

NJSL Biology I Exam Jan 2013

Choose the answer that best completes the statements or questions below and fill in the appropriate response on the scan-tron. If you change your answer be sure to completely erase your first choice, please **PRINT** your name, **school, area**, and **which test** you are taking onto the scan-tron.

- 1) Oparin believed that macromolecules, such as proteins, first appeared
 - A. in volcanoes.
 - B. in the caves
 - C. in water.
 - D. on iron pyrite and clay.

- 2) In their experiment, Miller and Urey produced
 - A. energy
 - B. microorganisms.
 - C. radioactive isotopes.
 - D. amino acids.

- 3) The English physician Ronald Ross wanted to try to find the cause of malaria. Based on his observations, Dr. Ross suggested that the *Anopheles* mosquito might spread malaria from person to person. This suggestion was a
 - A. prediction.
 - B. hypothesis.
 - C. theory.
 - D. scientific "truth."

- 4) A unifying explanation for a broad range of observations is a
 - A. hypothesis.
 - B. theory.
 - C. prediction.
 - D. controlled experiment.

- 5) Ribosomes are not visible under a light microscope, but they can be seen with an electron microscope because
 - A. electron beams have more energy than light beams.
 - B. electron microscopes focus light with magnets.
 - C. electron microscopes have more resolving power than light microscopes.
 - D. electrons have such high energy that they pass through biological samples.

- 6) Which of the following organelles were probably once independent prokaryote organisms?
 - A. Mitochondria and lysosomes
 - B. Mitochondria and chloroplasts
 - C. Chloroplasts and Golgi apparatus
 - D. Ribosomes and lysosomes

- 7) A light microscope that has an objective lens of 40 × and an ocular lens of 10 × has a magnification of
 - A. 30 ×.
 - B. 400 ×.
 - C. 300 ×.
 - D. 2000 ×.

- 8) Electron microscopes can reveal details
 - A. only in specimens that are still alive.
 - B. about the different colors of cell structures.
 - C. of cell structures only once they are stained.
 - D. 1000 times smaller than those visible in light microscopes.

9) What is the SI unit for temperature?

- A. Fahrenheit
- B. Centigrade
- C. Kelvin
- D. Joules

10) The part of the atom that determines how the atom behaves chemically is the

- A. proton.
- B. electron.
- C. neutron.
- D. innermost shell.

11) Phosphorus has an atomic number of 15 and an atomic weight of 30.974. How many neutrons does phosphorus have?

- A. 5
- B. 16
- C. 30
- D. 15

12) Polar molecules

- A. have bonds with an unequal distribution of electric charge.
- B. must be ions.
- C. have bonds with an equal distribution of electrical charge.
- D. have bonds with an overall negative charge.

13) Which property of water contributes most to the ability of fish in lakes to survive very cold winters?

- A. It is cohesive.
- B. It has a high heat capacity.
- C. Frozen water is denser than liquid water.
- D. Frozen water is less dense than liquid water.

14) The three most abundant elements in a human skin cell are

- A. calcium, carbon, and oxygen.
- B. carbon, hydrogen, and oxygen.
- C. carbon, hydrogen, and sodium.
- D. carbon, nitrogen, and potassium.

15) Which characteristic of water contributes to the relatively constant temperatures of the oceans?

- A. Water ionizes only slightly.
- B. It takes a small amount of heat energy to raise the temperature of water.
- C. Water can contain large amounts of salt.
- D. It takes a large amount of heat energy to raise the temperature of water.

16) Surface tension and capillary action occur in water because it

- A. is wet.
- B. is dense.
- C. has hydrogen bonds.
- D. has ionic bonds.

- 17) Atoms that have gained energy
- A. have protons and neutrons that move farther apart.
 - B. lose neutrons from the nucleus.
 - C. have electrons that move to higher energy levels.
 - D. absorb electrons into the nucleus.
- 18) Because carbon has four electrons in its outer energy level,
- A. it can form bonds with carbon atoms only.
 - B. these atoms are naturally chemically stable.
 - C. it can react with up to four other atoms to form covalent bonds.
 - D. it cannot react with anything other than organic molecules.
- 19) Which of the following statements most accurately describes the difference between an ionic bond and a covalent bond?
- A. Atoms held together by ionic bonds separate when placed in water, while atoms held together by covalent bonds do not separate in water.
 - B. Ionic bonds hold together atoms of two different types, while covalent bonds hold together atoms of the same type.
 - C. Electrons are exchanged between atoms held together by an ionic bond, but they are shared between atoms held together by a covalent bond.
 - D. Ionic bonds form between atoms that carry opposite charges, while covalent bonds form between uncharged atoms.
- 20) The most common elements making up biomolecules are
- A. Carbon, Hydrogen, Oxygen
 - B. Carbon, Hydrogen, Nitrogen
 - C. Carbon, Hydrogen, Nitrogen, Phosphorous, Oxygen
 - D. Carbon, Hydrogen, Nitrogen Phosphorous, Sulfur, Oxygen
- 21) Polymerization reactions in which polysaccharides are synthesized from monosaccharides
- A. require the formation of phosphodiester bonds between the amino acids.
 - B. occur in the nucleus of the cell.
 - C. are hydrolysis reactions.
 - D. result in the formation of water.
- 22) Which of the following is characteristic of proteins?
- A. They are insoluble in water.
 - B. Some function as enzymes.
 - C. They possess glycosidic linkages between amino acids.
 - D. They are the structural units of glycogen.

23) The atoms that make up carbohydrates are

- A. C, H, and N.
- B. C and H.
- C. C, H, and P.
- D. C, H, and O.

24) Lactose, or milk sugar, is composed of one glucose unit and one galactose unit. It can be classified as a

- A. disaccharide.
- B. hexose.
- C. pentose.
- D. polysaccharide.

25) DNA and RNA contain

- A. pentoses.
- B. hexoses.
- C. fructoses.
- D. maltoses.

26) A molecule that has an important role in long-term storage of energy is

- A. a steroid.
- B. RNA.
- C. glycogen.
- D. an amino acid.

27) Cellulose is the most abundant organic compound on Earth. Its main function is

- A. to store genetic information.
- B. to provide mechanical strength to plant cell walls.
- C. as a storage compound for energy in plant cells.
- D. as a component of biological membranes.

28) Carbon atoms can bond together to form all of the following *except*

- A. ring structures.
- B. straight chain structures.
- C. inorganic structures.
- D. branched structures.

29) Which of the following characteristics of living things best explains why some North American birds fly south for the winter?

- A. Living things respond to their environment.
- B. Living things maintain internal balance.
- C. Living things are made up of units called cells.
- D. Living things are based on a universal genetic code.

30) Polar molecules such as water have

- A. no negative or positive poles.
- B. both negative and positive poles.
- C. only a negative pole.
- D. only a positive pole.

31) Buffers

- A. are of relatively little importance in living things.
- B. are formed when a large number of hydroxide ions are released in a solution.
- C. are formed when a large number of hydronium ions are released in a solution.
- D. tend to prevent great fluctuations in pH.

- 32) Gloria, based on her observation of mold growing on bread in her refrigerator, suggests that the presence of water could accelerate the growth of bread mold. This is
- A. a conclusion.
 - B. a hypothesis.
 - C. an experiment.
 - D. an analysis.

- 33) How does sharing ideas through peer-reviewed articles help advance science?
- A. Peer-reviewed articles are published only when most scientists have accepted the ideas they contain.
 - B. Experiments in peer-reviewed articles do not need to be repeated.
 - C. Scientists reading the articles may come up with new questions to study.
 - D. Ideas in the articles always support and strengthen dominant theories.

- 34) A scientist discovers an important breakthrough in cancer treatment. The scientist thinks the information could save thousands of lives and immediately announces the results on national television, skipping peer review. How might other scientists react to this news?
- A. They will be skeptical because the report was not peer-reviewed.
 - B. They will quickly start to use the new treatment on their patients.
 - C. They will congratulate the scientist for the discovery.
 - D. They will denounce the work and call the scientist a fraud.

- 35) Saturated fatty acids contain
- A. carbon atoms that are each bonded to four other atoms.
 - B. carbon atoms linked by double bonds.
 - C. no carboxyl ($-\text{COOH}$) groups.
 - D. more than 100 carbon atoms.

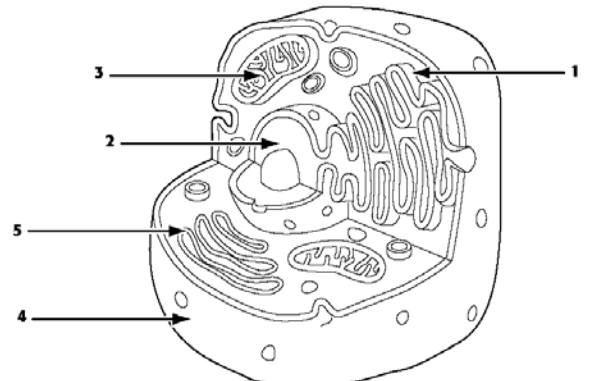
- 36) A phospholipid molecule is composed of all of the following **except**
- A. two fatty acids.
 - B. three fatty acids.
 - C. a phosphate group.
 - D. glycerol.

- 37) Which of the following is a carbohydrate?
- A. DNA
 - B. insulin
 - C. wax
 - D. cellulose

- 38) All of the following are functional groups *except*
- A. a hydroxyl group.
 - B. an amino group.
 - C. a carboxyl group.
 - D. a carbonate group.

- 39) Animals store glucose in the form of
- A. cellulose.
 - B. glycogen.
 - C. wax.
 - D. lipids.

- 40) Refer to the illustration to the side. Structure 1 is
- A. the endoplasmic reticulum.
 - B. a Golgi apparatus.
 - C. a mitochondrion.
 - D. the nucleus.

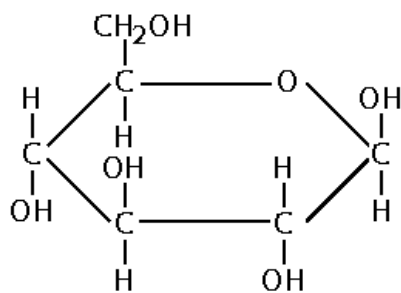


41) A scientist noticed that in acidic pond water some salamanders developed with curved spines. This was a(n)

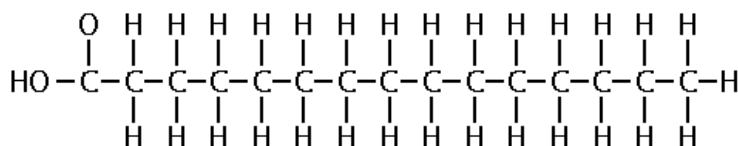
- A. hypothesis.
- B. observation.
- C. theory.
- D. control.

42) Changing the course or pathway of a chemical reaction so that it requires less activation energy

- A. is a violation of the laws of nature.
- B. requires higher temperatures than those found within cells.
- C. occurs only when reactants are quickly added to the reaction mixture.
- D. is accomplished by the action of catalysts on reactants.



Molecule 1



Molecule 2

43) Refer to the illustration above. Molecules like molecule 2 are found in

- A. carbohydrates.
- B. lipids.
- C. nucleic acids.
- D. proteins.

44) Energy is released when the bond between

- A. carbon atoms in ATP is broken.
- B. ribose and adenine in ATP is broken.
- C. phosphate groups in ATP is broken.
- D. two ATP molecules is broken.

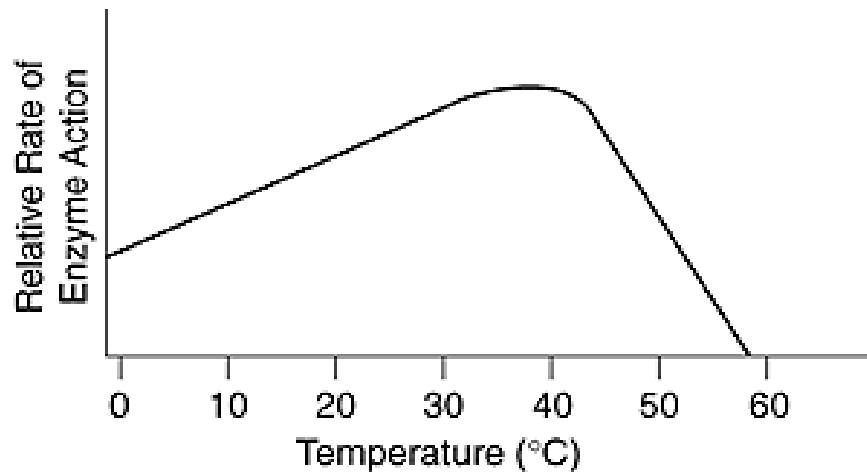
45) Which of the following enzymes would digest a fat?

