Science League Biology I – January 12, 2012

Choose the best answer to the following:

1. Which of the following best describes a hypothesis?
   A) it is the same thing as a theory
   B) it is an idea that can not be tested
   C) it is an observation that can be verified
   D) it is a tentative explanation
   E) it is a fact

2. After a hypothesis has been supported by repeated experiments over a period of time, it may be referred to as a(n):
   A) theory B) hypothesis C) fact D) experiment E) objective

3. The concentration of hydrogen ions increases in a solution as the reading for pH measurement:
   A) increases B) decreases C) turns red litmus blue D) remains constant
   E) reaches 15 or higher

4. Ideally, an experimental group differs from a control group
   A) only with respect to the hypothesis being tested
   B) only with respect to the variable being studied
   C) by being less subject to bias
   D) in that it is less vulnerable to sampling error
   E) in that its subjects are more reliable

5. Which of the following is a deduction?
   A) *E. coli* cells have ribosomes.
   B) An *E. coli* bacterium is a prokaryotic cell.
   C) Do archaebacteria have ribosomes?
   D) If all cells have ribosomes and bacteria are types of cells, then bacteria have ribosomes.
   E) Prokaryotic cells can be helpful or harmful.

6. The statement, " If you give a plant food, water and sunlight, it will grow" is an example of
   A) a statement that can be tested B) a statement derived from a hypothesis
   C) a prediction
   D) deductive reasoning E) all of the above

7. Through time, the lineage that led to modern whales shows a change form four-limbed land animals to aquatic animals with two limbs that function as flippers. This change is best explained by
   A) creationism
   B) the cell theory
   C) natural selection
   D) homeostasis
   E) the hierarchical organization of life

8. The fact that there is a strong genetic similarity among species is strong evidence in support of
   A) evolution B) creationism C) intelligent design D) multiple independent origins of life

Use the following choices to answer questions 9-14. A choice may be used once or more than once. Not at all choices have to be used.

A) Charles Lyell B) Charles Darwin C) Alfred Wallace
D) Carolus Linnaeus E) Jean Baptiste Lamarck

9. Which of the men in the choices above had a philosophy consistent with the statement, "Improving the intelligence of an adult through education will result in that adult's descendants being born with a greater native intelligence."

10. Increased contact with UV radiation causes the pigments in our skin to darken over a period of days of exposure. The notion that if such exposed individuals would reproduce, their offspring would inherit the darkened skin is consistent with the philosophy of

11. The mechanism of natural selection required long time spans in order to modify species. From whom did the founder of natural selection get the concept of the Earth's ancient age?

12. In evolutionary terms, his concept of taxonomy would be expressed as the more closely related two organisms are, the more recently they shared a common ancestor.

13. In 1831, he boarded the *Beagle* as the ship's naturalist

14. In 1859, he wrote the *Origin of Species*

15. Which of the following facts was not available to Darwin when he formulated his theory of evolution?
A) Natural resources are limited and affect populations
B) All populations have the potential to increase
C) Characteristics are inherited as genes on chromosomes
D) Most populations are stable in size
E) Individual organisms in a population are not similiar.

16. The spotted touch-me-not flower, a flowering plant, has seed pods that burst open when touched and forcefully eject their seeds. Which of the following describes why this adaptation is favorable?
A) aids in the dispersal of the species
B) attracts insects that aid in pollination
C) prevents germination with the seed pod
D) can cause genetic changes to occur
E) this adaptation is not favorable

17. In a water molecule, hydrogen and oxygen are held together by which of the following bonds?
A) ionic B) double covalent C) nonpolar covalent D) polar covalent E) hydrogen

18. Which type of bond is found in most organic molecules such as sugar?
A) hydrogen B) ionic C) covalent D) sucronic E) reinforced

19. Which of the following refers to the attraction between the partial negative charge at one end of a water molecule and the partial positive charge of another water molecule that gives water its unique properties?
A) hydrogen bond B) ionic bond C) covalent bond D) sucronic bond E) reinforced bond

