of a homozygous bird with red feathers and black eyes mating with a yellow bird with blue eyes and producing chicks that all show the homozygous recessive phenotype is
a. 100% b. 50% c. 25% d. 0

96. In the grocery store, you notice a new type of pea pod that contains more peas than normal, and that some of the peas appear to be white. You count the peas, and find that there are 60 green peas, and 20 white peas in the pod. Because you understood the Indian corn experiment in lab, you understand that pea color is probably determined by
a. two genes with one allele each
b. one gene with two alleles
c. two separate genes
d. Don't know because you didn't do the Indian corn experiment

97. For the peas described in previous question, which is the dominant trait?
a. green pea color b. white pea color c. they appear to be codominant

98. For the pea plants discussed above, which genetic cross between parent pea plants would result in the phenotypes that you observed in the pea pod?
a. homozygous dominant X homozygous dominant
b. homozygous dominant X homozygous recessive
c. heterozygous X homozygous recessive
d. heterozygous X heterozygous

99. Henry, who has type B blood, marries Mary, who has type A blood. They have four children, and each child has a different blood type; Tom is type O; Linda is type AB, Patti is type A, and Heidi is type B. Henry's genotype must be
a. I^AI^B b. I^Bi c. I^BI^B d. I^Ai

100. In humans, color blindness is a sex-linked trait. Jerry is a color-blind man who is dating April who has normal vision, but she knows that her father was color-blind. Jerry and April are planning to get married, and want to find out the probability of their children being color-blind. What is the probability that Jerry and April would have a color-blind child (of either gender)?
a. 100% b. 75% c. 50% d. 25%