- A. sucrase
- B. fatase
- C. protease
- D. lipase

46) A certain enzyme will hydrolyze egg white but not starch. Which statement best explains this observation?

- A. Starch molecules are too large to be hydrolyzed.
- B. Enzyme molecules are specific in their actions.
- C. Egg white acts as a coenzyme for hydrolysis.
- D. Starch is composed of amino acids.

47) The effect of temperature on the relative rate of action of an enzyme is represented in the graph below.



The optimum temperature for the action of this enzyme is approximately

- A. 15 °C
- B. 22 °C
- C. 37 °C
- D. 50 °C

48) The molecules that are acted on by an enzyme are called

- A. products.
- B. substrates.
- C. carriers.
- D. prosthetics

49) Which of the following is an enzyme?

- A. Manganese dioxide
- B. Hemoglobin
- C. Catalase
- D. Hydrogen peroxide

50) A single organism may contain

- A. thousands of different enzymes, each one specific to a different chemical reaction.
- B. one enzyme that plays a role in thousands of different chemical reactions.
- C. approximately 100 kinds of enzymes, each one specific to a different chemical reaction.
- D. one enzyme that is specific to photosynthesis and one enzyme that is specific to cellular respiration.

51) As a result of diffusion, the concentration of many types of substances to which the membrane is permeable

- A. always remains greater inside a membrane.
- B. eventually becomes balanced on both sides of a membrane.
- C. always remains greater on the outside of a membrane.
- D. becomes imbalanced on both sides of a membrane.

52) Without enzymes, many chemical reactions in the body would

- A. happen too fast.
- B. occur at much the same rate as they do with enzymes.

- C. require a different pH.
- D. occur too slowly to support life processes.

53) Functions of the smooth endoplasmic reticulum include

- A. modification of proteins.
- B. chemical modification of foreign molecules, including drugs.
- C. lipid biosynthesis.
- D. all of the above

54) An organelle with an internal cross-section showing a characteristic "9 + 2" morphology of microtubules is the

- A. mitochondrion.
- B. cytoskeleton.
- C. Golgi apparatus.
- D. flagellu

55) Which organelle does not have one or more membrane(s)?

- A. Ribosome
- B. Chloroplast
- C. Mitochondrion
- D. Vacuole.

56) Lysosomes

- A. are derived from the endoplasmic reticulum.
- B. are derived from the Golgi apparatus.
- C. contain digestive enzymes.
- D. Both b and c.

57) The plasma membrane of animals contains carbohydrates

- A. on the inner side of the membrane, facing the cytosol.
- B. on the outer side of the membrane, protruding into the environment.
- C. on both sides of the membrane.
- D. within the membrane.

58) When a hormone molecule binds to a specific protein on the plasma membrane, the protein it binds to is called a

- A. ligand.
- B. clathrin.
- C. receptor protein.
- D. hydrophobic protein.

59) A protein that forms an ion channel through a membrane is most likely to be

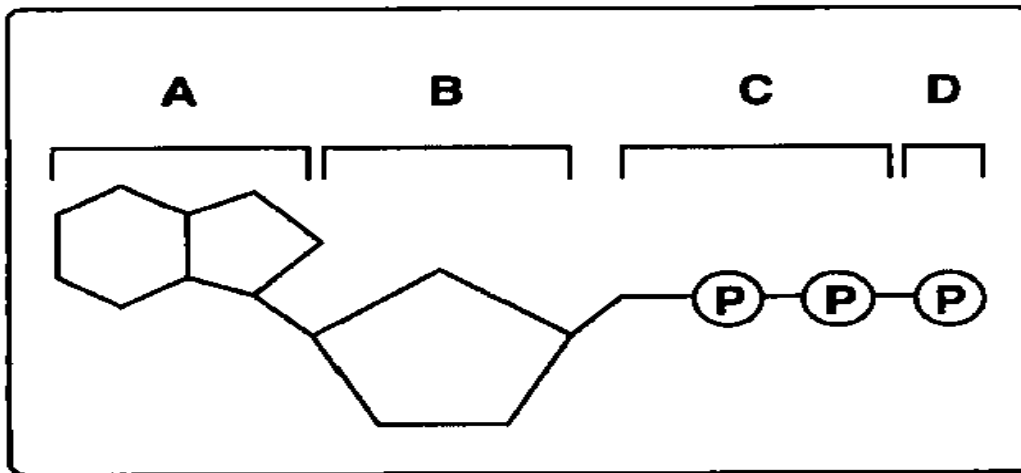
- A. a peripheral protein.
- B. a transmembrane protein.
- C. a phospholipid.
- D. an enzyme

60) Compared with fermentation, the aerobic pathways of glucose metabolism produce

- A. more ATP.

- B. pyruvate.
- C. fewer protons for pumping in mitochondria.
- D. less CO₂.

61) Answer the following question using the figure to the side.



All of the following are parts of an ADP molecule EXCEPT

- A. structure A.
 - B. structure B.
 - C. structure C.
 - D. structure D.
- 62) A particularly active cell might contain large numbers of
- A. chromosomes.
 - B. vacuoles.
 - C. mitochondria.
 - D. walls.
- 63) One important organelle that helps maintain homeostasis by moving supplies from one part of the cell to the other is the
- A. endoplasmic reticulum.
 - B. mitochondrion.
 - C. nucleus.
 - D. cytoplasm.
- 64) Compared to animal cells, plant cells
- A. do not contain mitochondria.
 - B. have a cell wall instead of a plasma membrane.
 - C. have a large central vacuole instead of a Golgi apparatus.
 - D. have chloroplasts and a cell wall.
- 65) Surface area is an important factor in limiting cell growth because
- A. the cell can burst if the membrane becomes too large.
 - B. materials cannot enter the cell if the surface is too large.
 - C. the cell may become too large to take in enough food and to remove enough wastes.
 - D. waste products cannot leave the cell if the cell is too small.
- 66) Studying a picture of a cell taken with an electron microscope, you find that the cell has no nucleus and no mitochondria, but it does have a plasma membrane and a cell wall. You conclude that the cell is probably from a(n)
- A. animal.
 - B. plant.
 - C. prokaryote.
 - D. extinct organism.

67) Numerous hairlike organelles that protrude from the surface of a cell and are packed in tight rows are called

- A. flagella.
- B. microtubules.
- C. actin filaments.
- D. cilia.

68) The packaging and distribution center of the cell is the

- A. nucleus.
- B. Golgi apparatus.
- C. central vacuole.
- D. nuclear envelope.

69) How are chloroplasts like mitochondria?

- A. They can both use energy from sunlight.
- B. They look alike.
- C. They both contain DNA.
- D. They are both found in animal cells.

70) Which statement about osmosis is not true?

- A. It obeys the laws of diffusion.
- B. In animal tissues, water moves into cells if they are hypertonic to their environment.
- C. Red blood cells must be kept in a plasma that is hypotonic to the cells.
- D. Two cells with identical solute concentrations are isotonic to each other.

71) Which of the following molecules would most likely diffuse across a phospholipid bilayer fastest? Assume that there are no proteins associated with the bilayer. (Hint: keep in mind the nature of the interior of the bilayer).

- A. Water
- B. NH_4^+
- C. CH_3COO^-
- D. NH_3

72) Which of the following is *not* characteristic of facilitated diffusion?

- A. It requires a carrier protein.
- B. It moves substances against a concentration gradient.
- C. It requires no energy input.
- D. It involves a change in the shape of its carrier.

73) The sodium-potassium pump usually pumps

- A. potassium out of the cell.
- B. sodium into the cell.
- C. potassium into the cell.
- D. only a potassium and sugar molecule together.

74) Based on the large numbers of offspring produced by many organisms, Darwin proposed that mortality was high and only a few individuals survived to reproduce. He called the differential reproductive success of individuals with particular variations

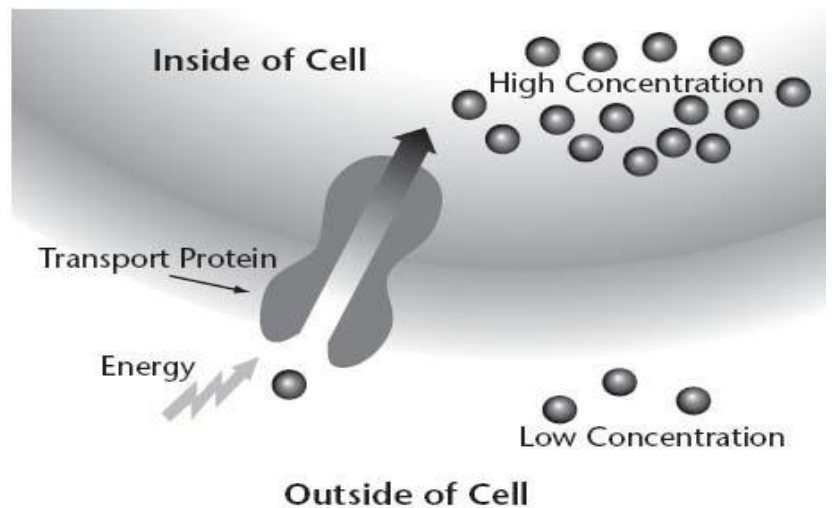
- A. evolution.
- B. artificial selection.
- C. inheritance of acquired characteristics.
- D. natural selection.

75) Which of the following is the most fit in an evolutionary sense?

- A. A lion that is successful at capturing prey but has no cubs.
- B. A lion that has many cubs, eight of which live to adulthood.
- C. A lion that overcomes a disease and lives to have three cubs.
- D. A lion that cares for his cubs, two of who live to adulthood.

76) Charles Darwin

- A. was the first to realize fossils are remains of ancient organism.
- B. believed that organisms could pass on acquired changes to offspring.
- C. proposed natural selections as the mechanism of evolution.
- D. was the first person to realize that organism can evolve.



77) When living cells break down molecules, energy is

- A. stored as ADP.
- B. stored as ATP.
- C. released as heat.
- D. Both b and c

78) Which means of particle transport is shown in the illustration to the side?

- A. diffusion
- B. active transport
- C. osmosis
- D. facilitated diffusion

79) Pyruvate oxidation generates

- A. acetate.
- B. $\text{NADH} + \text{H}^+$ from NAD^+ .
- C. a capture of energy.
- D. All of the above

80) Glycolysis

- A. is the conversion of glucose to two molecules of pyruvate.
- B. is an exergonic reaction.
- C. uses ATP in its initial steps.
- D. All of the above

**New Jersey Science League
Biology 1 Answer Key
Date: January 2013**

| | | | | |
|------|------|------|------|------|
| 1 C | 17 C | 33 C | 49 C | 65 C |
| 2 D | 18 C | 34 A | 50 A | 66 C |
| 3 B | 19 C | 35 A | 51 B | 67 D |
| 4 B | 20 D | 36 B | 52 D | 68 B |
| 5 C | 21 D | 37 D | 53 D | 69 C |
| 6 B | 22 B | 38 D | 54 D | 70 C |
| 7 B | 23 D | 39 B | 55 A | 71 D |
| 8 D | 24 A | 40 A | 56 D | 72 B |
| 9 C | 25 A | 41 B | 57 B | 73 C |
| 10 B | 26 C | 42 D | 58 C | 74 D |
| 11 B | 27 B | 43 B | 59 B | 75 B |
| 12 A | 28 C | 44 C | 60 A | 76 C |
| 13 D | 29 A | 45 D | 61 D | 77 D |
| 14 B | 30 B | 46 B | 62 C | 78 D |
| 15 D | 31 D | 47 C | 63 A | 79 B |
| 16 C | 32 B | 48 B | 64 D | 80 D |

NJ Science League – February 2013 – Biology 1 exam

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1. The structural feature that allows the DNA to replicate itself is the
 - a. a. sugar-phosphate backbone
 - b. b. complementary pairing of the bases
 - c. c. phosphodiester bonding of the helices
 - d. d. twisting of the molecule to form an alpha helix
 - e. e. three part structure of the nucleotides

2. What do both mitochondria and chloroplasts have in common?
 - a. ATP is produced
 - b. DNA is present
 - c. Ribosomes are present
 - d. Only b and c are correct
 - e. a,b and c are correct

3. Where is ATP synthase located in a plant cell?
 - a. thylakoid membrane
 - b. inner mitochondrial membrane
 - c. plasma membrane
 - d. a and b are correct
 - e. a, b and c are correct

4. If cells in the process of dividing are subjected to colchicine, a drug that interferes with the functioning of the spindle apparatus, at which stage will mitosis be arrested?
 - a. anaphase
 - b. prophase
 - c. telophase
 - d. metaphase
 - e. interphase

5. Hemophilia is due to a recessive allele on the X chromosome. What is the probable ratio of offspring from a cross between parents who have normal clotting, but the mother is a carrier.
 - a. 1 normal daughter : 1 carrier daughter : 1 normal son : 1 hemophiliac son
 - b. 2 carrier daughters : 1 normal son : 1 hemophiliac son
 - c. 2 normal daughters : 1 normal son : 1 carrier son
 - d. 1 normal daughter : 1 carrier daughter : 1 normal son : 1 carrier son
 - e. 1 normal daughter : 1 carrier daughter : 1 carrier son : 1 hemophiliac son

6. In the case described in number 5 above, why are female hemophiliacs rare?
 - a. They die when they are born
 - b. Hemophilia cannot be expressed in females
 - c. Both parents must be have the allele
 - d. All of the above

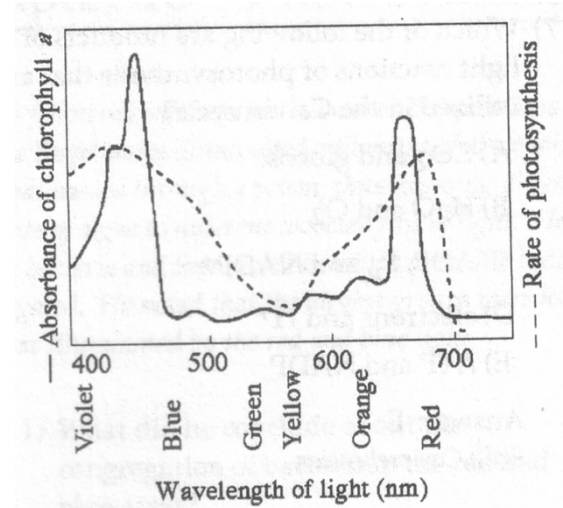
7. Which of the following refers to the class of enzymes involved in triggering events in the cell cycle?
- a. proteases
 - b. transferases
 - c. kinases
 - d. nucleases
 - e. synapses
8. Which of the following illustrates why meiosis is so important?
- a. It is important for sexual reproduction
 - b. It important because the genetic material is copied
 - c. It is important for creating diversity upon which natural selection operates
 - d. a and c are correct
 - e. a, b and c are correct
9. Which of the following is NOT true of HIV, the virus that causes AIDS?
- a. it is a retrovirus
 - b. it is a DNA virus
 - c. it incorporates viral DNA into the host cell's genome
 - d. it attacks helper T cells
10. In the Central Dogma, the major role of RNA is to
- a. transmit genetic information to offspring
 - b. function in the synthesis of proteins
 - c. make a copy of itself, thus insuring genetic continuity
 - d. act as a pattern to form DNA
 - e. form the genes of an organism
11. Some bacteria are resistant to the antibiotic Penicillin. This may be because
- a. penicillin cannot pass through the cell walls of gram positive bacteria
 - b. some bacteria can swim away from the antibiotic
 - c. some bacteria can reproduce sexually
 - d. the bacteria make an enzyme to digest penicillin
 - e. Both b and d
12. Most molecular biologists believe that viruses originated from fragments of cellular nucleic acid. Which of the following observations supports this theory?
- a. Viruses contain either DNA or RNA
 - b. Viruses are enclosed in protein capsids rather than plasma membranes
 - c. Viruses can reproduce only inside host cells
 - d. Viruses can infect both prokaryotic and eukaryotic cells
 - e. Viral genomes are usually more similar to the genome of the host cell than to the genome of other cells

13. What is the most important missing evidence or observation in Darwin's theory of 1859?
- the source of genetic variation
 - evidence of the overproduction of offspring
 - observation that variation is common in populations
 - evidence that some organisms became extinct
 - observation that competition exists in populations

Use the following graph to answer question 14.

14. The graph to the right is plotted from an experiment and shows the absorption spectrum for chlorophyll *a* and the action spectrum for photosynthesis. Which of the following explain why they are different?

- Anaerobic bacteria may have interfered with the light absorption
- Yellow and green wavelengths inhibit the absorption of blue and red wavelengths
- Other pigments absorb light besides chlorophyll *a*
- Sunlight that is too bright can destroy photosynthetic pigment
- An error must have occurred in this experiment

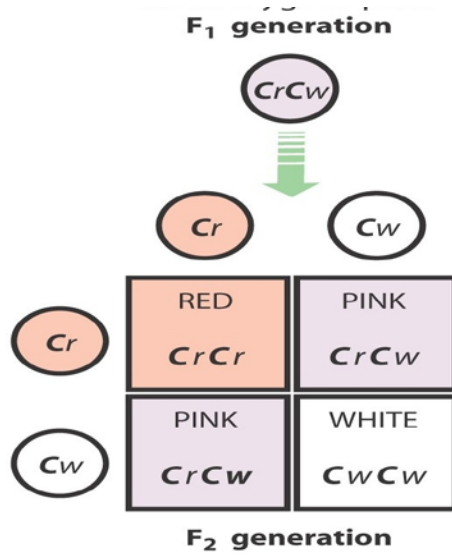


15. Which is/are true of HPV, the Human Papilloma Virus?

- can be spread by sex
- causes irregular cell growth
- can cause cancer
- a and b are true
- a, b and c are true

Use the following information and diagram to answer question 16.

A homozygous red flower ($CrCr$) was crossed with a homozygous white flower, and the resultant F_1 generation was heterozygous pink ($CrCw$). Crossing the F_1 generation showed the following results:



16. What pattern of inheritance is illustrated in the above diagram?

- a. Codominance b. Incomplete Dominance c. Polymorphism d. Sex-linked

17. Which metabolic process is common to both aerobic cellular respiration and alcoholic fermentation?

- a. Krebs cycle b. Glycolysis c. Electron Transport Chain
d. Conversion of pyruvic acid to acetyl CoA e. Production of a proton gradient

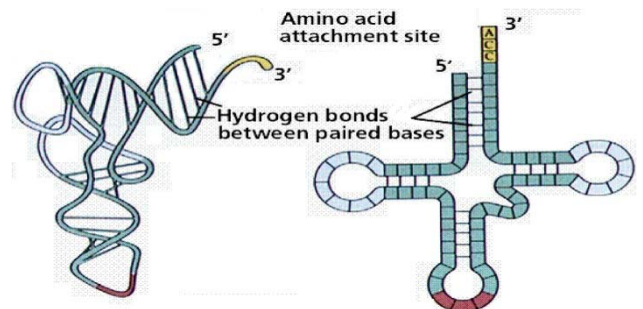
18. Reproduction in bacteria requires

- a. the production of a mitotic spindle b. a plasmid c. cyclic AMP
d. replication of DNA e. both B and D

Use the following image to answer number 19.

19. The diagram shows models of

- a. DNA b. mRNA
c. tRNA d. rRNA



20. To what organelle does the above structure carry the amino acid?

- a. nucleus b. chloroplast c. ribosome d. mitochondria e. nucleolus

Use the following choices to answer numbers 21-23.

- a. Thomas Malthus b. Alfred Wallace c. Carolus Linnaeus
d. Charles Lyell e. Jean Baptiste Lamarck

21. The naturalist who synthesized a concept of natural selection independently of Darwin

22. From whom did Darwin get the concept of the Earth's ancient age?

23. The idea of improving the intelligence of an adult through education will result in that adult's descendants being born with a greater native intelligence is an idea consistent with whose philosophy?

24. A cell containing 92 chromatids at metaphase of mitosis would, at its completion, produce two nuclei containing how many chromosomes?

- a. 12 b. 16 c. 23 d. 46 e. 92

25. During which of the following phases is genetic material duplicated?

- a. the mitotic phase b. G₁ c. the S phase d. G₂ e. mitosis

26. In animals, _____ cells result from mitosis and _____ cells result from meiosis.

- a. gametes, zygotes b. Gametes, somatic c. somatic, zygotes d. somatic, gametes

27. Crossing over occurs during which phase of meiosis?

- a. prophase I b. anaphase I c. telophase I d. prophase II e. metaphase II

28. Which of the following is NOT a protein?

- a. hemoglobin b. cholesterol c. an antibody d. an enzyme e. insulin

29. Which of the following is a characteristic of all viruses?

- a. nucleic acid genome b. a protein capsid c. glycoprotein cell wall
d. A and B only e. A,B and C

30. All of the following diseases are caused by bacteria **except**

- a. plague b. yellow fever c. typhus d. cholera e. tuberculosis

31. A phage is

- a. a virus that infects bacteria d. lysed bacterium
b. virus-infected bacterium e. viral genome
c. protein shell enclosing a viral genome

32. Which of the following information transfers is catalyzed by reverse transcriptase?

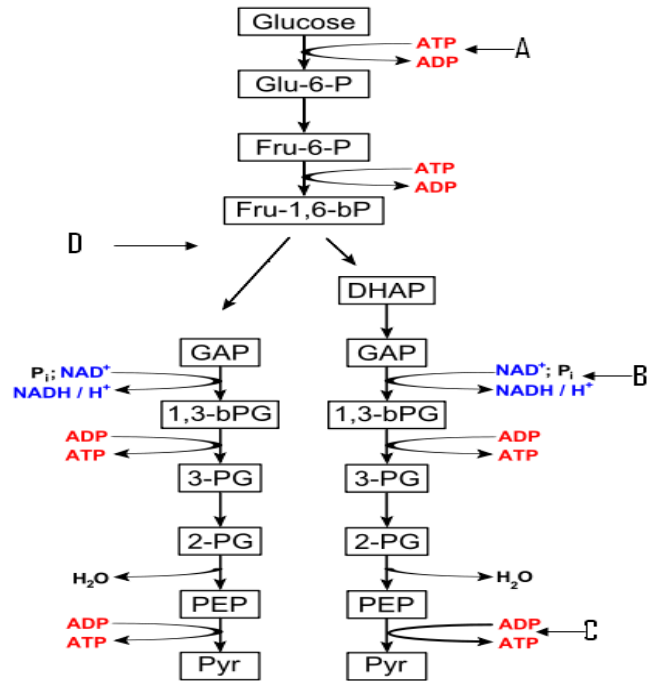
- a. RNA→ RNA b. DNA→ RNA c. RNA →DNA
d. Protein→ DNA e. RNA→ protein

33. RNA polymerase binds to the

- a. enhancer b. promoter c. operon d. silencer e. activator

Use the following diagram to answer questions 34-37.

34. What process is illustrated in the diagram?
 a. photosynthesis b. electron transport chain
 c. glycolysis d. Krebs cycle
35. Where does the process occur?
 a. mitochondria b. cytosol
 c. chloroplast d. nucleus
 e. endoplasmic reticulum
36. In which labeled reaction is an inorganic phosphate added to the reactant?
 a. A b. B c. C d. D
37. In which reaction is a net gain of ATP finally realized from the process?
 a. A b. B c. C d. D

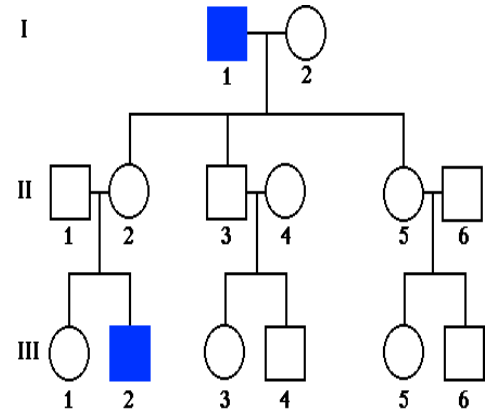


38. Most of the energy that enters the electron transport enters as
 a. ATP b. acetyl coA c. glucose d. CO₂ e. FADH₂ and NADH₂
39. Which of the following are products of the light reactions of photosynthesis that are utilized in the Calvin Cycle?
 a. CO₂ and glucose b. H₂O and O₂ c. ADP, P_i, and NADP⁺ d. ATP and NADPH
40. Which of the following is NOT true of Mitosis?
 a. Daughter nuclei are genetically identical to the parent nucleus
 b. Homologous chromosomes synapse in prophase
 c. The centromeres divide at the onset of anaphase
 d. A single nucleus gives rise to two identical daughter nuclei
41. The Calvin cycle requires all of the following molecules except
 a. CO₂ b. ATP c. RuBp d. glucose e. NADPH
42. Cyclic electron flow in the chloroplast produces
 a. ATP b. NADPH c. glucose d. A and B e. A, B and C
43. Foods inadequately heated during the canning process
 a. may produce high growth of symbionts.
 b. may produce a sterilized environment.
 c. are likely to have a lower bacterial spore count than those that are thoroughly heated.
 d. may allow the growth of *Clostridium botulinum* and the production of botulinum toxins.

44. Cyanobacteria are note-worthy in the history of life on planet Earth because

- a. they were the first organisms to carry out metabolic reactions similar to photosynthesis in modern plants
- b. they are the absolute oldest bacteria specimens ever found dating to 2.5 billion years old
- c. they utilized the abundant amount of oxygen gas that existed in the early Earth's atmosphere and oceans
- d. they formed the base of a complex food web 2.5 billion years ago consisting of plants, animals, protists and fungi

Use the following pedigree diagram to answer questions 45-46.



Pedigree 7. X-linked recessive inheritance.

45. If the pedigree represents a family with colorblindness caused by a recessive allele on the X chromosome, which female is least likely to be a heterozygote for the rare x-linked recessive gene?

- a. III-1 b. III-3 c. III-4
- d. III-5 e. III-6

46. Which of the following individuals are carriers for colorblindness?

- a. I-2 b. II -1 c. II-2
- d. II-4 e. II-6

47. Which of the following is a correct statement about mutations?

- a. They drive evolution by creating mutation pressures.
- b. They are irreversible.
- c. They are a source of variation for evolution.
- d. They occur in germ cells but not in somatic cells.
- e. They are most often beneficial to the organisms in which they occur.

48. A part of an mRNA molecule with the following sequence is being read by a ribosome:

5' GGC-ACG 3'(mRNA). The following activated transfer molecules are available. Two of them can correctly match the mRNA so that a dipeptide can form.

| tRNA Anticodon | Amino Acid |
|----------------|------------|
| GGC | Proline |
| CGU | Alanine |
| UGC | Threonine |
| CCG | Glycine |
| ACG | Cysteine |
| CGG | Alanine |

The dipeptide that will form will be

- a. cysteine-alanine b. proline-Cysteine c. glycine-threonine d. alanine-alanine
e. threonine-glycine

49. By convention, the sequence of bases in a nucleic acid is usually expressed in the _____ direction.

- a. 3' to 1' b. 3' to 5' c. 1' to 3' d. 5' to 3' e. 1' to 5'

50. Since the first nucleotides cannot be linked in a newly synthesized strand in DNA replication, _____ is required.

- a. a DNA primer b. DNA polymerase c. helicase d. ligase e. an RNA primer

51. Okazaki fragments are used to elongate

- a. the leading strand toward the replication fork
b. the lagging strand toward the replication fork
c. both the strands in both directions
d. the leading strand away from the replication fork
e. the lagging strand away from the replication fork

52. In replication of DNA, the helix is opened and untwisted by

- a. ligase b. helicase c. ribase d. deoxase e. polymerase

53. Which organelle contains enzymes that modify proteins and lipids?

- a. lysosomes
- b. peroxisomes
- c. golgi apparatus
- d. mitochondria
- e. rough endoplasmic reticulum

54. For which of the following is a vacuole in a plant cell responsible?

- a. added support to the cell
- b. stores water, sugar
- c. stores toxic substances
- d. stores pigments
- e. all of the above

55. A metabolic disorder involving a missing or inactive enzyme is found in the ____ made by the ____.

- a. golgi apparatus, endoplasmic reticulum
- b. ribosomes, nucleolus
- c. lysosomes, golgi apparatus
- d. rough endoplasmic reticulum, nuclear envelope
- e. mitochondria, plasma membrane

56. Sexual reproduction involves the alternation of

- a. mitosis and oogamy
- b. isogamy and meiosis
- c. meiosis and fertilization
- d. mitosis and heterogamy

57. The evolution of sexual reproduction may have occurred based on the following except

- a. as a means to keep animals within a population in close proximity
- b. as a means to correct damage to the double strands of the DNA
- c. through independent assortment, offspring have new combinations of genes that can be beneficial
- d. through crossing over, there is an unlimited amount of genetic variability in the population

58. Mendel's law of segregation was substantiated by a general understanding of

- a. dominance
- b. meiosis
- c. mitosis
- d. pleiotropy
- e. epistasis

59. What was the most significant result Gregor Mendel drew from his experiments with pea plants ?

- a. There is considerable genetic variation in garden peas.
- b. Traits are inherited in discrete units, and are not the results of "blending."
- c. Recessive genes occur more frequently in the F₁ than do dominant ones.
- d. Genes are composed of DNA.

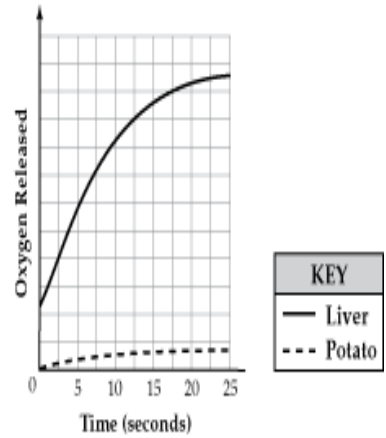
60. Advantages to using the garden pea for Mendel's experiments included all listed below except

- a. true-breeding varieties were scarce
- b. he could expect to observe segregation of traits among the offspring.
- c. they have relatively short generation time.
- d. sex organs of the pea are enclosed within the flower.

61. Which structure is the outermost component of a bacterium?

- a. cell wall b. nucleoid region c. capsule d. ribosome
- e. plasma membrane

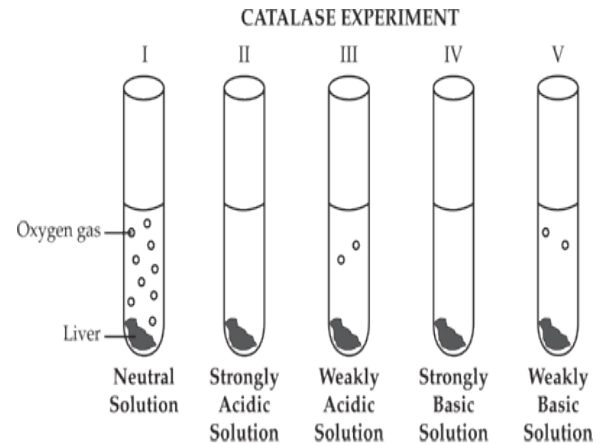
THE EFFECT OF CATALASE ON HYDROGEN PEROXIDE



Use the following information regarding an experiment to answer question 62.

Catalase is an enzyme found in plant and animal cells. Hydrogen peroxide is a harmful substance found in cells. Catalase causes hydrogen peroxide to break down into water and oxygen.

A student conducted an experiment to determine whether plant and animal cells have the same amount of catalase. She used liver and potato tissues in the experiment. The graph below shows the results from her experiment.



The student also conducted a second experiment. She boiled the liver tissue completely and added it to the hydrogen peroxide solution. She observed that little to no oxygen was released in the second experiment.

62. Which of these statements best supports the student's observations?

- a. Exposing catalase to high temperatures makes it inactive.
- b. Exposing catalase to high temperatures changes it into a different enzyme.
- c. Boiling liver breaks down hydrogen peroxide faster.
- d. Boiling removes oxygen from the liver.

Other biology students of the same class conducted an experiment to test the effects of pH on the activity of catalase. Each test tube contains a solution of hydrogen peroxide and water at various pH levels. The liver tissue is a source of catalase. The diagram to the side represents the results of their experiment.

63. Based on the students' results, catalase works best at a pH of

- a. 1 b. 4 c. 7 d. 10

64. Many bacteria live in fresh water. Which of these statements best describes what will happen
- a. when freshwater bacterial cells are placed in salt water?
 - b. Water leaves the cell, causing the cell to expand.
 - c. Water leaves the cell, causing the cell to shrink.
 - d. Water enters the cell, causing the cell to expand.
 - e. Water enters the cell, causing the cell to shrink.

65. During their early stages of development, the embryos of reptiles, birds, and mammals look very similar. This suggests that reptiles, birds, and mammals

- a. have a common ancestor
- b. live in the same types of environments
- c. have undergone parallel evolution
- d. are no longer undergoing evolution
- e. have gotten rid of all their vestigial structures

66. In Australia, marsupial mammals fill the same niches as do placental mammals in most of the rest of the world. This is an example of

- a. industrial melanism
- b. convergent evolution
- c. divergent evolution
- d. relative dating
- e. absolute dating

67. Bacteria that oxidize NH_3 to NO_2 are

- a. saprobes
- b. chemoheterotrophs
- c. chemoautotrophs
- d. photoautotrophs
- e. photoheterotrophs

68. Bacteria that use light for energy and organic matter for a carbon source are

- a. saprobes
- b. chemoheterotrophs
- c. chemoautotrophs
- d. photoautotrophs
- e. photoheterotrophs

69. Influenza subtypes differ in their

- a. capsid composition
- b. capsule composition
- c. protein spikes
- d. chemical composition of adenosine

70. Viruses are considered to be

- a. non-living
- b. primitive precursors of bacteria
- c. a link between life and non-life
- d. very small bacteria

71. The basic structure of a virus contains

- a. protein coat
- b. nucleic acid
- c. cell wall
- d. A and B are correct
- e. A and C are correct

72. Which of the following have the greatest problem with photorespiration?

- a. CAM plants
- b. C₃ plants
- c. C₄ plants
- d. Heterotrophs

73. Which of the following occurs during the light-dependent reactions of plants ?

- a. electron transport
- b. chemiosmosis
- c. splitting of water
- d. all of the above

74. Which of the following are the major structural components of the cell membrane?

- a. phospholipids and cellulose
- b. nucleic acids and proteins
- c. proteins and cellulose
- d. phospholipids and proteins

75. All of the following are functions of membrane proteins except

- a. cell-cell recognition
- b. protein synthesis
- c. signal transduction
- d. transport

76. Which of the following is NOT involved in transcription?

- a. start codon
- b. RNA polymerase
- c. Terminator
- d. promoter

77. All of the following are directly involved in translation except

- a. mRNA
- b. tRNA
- c. ribosomes
- d. DNA

78. A particular code of bases in the coding sequence of DNA is AAA. The anticodon on the tRNA that binds the mRNA codon is

- a. TTT
- b. UUA
- c. UUU
- d. AAA

79. Which of the following factors was most important in the origin of life on Earth?

- a. competition for oxygen
- b. low levels of solar energy
- c. biotic synthesis of organic molecules
- d. natural selection acting on molecules and protobionts

80. Which of the following is the best example of humans undergoing evolution (“descent with modification”)?

- a. reduction in number of hairs on the head of a balding person
- b. reduction in coarseness of body hair over millennia
- c. increase in weight over an individual’s lifetime
- d. increased pigment production by the skin of a person who is exposed to increased UV radiation levels

**New Jersey Science League
Biology I Answer Key Blue Test
Date: February, 2013**

| | | | | |
|------|------|------|------|------|
| 1 B | 17 B | 33 B | 49 D | 65 A |
| 2 E | 18 D | 34 C | 50 E | 66 B |
| 3 D | 19 C | 35 B | 51 E | 67 C |
| 4 D | 20 C | 36 B | 52 B | 68 E |
| 5 A | 21 B | 37 C | 53 C | 69 C |
| 6 C | 22 D | 38 E | 54 E | 70 A |
| 7 C | 23 E | 39 D | 55 C | 71 D |
| 8 E | 24 D | 40 B | 56 C | 72 B |
| 9 B | 25 C | 41 D | 57 A | 73 D |
| 10 B | 26 D | 42 A | 58 B | 74 D |
| 11 D | 27 A | 43 D | 59 B | 75 B |
| 12 E | 28 B | 44 A | 60 A | 76 A |
| 13 A | 29 D | 45 B | 61 C | 77 D |
| 14 C | 30 B | 46 C | 62 A | 78 D |
| 15 E | 31 A | 47 C | 63 C | 79 D |
| 16 B | 32 C | 48 C | 64 B | 80 B |

NJSL Biology I March 2013 Test

Choose the answer that best completes the statements or questions below and fill in the appropriate response on the form. If you change an answer be sure to completely erase your first choice. Make sure you have 80 questions.

1) Cells that do not divide are usually arrested in

- | | |
|--------|-------------|
| A. S. | C. G2. |
| B. G1. | D. Prophase |

2) Chromatin consists of

- A. DNA, histones, and many other nonhistone proteins.
- B. mostly RNA and DNA.
- C. RNA, DNA, and nonhistone proteins.
- D. DNA only.

3) A plant has a diploid chromosome number of 12. An unusual egg cell of that plant has 5 chromosomes. The most probable explanation is

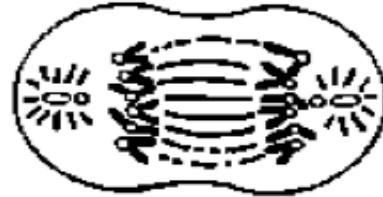
- A. normal mitosis.
- B. normal meiosis.
- C. nondisjunction in meiosis I.
- D. nondisjunction in mitosis.

4) Homologous chromosomes cross over during

- A. Prophase I.
- B. Prophase II.
- C. Prophase I and II.
- D. Metaphase I.

5) What phase of meiosis is illustrated in this drawing below?

- A. anaphase I.
- B. anaphase II.
- C. S phase.
- D. synapse



6) A person with Klinefelter syndrome has 44 chromosomes and three sex chromosomes (XXY). The resulting aneuploidy is caused by

- A. nondisjunction.
- B. crossing over.
- C. a mutation.
- D. an enzyme deficiency.

7) When dividing cells are examined under a light microscope, chromosomes first become visible during

- A. interphase.
- B. the S phase.
- C. prophase.
- D. G1.

8) The structures that line up the chromatids on the equatorial plate during metaphase are called

- A. asters.
- B. polar and kinetochore microtubules.
- C. centrosomes.
- D. centrioles

9) In plant cells, cytokinesis is accomplished by the formation of a(n)

- A. aster.
- B. membrane furrow.
- C. additional nucleus.
- D. cell plate.

10) The cell walls of fungal hyphae contain the polysaccharide

- A. cellulose.
- B. chitin.
- C. lignin.
- D. pectin

11) The cells of the body of a multicellular fungus are organized into rapidly growing individual tubular filaments called

- A. dikaryons.
- B. rhizoids.
- C. hyphae.
- D. mycelia.

12) A tree depends on mycorrhizal fungi to absorb nutrients. The relationship between the tree and the fungus is an example of

- A. saprobism.
- B. mutualism.
- C. absorptive heterotrophism.
- D. heterotrophism.

13) The picture below is of the underside of a mushroom cap. The labeled structures, called gills, play a role in

- A. respiration
- B. defense
- C. making food
- D. reproduction



14) Which of the following organisms is a multicellular algae?

- A. kelp
- B. *Euglena*
- C. diatom
- D. archaea

15) Algal blooms may be caused by

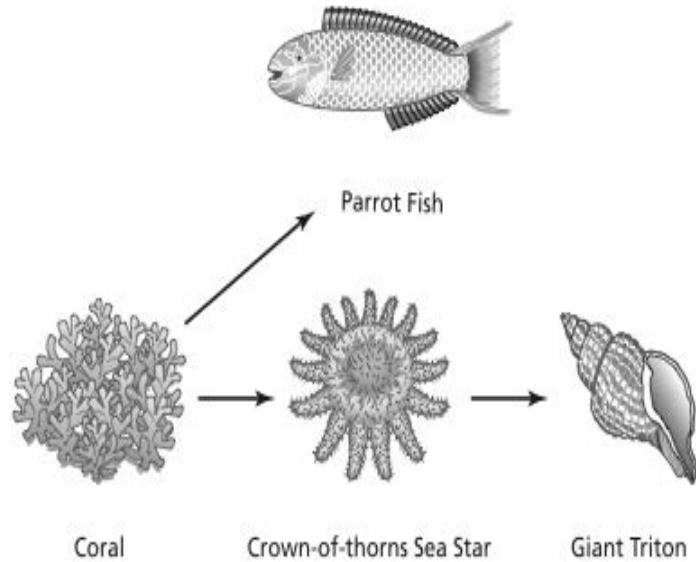
- A. high nutrient concentrations.
- B. low nutrient concentrations.
- C. low water temperature.
- D. large numbers of fish

16) Algae are

- A. usually found deep in the oceans.
- B. always unicellular.
- C. autotrophic protists.
- D. All of the above

17) Green algae and plants

- A. both have photosynthetic pigments.
- B. both use starch to store food.
- C. both have cell walls.
- D. All of the above



- 18) The diagram below shows the feeding relationships for four coral reef organisms. Humans sometimes kill giant tritons in order to collect their attractive spiral shells. If humans kill most of the giant tritons in a coral reef, the coral population will **most** likely
- | | |
|---|--|
| A. decrease due to a decrease in the parrot fish population. | C. increase due to a decrease in the crown-of-thorns sea star population. |
| B. increase due to an increase in the parrot fish population. | D. decrease due to an increase in the crown-of-thorns sea star population. |
- 19) In the late 1800's, Christiann Eijkman studied beriberi, a vitamin-deficiency disease similar to one that chickens develop if they feed exclusively on polished rice (rice that has the bran layer removed). Chickens with bran in the diet do not get the disease. Eijkman convinced prison officials that prisoners fed a diet of unpolished rice would experience a reduction in beriberi frequency. The rate of the beriberi disease decreased dramatically. What procedure would **best** convince other scientists who questioned his results?
- | |
|---|
| A. Feed prisoners chickens that ate only unpolished rice. |
| B. Compare the same number of prisoners who ate polished rice with those who had unpolished rice. |
| C. Study other types of animals that had a disease similar to beriberi. |
| D. Compare chickens that ate polished rice to prisoners who ate polished rice. |
- 20) We refer to the long-term average atmospheric conditions of a region as its
- | | |
|-------------------|-------------|
| A. weather. | C. biome. |
| B. biotic factor. | D. climate. |

21) According to the theory of island biogeography, equilibrium is reached on an island

- A. when the first colonists arrive.
- B. when the first species goes extinct.
- C. when the rate of arrival equals the rate of extinction.
- D. when the species pool is very large.

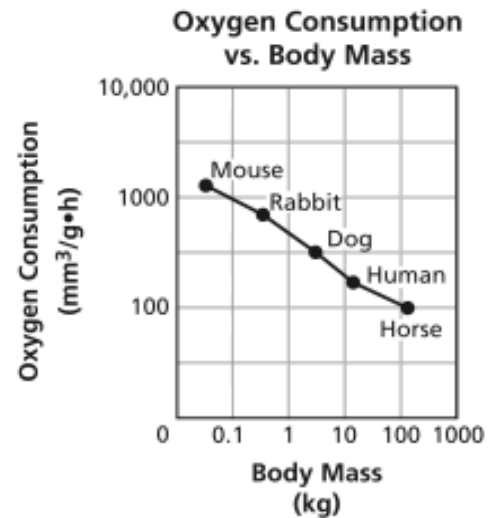
22) A single bacterium is put in an environment with no competition. As long as resources remain unlimited, the bacterium will

- A. reproduce logistically.
- B. reproduce exponentially.
- C. reproduce linearly.
- D. not reproduce

23) The graph represents the relationship between an organism's oxygen consumption and body mass.

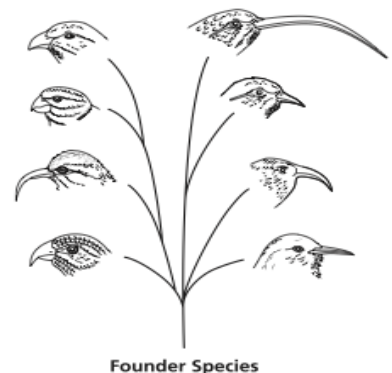
Which statement is supported by the information shown in the graph?

- A. The oxygen consumption of an organism is one-half its body mass.
- B. The oxygen consumption of an organism is not related to its body mass.
- C. As the body mass of an organism increases, oxygen consumption decreases.
- D. As the body mass of an organism decreases, oxygen consumption decreases.



24) A diagram showing the evolution of eight bird species is shown below. The differences in the species are **most** likely a result of

- A. Length of mating season.
- B. Population size.
- C. Color of feathers.
- D. Available food sources.



25) Which of the following is most likely a decomposer?

- A. Spider
- B. Mushroom
- C. Oak tree
- D. Whale

26) A taxon that consists of all of the descendants of a common ancestor is called

- A. a synapomorphy.
- B. a polyphyly.
- C. a clade.
- D. parsimonious

27) The female wasp of a certain species of wasp lays its eggs in the developing seeds of an already fertilized fig syncomium. The larvae of this wasp eat (and kill) the seeds of the fig. This wasp does not pollinate the fig or in any other manner benefit the fig. The interaction between figs and this wasp has aspects of

- A. mutualism.
- B. commensalism.
- C. amensalism.
- D. a predator-prey or host-parasite interaction

28) The endosymbiosis hypothesis for the evolution of eukaryotic cells states that modern mitochondria descended from free-living bacterial ancestors that "infected" larger cells. If the assumption is correct that the predecessors of the organelles and the proto-eukaryotic cells both benefited, this association describes a very early example of

- A. mutualism.
- B. parasitism.
- C. interspecific competition.
- D. predation.

29) Organisms that are most likely to tolerate harsh conditions are found during

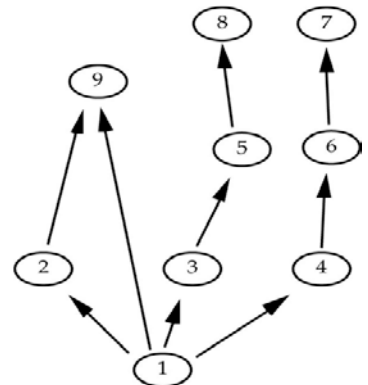
- A. early primary succession.
- B. late primary succession.
- C. secondary succession.
- D. early climax stage.

30) A species that exerts a much greater influence on a biotic community than its relative abundance would lead one to expect is a(n)

- A. primary producer.
- B. ecosystem engineer.
- C. keystone species.
- D. successional species.

31) Examine the following food web below. Organism 9 is best described as a(n)

- A. herbivore.
- B. primary carnivore.
- C. secondary carnivore.
- D. omnivore.



32) The gradual process of environmental change and species replacement is called

- A. succession.
- B. area effect.
- C. zonation.
- D. commensalism

33) Mimicry is most often an adaptation against

- A. competitors.
- B. mutualists.
- C. decomposers.
- D. predators

34) In a phylogenetic tree, what do we call the points at which lineages split?

- A. Divisions
- B. Roots
- C. Taxa
- D. Nodes





35) A tropical rain forest may not return to its original climax community after which of the following disturbances?

- A. burning of a forest fire
- B. clearing and farming
- C. volcanic eruption
- D. flooding after a hurricane

36) Use the classification of four birds in the chart to answer the question below.

Based on the classification, which two birds are **most** closely related.

- A. Western Kingbird and Ovenbird
- B. Eastern Bluebird and Robin
- C. Western Kingbird and Eastern Bluebird
- D. Robin and Ovenbird

| | | | | |
|----------------|---|--|--|--|
| |  |  |  |  |
| | Eastern Bluebird | Western Kingbird | Ovenbird | Robin |
| Class | Aves | Aves | Aves | Aves |
| Order | Passeriformes | Passeriformes | Passeriformes | Passeriformes |
| Family | Turdidae | Tyrannidae | Parulidae | Turdidae |
| Genus | <i>Sialia</i> | <i>Tyrannus</i> | <i>Seiurus</i> | <i>Turdus</i> |
| Species | <i>sialis</i> | <i>verticalis</i> | <i>aurocapillus</i> | <i>migratorius</i> |

37) Primates should eat citrus fruit to prevent scurvy, a deficiency of

- A. niacin.
- B. thiamin.
- C. calciferol.
- D. ascorbic acid.

38) Breathing provides the body with oxygen required to support the energy metabolism of all cells. Breathing also eliminates _____, one of the waste products of cell metabolism.

- A. CO₂
- B. CO
- C. carbon tetrachloride
- D. carbonic acid

- 39) Which part of the blood is most efficient at carrying oxygen?
- A. Blood plasma solution
 - B. Blood plasma proteins
 - C. Hemoglobin molecules of red blood cells
 - D. Membrane molecules of red blood cells
- 40) The earliest stage of development the process of cleavage produces a
- A. fetus
 - B. morula
 - C. gastrula
 - D. blastula
- 41) The mesoderm
- A. is located on the outside of the embryo.
 - B. lies between the endoderm and the ectoderm.
 - C. is found in blastula-stage embryos.
 - D. gives rise to the linings of the gut.
- 42) After gastrulation, the ectodermal cells contribute predominantly to the developing
- A. brain, nervous system, and sweat glands.
 - B. skeletal system and muscles.
 - C. inner lining of the gut and respiratory tract.
 - D. liver and pancreas.
- 43) Which of the following statements about asexual reproduction is *false*?
- A. Cell division occurs by mitosis.
 - B. Populations can grow until limited by resources.
 - C. Single individuals can produce offspring.
 - D. Genetic diversity in a population is generated in changing environments.
- 44) Sexual reproduction has an evolutionary advantage over asexual reproduction because it
- A. results in both males and females of a species.
 - B. is a more lengthy process.
 - C. promotes genetic variability to cope with changes in the environment.
 - D. is controlled by many hormonal mechanisms.
- 45) Which of the following is not a part of asexual reproduction?
- A. Budding
 - B. Fertilization
 - C. Parthenogenesis
 - D. Regeneration

- 46) Progeny inherit all the characteristics of a single parent through
- A. copulation.
 - B. asexual reproduction.
 - C. gametogenesis.
 - D. sexual reproduction.
- 47) In male gametogenesis, the second meiotic division produces four haploid
- A. spermatids.
 - B. primary spermatocytes.
 - C. secondary spermatocytes.
 - D. spermatogonia.
- 48) After spermatogenesis, sperm cells are generally stored in the
- A. spermatophore.
 - B. prostate gland.
 - C. vas deferens.
 - D. epididymis.
- 49) The egg is propelled through the oviduct by means of
- A. cilia on the surface of the egg.
 - B. its flagellum.
 - C. uterine contractions.
 - D. cilia lining the oviduct.
- 50) Unlike spermatogenesis, oogenesis in humans
- A. is continuous over the life of the woman.
 - B. begins prenatally.
 - C. produces four haploid gametes.
 - D. occurs at a rapid rate.
- 51) A benefit of sexual reproduction in plants is
- A. the greater number of progeny that results.
 - B. ease of pollination.
 - C. the improved ability of plants to adapt to new environments.
 - D. that the haploid plant becomes diploid.
- 52) In a flower, the microsporangia are found in the
- A. anther.
 - B. filament.
 - C. stigma.
 - D. ovule.
- 53) Which of the following is a gametophyte of a flowering plant?
- A. Flower
 - B. Egg
 - C. Pollen grain
 - D. Anther

54) In flowering plants, during pollination, pollen is transferred to the

- A. stigma.
- B. style.
- C. ovary.
- D. ovule.

55) Canada geese breed across northern North America and overwinter in southern parts of the continent. They feed on various plant materials, including aquatic vegetation and field grains. A scientist hypothesizes that a lack of sufficient food is responsible for inducing migratory behaviors in the fall. Which of the following experiments best tests this hypothesis?

- A. Split a flock of geese into two groups. Provide extra food to one of the groups, and record the dates when migratory behaviors are first displayed within each group.
- B. Measure fat content as a percentage of body weight in individual geese over the summer. Compare this with the dates on which migratory behaviors are first displayed.
- C. Observe several flocks of geese over a ten-year period. Record the dates of the first killing frost and the dates when migratory behaviors are first displayed in each flock.
- D. Raise geese in large outdoor cages. Beginning in midsummer, gradually reduce the available food supply and record the dates when migratory behaviors are first displayed.

56) In flowering plants, double fertilization results in the formation of

- A. two diploid embryos.
- B. one diploid embryo and a diploid endosperm.
- C. two diploid embryos and a haploid endosperm.
- D. one diploid embryo and a triploid endosperm.

57) The embryonic sac is also called the

- A. megaspore.
- B. megasporangium.
- C. megasporocyte.
- D. megagametophyte.

58) Seed dormancy is usually an adaptation to ensure that

- A. the embryo is mature.
- B. germination occurs at a favorable time.
- C. seeds germinate near the parent plant.
- D. levels of abscisic acid are high enough.

59) The hormone responsible for phototropism is

- A. abscisic acid.
- B. auxin.
- C. ethylene.
- D. gibberellin.

60) A species of newt produces a toxin that can kill predators. Scientists have observed that some garter snakes can feed on the newts because they have a natural resistance to the toxin. In areas where populations of newts and garter snakes interact, which of the following predictions is **best** supported by evolutionary theory?

- A. The garter snakes with resistance to the toxin will successfully reproduce and pass the trait on to their offspring.
- B. The garter snakes without resistance to the toxin will acquire resistance by increasing the rate at which they feed on the newts.
- C. The newts that produce low levels of toxin will also develop camouflage adaptations that allow them to hide from the garter snakes.
- D. The newts will stop making the toxin rather than continue to use energy to make a toxin that is ineffective against the garter snakes.

61) A photoautotroph acquires its carbon from

- A. the soil.
- B. the air.
- C. water.
- D. the sun

62) An isolated population of termites lives in a forest surrounded by mountains. These termites feed on dead wood, grasses, and seeds. This food is broken down by a species of microorganism that lives inside the intestines of the termites. Without the microorganisms, these termites cannot obtain the nutrients they need to survive. One winter a virus causes most of the microorganisms to die.

As a result of the microorganism's absence, these termites will **most** likely

- A. eat different food.
- B. experience a significant reduction in population.
- C. evolve immediately into a new species.
- D. develop a new species of microorganism.

63) A plant cell placed in distilled water will

- A. expand until the osmotic potential reaches that of distilled water.
- B. become more turgid until the pressure potential of the cell reaches its osmotic potential.
- C. become less turgid until the osmotic potential reaches that of distilled water.
- D. become more turgid until the osmotic potential reaches that of distilled water.

64) Where bulk flow occurs in plants, the stream consists of

- A. water and minerals.
- B. water and organic molecules.
- C. water only.
- D. Both a and b

65) The evaporative loss of water from the shoot is called

- A. translocation.
- B. transformation.
- C. transportation.
- D. transpiration.

- 66) Which force accounts for the movement of water upward through a narrow tube?
- A. Cohesion of water molecules via hydrogen bonding
 - B. Negative water potential in the xylem
 - C. Active transport of water molecules
 - D. Passive osmosis of water following ion movement
- 67) The human body regularly sheds and replaces its skin cells. Which of the following processes is directly responsible for replacing these cells?
- A. meiosis
 - B. mitosis
 - C. osmosis
 - D. transcription
- 68) Which structure of the leaf minimizes water loss?
- A. Mesophyll
 - B. Epidermis
 - C. Cuticle
 - D. Phloem
- 69) In which of the following conditions do plants close their stomata?
- A. Dim sunlight
 - B. Water stress
 - C. High CO₂
 - D. Lack of wind
- 70) Clues to the evolutionary relationships of animals can be found in
- A. the fossil record.
 - B. patterns of embryonic development.
 - C. comparative morphology and physiology.
 - D. All of the above.
- 71) Which of the following statements about Darwin is true?
- A. Even as a youth he recognized that life evolves.
 - B. He had a keen interest in geology.
 - C. He was the only person credited with the idea of evolution.
 - D. He recognized that animals on the Galápagos Islands were identical to those on the mainland.
- 72) Some large snakes such as pythons have small internal leg bones. These bones are examples of
- A. fossil organs
 - B. vestigial structures
 - C. naturally adapted structures
 - D. birth defects in snakes

73) Microevolution: frequency of alleles::macroevolution:_____

- A. descent from a common ancestor
- B. difference in genes
- C. number of offspring
- D. survival of the fittest

74) The "raw material" for evolution is genetic diversity. Which phenomenon can be an important source of this raw material?

- A. cloning
- B. asexual reproduction
- C. genetic recombination during meiosis.
- D. All of the above are important sources of genetic diversity

75) Which of the following modes of selection results in variation being decreased?

- A. Stabilizing selection only
- B. Directional selection only
- C. Disruptive selection only
- D. Both directional and disruptive selection

76) Which of the following is currently a primary cause of species decline worldwide

- A. habitat destruction
- B. intraspecific competition
- C. random mating
- D. viral outbreak

77) Embryonic stem cells in mammals are most similar in function to which of the following types of plant cell?

- A. meristem
- B. collenchyma
- C. endodermis
- D. parenchyma

78) Which of these animals is an example of a living fossil?

- A. Horses
- B. Whales
- C. Oak trees
- D. Horseshoe crabs

79) Which of the following statements about sister clades is true?

- A. They share a common ancestor.
- B. They have been evolving co-dependently.
- C. They always have the same number of species.
- D. None of the above.

80) The binomial system of nomenclature, by which we still classify species, was originated by

- A. Charles Darwin.
- B. Thomas Malthus.
- C. Carl Sagan.
- D. Carolus Linnaeus

New Jersey Science League **Blue Test**

Biology 1 Answer Key

Date: March 2013

| | | | | |
|------|------|------|------|------|
| 1 B | 17 D | 33 D | 49 D | 65 D |
| 2 A | 18 D | 34 D | 50 B | 66 A |
| 3 C | 19 B | 35 B | 51 C | 67 B |
| 4 A | 20 D | 36 B | 52 A | 68 C |
| 5 B | 21 C | 37 D | 53 C | 69 B |
| 6 A | 22 B | 38 A | 54 A | 70 D |
| 7 C | 23 C | 39 C | 55 A | 71 B |
| 8 B | 24 D | 40 B | 56 D | 72 B |
| 9 D | 25 B | 41 B | 57 D | 73 A |
| 10 B | 26 C | 42 A | 58 B | 74 C |
| 11 C | 27 D | 43 D | 59 B | 75 A |
| 12 B | 28 A | 44 C | 60 A | 76 A |
| 13 D | 29 A | 45 B | 61 B | 77 A |
| 14 A | 30 C | 46 B | 62 B | 78 D |
| 15 A | 31 D | 47 A | 63 B | 79 A |
| 16 C | 32 A | 48 D | 64 D | 80 D |

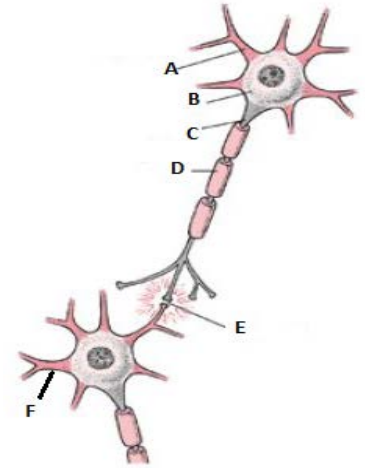
Science League Biology I – April 11, 2013

Choose the answer that best completes the statements or questions below and fill in the appropriate response on the form. If you change an answer, be sure to completely erase your first choice. Please PRINT your name, school, area, and which test you are taking onto the scan-tron.

1. In a given population, an emigrant:
- A) moves into the area
 - B) has biotic potential
 - C) is required to meet the carrying capacity
 - D) is prey for immigrants of the population
 - E) moves out of the area

For questions 2-4 use the letters on the diagram for each answer. You may use an answer only once.

2. Specialized site where these cells communicate with other cells like themselves.
3. The fiber belonging to the TOP cell that conducts an impulse toward the cell body



4. The letter F on this diagram labels:
- A) an axon belonging to another cell
 - B) a dendrite belonging to another cell
 - C) an axon of the cell in the diagram
 - D) a dendrite of the cell in the diagram
 - E) a synapse in this diagram
5. The enzyme pepsin starts the digestion of:
- A) starches in the mouth
 - B) starches in the stomach
 - C) proteins in the mouth
 - D) proteins in the stomach
 - E) Both C and D
6. The correct order of egg development is:
- A) ootid, ovum, primary oocyte, secondary oocyte
 - B) primary oocyte, secondary oocyte, ootid, ovum
 - C) ovum, primary oocyte, secondary oocyte, ootid,
 - D) ootid, primary oocyte, secondary oocyte, ovum
 - E) ootid, ovum, secondary oocyte, primary oocyte

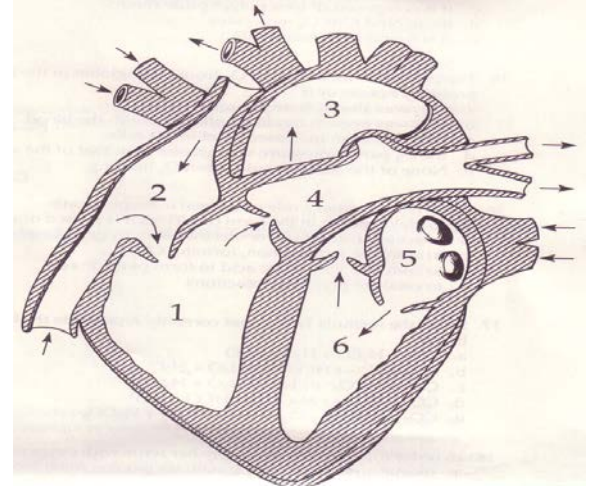
7. The pancreas is a(n):
- A) endocrine gland
 - B) exocrine gland
 - C) lymph gland
 - D) Both A and B
 - E) Both B and C
8. Comparing the digestive systems of herbivores and carnivores, the herbivores would have:
- A) larger canine teeth
 - B) longer intestines
 - C) smaller stomachs
 - D) fewer digestive enzymes
 - E) less feces to eliminate
9. Human alveoli work primarily on the principle of
- A) ventilation
 - B) active transport
 - C) electron transport
 - D) osmosis
 - E) diffusion
10. Energy in an ecosystem is stored as:
- A) oxygen bonds
 - B) organic molecules
 - C) sunlight
 - D) water
 - E) sedimentary rock layers
11. Which of the following can be considered a contribution to a density-dependent regulation of populations?
- A) predation
 - B) intraspecific competition for nutrients
 - C) the accumulation of toxic wastes
 - D) none of the above
 - E) A, B, and C are true
12. All of the following have contributed to the growth of the human population EXCEPT
- A) environmental degradation
 - B) improved nutrition
 - C) vaccines
 - D) pesticides
 - E) improved sanitation

Use the following diagram of the heart to answer # 13-14.

13. Which of the following carry oxygenated blood?
- A) 1 and 2
 - B) 1, 2 and 4
 - C) 3 and 4
 - D) 5 and 6
 - E) 3, 5 and 6

14. What is the correct sequence of structures encountered by blood as it travels from the right atrium to the aorta?

- A) 2,1,3,4,5,6
- B) 2,1,4,5,6,3
- C) 5,6,3,2,1,4
- D) 5,6,4,3,2,1



15. Which statement(s) is (are) true regarding Heart Disease in humans?

- A) The most common type is CAD, Coronary Artery Disease
- B) One in every three American women dies from Heart Disease
- C) The probability of heart disease frequency rises with smoking
- D) A and C are correct
- E) A, B, and C are correct

16. An embryologist studying the development of a vertebrate organism from the zygote stage to fetus would be justified in drawing which of the following conclusions?

- A) Ontogeny recapitulates phylogeny.
- B) Early embryos display identical features of their class, order, and species.
- C) An early human embryo has features in common with early fish and avian embryos.
- D) A human embryo displays features of adult fish and birds in the course of its development.
- E) Development of an embryo proceeds in a direction from more specialized to more generalized features.

In an experiment involving the development of frog embryos, selected gastrulas were stained. The location of the dye post-gastrulation is found in the data table below. Use this table to answer questions 17-18.

| TISSUE | STAIN |
|------------------------|--------|
| Digestive tract lining | Red |
| Lungs | Orange |
| Lens of the eye | Yellow |
| Brain | Green |
| Notochord | Blue |

17. Ectoderm would produce tissue exhibiting which of the following color(s)?

- A) green and blue
- B) green and yellow
- C) yellow and blue
- D) Red
- E) Orange

18. Which of the following colors was most likely used to stain the endoderm?

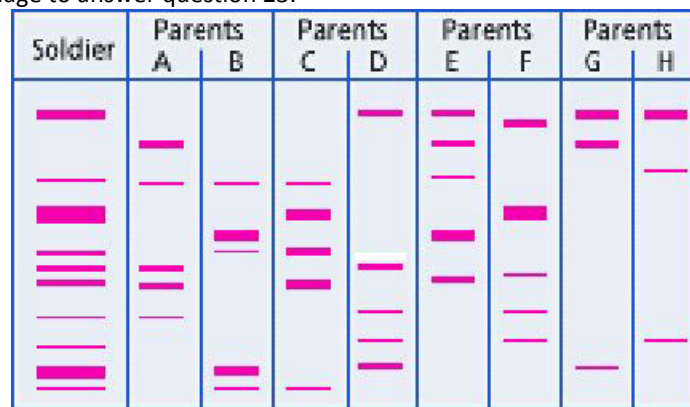
- A) yellow
- B) red
- C) blue
- D) green
- E) None of them

19. Which of the following scientists is/are credited with confirming the germ theory of disease and creating the first vaccine for rabies

- A) Wohler
- B) Robert Koch
- C) Schleiden and Schwann
- D) Louis Pasteur
- E) Cuvier

20. In the 1950's this person created the first successful vaccine for Polio
 A) C. Everett Koop B) Jonas Salk C) Leonard Scheele D) Thomas Henry Huxley
21. Each morning at the same time Bill would enter his kitchen and feed his new clown fish. After a few weeks Bill noticed that the fish would rise to the top of the tank as soon as he would enter the room. This is a good example of which of the following?
 A) habituation B) imprinting C) classical conditioning
 D) maturation E) operant conditioning
22. Using _____, cloning of millions of copies of DNA fragments can happen in a few hours.
 A) gene therapy
 B) linkage mapping
 C) polymerase chain reactions
 D) DNA fingerprinting

Use the following image to answer question 23.



23. Using the DNA fingerprint above pattern, determine which set of parental DNA matches that of the soldier.
 A) parents A and B D) parents G and H
 B) parents C and D E) none of the parents tested are a match
 C) parents E and F
24. In the laboratory, DNA molecules can be split at specific sequences using
 A) DNA Ligase C) electron transmission lasers
 B) UV Light D) endonucleases
25. Gel electrophoresis separates DNA fragments by which of the following features?
 A) charge C) Sequence
 B) size D) gender
26. Which of the following technologies can be used to determine the evolutionary relationship between horses and zebras?
 A) analysis of DNA from recent fossils
 B) analysis of amino acid differences in homologous proteins
 C) restriction mapping of DNA
 D) A and B are correct
 E) A, B and C are correct

Answer questions 27-28 by correctly pairing the following scientists to their theories or accomplishments.

A. Charles Darwin B. Jean Baptiste-Lamarck C. Joseph Lister D. Louis Pasteur

27. He developed antiseptic surgery to thwart post-surgical infections.

28. Theory of Inheritance of acquired characteristics

Use the following lab set up to answer questions 29-30.

In a laboratory exercise, students were using gel electrophoresis to determine the presence and size of PCR products. The students loaded different sizes of DNA fragments into an agarose gel and applied voltage.

29. Which molecules of DNA will migrate the fastest?

- A) the molecules with the greatest fraction of G/C nucleotides
- B) the molecules with the greatest fraction of A/T nucleotides
- C) the shortest D) the longest

30. When the DNA fragments are being separated by the gel electrophoresis, toward which electrode do the DNA fragments move? (note: only choices A and B)

- A) The positive electrode B) The negative electrode

31. The polymerase chain reaction (PCR) could be used to amplify DNA from which of the following?

- A) a fossil D) B and C are correct
- B) a fetal cell E) A, B and C are correct
- C) a virus

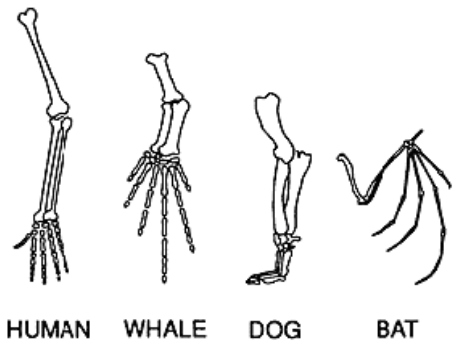
32. Which of the following is NOT a component of The Theory of Evolution by Natural Selection?

- A) variation among species C) inheritance of acquired characteristics
- B) competition for food and space D) survival and reproduction

Use the image of the human, whale, dog, and bat to answer 33-34.

33. The images illustrate which of the following concepts?

- A) vestigial structures
- B) variation between species
- C) embryological similarities
- D) homologous structures



34. The image suggests which of the following ideas?

- A) Larmarckian Inheritance
- B) descent with modification
- C) survival of the fittest
- D) genetic mutations

Use this information on an experiment on plant behavior to answer numbers 35-36.

A student wanted to study the effect of nitrogen fertilizer on plant growth, so she took two similar plants and set them on a windowsill for a two-week observation period. She watered each plant the same amount, but she gave one a small dose of fertilizer with each watering. She collected data by counting the total number of new leaves on each plant and also measured the height of each plant in centimeters.

35. Which of the following is a significant flaw in the experiment?

- A) there is no control
- B) there is no variable factor
- C) there is a small sample size and no repetition
- D) measurable results can not be expected
- E) it will require too much data collection time

36. In the observation notes, the student wrote that the plants both grew in the same direction, toward the light source. This is an example of

- A) twining
- B) nutation
- C) phototropism
- D) gravitropism

37. Both automatic responses and instinctive behaviors are indirectly controlled by

- A) insight
- B) genes
- C) reflexes
- D) conscious thought

38. Ivan Pavlov was the first to demonstrate

- A) conditioning in dogs
- B) trial and error in dogs
- C) habituation in dogs
- D) insight in dogs

Match the following conditions with their cause for questions 39-40.

- A) trisomy B) Turner's syndrome C) Klinefelter's syndrome D) Huntington's Disease

39. Missing a sex chromosome

40. Three copies of one chromosome which cause the formation of gametes

41. Which of the following organisms fix nitrogen in aquatic ecosystems?

- A) Rhizobium
- B) cyanobacteria
- C) chemoautotrophs
- D) phytoplankton
- E) legumes

42. Carbon is released into the atmosphere by all of the following EXCEPT

- A) burning of fossil fuels
- B) forest fires
- C) respiration
- D) photosynthesis
- E) volcanic eruptions

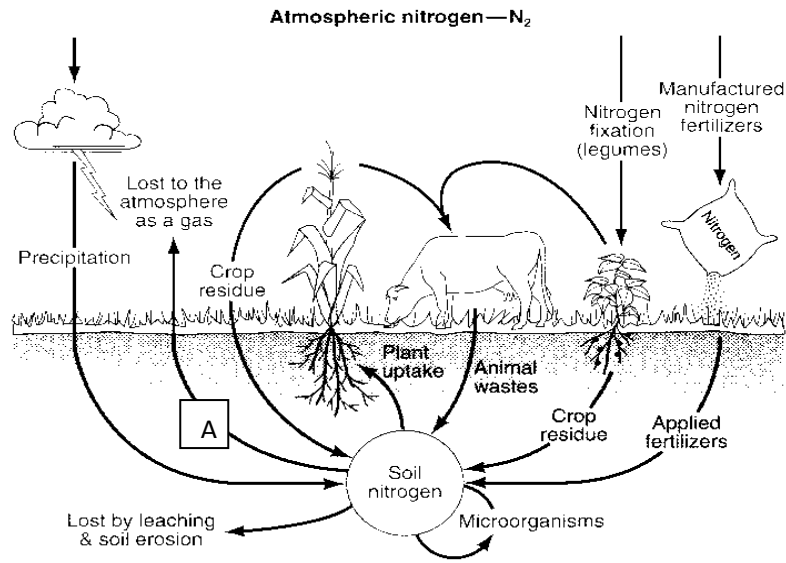
43. Thalidomide was a chemical prescribed as a sedative in the early 1960s. If taken by women in their first trimester of pregnancy, the children born had deformities of the arms and legs. What developmental process was affected by this drug?

- A) early cleavage divisions
- B) determination of the polarity of the zygote
- C) differentiation of bone tissue
- D) morphogenesis
- E) organogenesis

44. Which of the following is not a function of the circulatory system?

- A) to regulate body temperature
- B) transport hormones
- C) transport nutrients
- D) separate cell tissues
- E) Both A and D

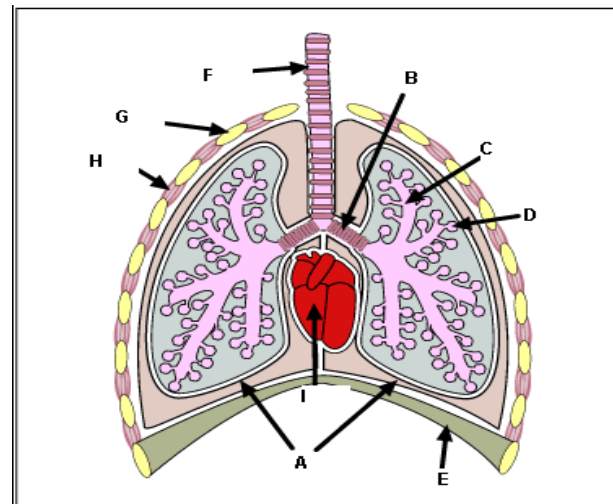
Use the following image to answer questions 45-47.



45. In the above illustration, the organism responsible for the process labeled as A is
 A) nitrifying bacteria B) *Rhizobium* bacteria C) nitrogen-fixing bacteria
 D) methanogenic protozoans E) denitrifying bacteria
46. How have humans interfered with the cycle in the illustration above?
 A) Dumping untreated sewage and urban runoff B) use of inorganic fertilizer
 C) burning fossil fuels D) overharvesting legumes and nitrogen rich mines E) all of the above
47. If humans continue to interfere with the nitrogen cycle, it may result in which of the following?
 A) depletion of atmospheric ozone
 B) eutrophication of freshwater sources
 C) increased availability of fixed nitrogen to primary producers
 D) accumulation of toxic levels of nitrates in groundwater
 E) all of the above

Use the following image to answer questions 48-49.

48. Which of the following choices is responsible for making gas exchange more easy and efficient and why?
 A) B, it expands upon inhaling to allow a great amount of gas to enter the lungs
 B) C, it has a lot of tiny blood vessels, moist thin walls and increases the surface area of the lungs
 C) D, it has a lot of tiny blood vessels, moist thin walls and increases the surface area of the lungs
 D) B, it filters the air making for the most efficient ventilation possible
 E) C, it filters the air making for the most efficient ventilation possible



49. Which of the following is a chronic disease of B in the above diagram and what is the main cause of it?
- A) Acute Respiratory Distress Syndrome, accumulation of fluid
 - B) Pneumonia, an infection
 - C) Asthma, inflammation of its walls
 - D) Acute Bronchitis, an infection
 - E) none of the above

Use the graph to answer question 50.

50. According to the above graph, which of the following could be true?
- A) Person A is diabetic
 - B) Person B is Diabetic
 - C) Person A lacks certain digestive enzymes
 - D) Person B lacks certain digestive enzymes

51. The secretion of saliva when food is seen or smelled is an example of a(n):

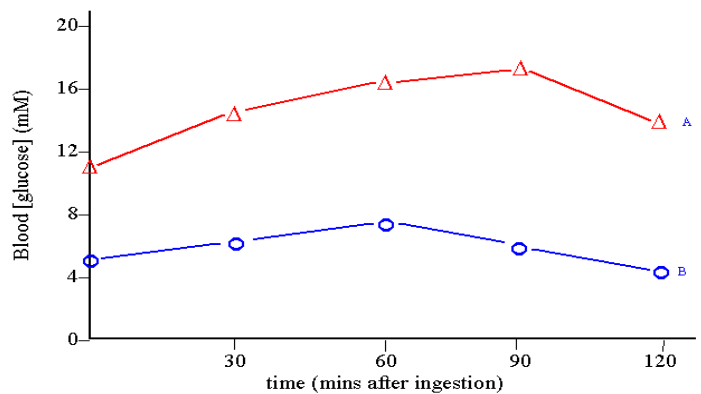
- A) irritation
- B) motivation
- C) emotion
- D) reflex
- E) predator

52. Mastication

- A) is a process occurring in the small intestine
- B) is equivalent to digestion
- C) is a technical term for swallowing
- D) is chemical digestion
- E) involves the molars

53. Which of the following is not a true statement for saliva?

- A) It performs the digestion of starches
- B) It is used in lubricating foods
- C) It helps in maintaining moist membranes in the mouth
- D) It may be secreted from the parotid gland
- E) It normally has a pH of about 3



54. Which is the correct path that air takes when it travels from the atmosphere to the blood?

- A) larynx, trachea, pharynx, alveolus, bronchiole, bronchus
- B) pharynx, larynx, trachea, bronchus, bronchiole, alveolus
- C) pharynx, trachea, larynx, bronchus, bronchiole, alveolus
- D) pharynx, trachea, larynx, bronchiole, bronchus, alveolus
- E) larynx, pharynx, trachea, bronchus, bronchiole, alveolus

55. Animals that exhibit activity during daylight hours are referred to as:

- A) diurnal
- B) migrational
- C) nocturnal
- D) predatory
- E) limited

56. The statistical study of populations is called

- A) fecundity
- B) dispersion
- C) demography
- D) mortality
- E) density

57. The number of individuals per unit area determines the population's

- A) fundamental niche
- B) survivorship
- C) density
- D) age distribution
- E) mortality

58. The body energy that can be stored in almost unlimited amounts is

- A) glycogen
- B) glucose
- C) triglyceride
- D) protein

59. Where does digestion begin?

- A) small intestine
- B) stomach
- C) mouth
- D) large intestine

60. The muscular contractions that move food through the digestive tract are called

- A) regurgitation
- B) propulsion
- C) peristalsis
- D) compression

61. Which of the following can directly supply energy for human use?

- A) lipids and oils
- B) minerals
- C) vitamins
- D) fibers

62. Which of the following pieces of evidence most strongly supports the common origin of all life on Earth? All organisms

- A) require energy
- B) use essentially the same genetic code
- C) reproduce
- D) have undergone evolution

63. What types of events are typically seen in the fossil record?

- A) speciation
- B) extinction
- C) successive changes in structures
- D) All of the above

64. Which of the following organisms alive today is likely to be most similar to the first life forms that evolved on the earth?

- A) cyanobacteria
- B) algae
- C) methane producing bacteria
- D) dinosaurs

65. Which of the following traits evolved most recently?

- A) prokaryotic cells
- B) eukaryotic cells
- C) photosynthesis
- D) multicellularity

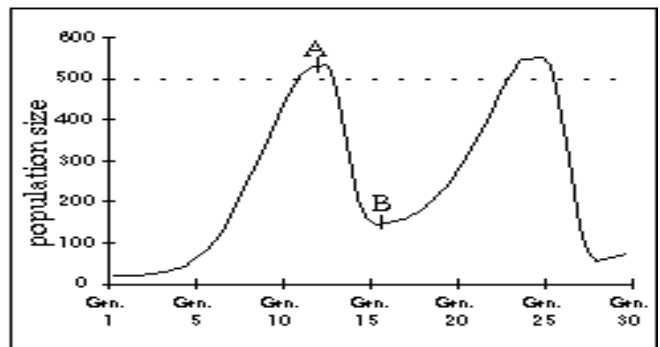
66. Miller and Urey's experiments proved that

- A) complex organic molecules can form spontaneously under conditions that probably existed on the early earth
- B) life evolved on earth from inanimate chemicals
- C) RNA can act as an enzyme and assemble new RNA molecules from RNA templates
- D) bacteria were the first type of living organism to appear on the earth

Use the graph to answer questions 67-68.

67. Which of the following describes the pattern of population growth shown in the graph?

- A) Boom and Crash curve
- B) S curve



C) Exponential

D) linear

68. Which of the following could explain what happened to the population from point A to point B?

A) drought

D) a and b are correct

B) frost

E) a, b and c are correct

C) competition

69. A lake rich in nutrients is referred to as

A) dystrophic

C) oligotrophic

B) eutrophic

D) ectotrophic

70. In which stage of development does a zygote go through the structural and functional specialization of groups of cells?

A) fertilization

C) growth

B) differentiation

D) meiosis

71. The hollow sphere of cells is called a _____.

A) morula

C) blastula

B) blastocoel

D) blastomeres

72. Which of the following is a germ layer formed during gastrulation?

A) endoderm

C) mesoderm

B) ectoderm

D) all of the above

73. An example of associative learning would be

A) Pavlovian conditioning

C) classical conditioning

B) operant conditioning

D) all of the above

74. Circadian rhythms are based on approximately a

A) 2 hour period

D) 30 day period

B) 24 hour period

E) 365 day period

C) 7 day period

75. DNA will precipitate out of solution in a test tube of lysed cells when ____ is added.

A) water

C) acetone

B) ethanol

D) acetic acid

76. Embryonic stem cells are of particular importance because

A) they can become any type of cell

B) they can cure diseases

C) they divide rapidly and consistently

D) they are immune to cancers

77. Recombinant DNA technology

A) requires a donor cell and a surrogate

B) involves combining existing genes from different organisms

C) involves randomly creating new genes

D) can only be used with bacteria cells

78. Many non-infectious diseases have been shown to be associated with chronic infections with certain microorganisms. Which of the following is one of these diseases?

A) stroke

B) depression

C) Alzheimer's Disease

D) Coronary Artery Disease

Use the following nutritional diseases to questions 79 and 80.

A) Scurvy

B) Rickets

C) BeriBeri

D) Anemia

79. A deficiency in Vitamin D, calcium and phosphorus can lead to this condition.

80. A deficiency in Vitamin C can lead to this condition with symptoms including bleeding gums, loosening of teeth, swollen and painful joints and bleeding in tissues.

New Jersey Science League **Blue Test**

Biology I Answer Key

Date: APRIL 11, 2013

| | | | | |
|------|------|------|------|------|
| 1 E | 17 B | 33 D | 49 D | 65 D |
| 2 E | 18 B | 34 B | 50 A | 66 A |
| 3 A | 19 D | 35 C | 51 D | 67 A |
| 4 B | 20 B | 36 C | 52 E | 68 D |
| 5 D | 21 C | 37 B | 53 E | 69 B |
| 6 B | 22 C | 38 A | 54 B | 70 B |
| 7 D | 23 B | 39 B | 55 A | 71 C |
| 8 B | 24 D | 40 B | 56 C | 72 D |
| 9 E | 25 B | 41 D | 57 C | 73 D |
| 10 B | 26 E | 42 D | 58 C | 74 B |
| 11 E | 27 C | 43 D | 59 C | 75 B |
| 12 A | 28 B | 44 D | 60 C | 76 A |
| 13 E | 29 C | 45 E | 61 A | 77 B |
| 14 B | 30 A | 46 E | 62 B | 78 D |
| 15 E | 31 E | 47 E | 63 D | 79 B |
| 16 C | 32 C | 48 C | 64 C | 80 A |