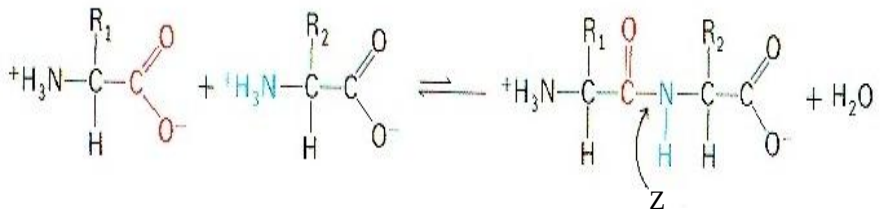
20. Oxygen has an atomic number of 8, therefore it must have
A) 8 protons B) 8 electrons C) 16 neutrons D) A and B are correct E) A, B and C are correct

21. The molecular formula for glucose is $C_6H_{12}O_6$. What would be the molecular formula for a polymer made by linking ten glucose molecules together by dehydration reactions?
A) $C_{60}H_{120}O_{60}$
B) $C_6H_{12}O_6$
C) $C_{60}H_{102}O_{51}$
D) $C_{60}H_{100}O_{50}$
E) $C_{60}H_{111}O_{51}$

22. As contrasted with most other types of atom, what property of the carbon atom gives it compatibility with a very large number of different elements?
A) Carbon has six to eight neutrons
B) Carbon has a valence of 4
C) Carbon forms ionic bonds
D) Only A and C are correct
E) A, B, and C are correct

23. Choose the pair of terms that correctly completes this sentence: Nucleotides are to _____ as _____ are to proteins.
A) nucleic acids; amino acids B) amino acids; polypeptides
C) glycosidic linkages; polypeptide linkages D) genes; enzymes E) polymers; polypeptides

Use the following image to answer questions 24-25.

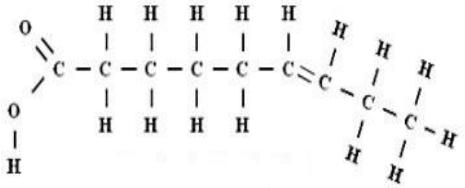


24. The arrow labeled Z in the above picture points to a
A) an isotope B) hydrogen bond C) glycosidic bond D) ionic bond E) peptide bond

25. The diagram above shows a step in the formation of a
A) carbohydrate B) lipid C) protein D) simple sugar E) A and D

26. Fatty acids
A) are composed of C, H, and O in a 1:2:1 ratio
B) are composed of C, H, glycerol, and a phosphate group
C) have hydrocarbon tails
D) are composed of four linked rings
E) are components of RNA

Use the following image to answer question 27.



27. Which of the following is true about the molecule pictured above
A) it is glucose B) it is a protein C) it is an unsaturated fatty acid
D) it is a saturated fatty acid E) it is a nucleic acid

Use the following image to answer questions 28-30.

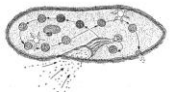
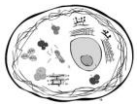
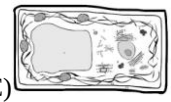
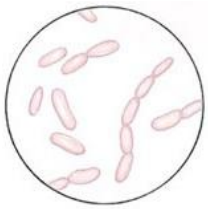
28. If you are viewing a specimen under the lowest objective, what is the total magnification?
A) 4X B) 10X C) 40X D)100X E)400X

29. How would you decrease the field of view on this microscope setting?
A) decrease the amount of light B) decrease the total magnification
C) increase the total magnification D) increase the amount of light

Use the following choices to answer questions 30-31.
A) Zaccharias Janssen B) Anton Van Leeuwenhoek C) Robert Hooke D) Charles A. Spencer
30. He was considered the Father of Microscopy. He was the first to observe and describe bacteria.
31. He was the first to use the word "cell" to describe microscopic structures.

32. If you were to find the mass of a test tube cork in your lab, what unit would you use?
A) g B) µm C) l D) m^3

33. If you were to observe a single cell from said cork in #32 under a microscope and report the length of the sample, the unit that would most likely accompany it would be
A) g B) µm C) l D) m^3 E) kg
The following are drawings of various types of cells. Use them to answer questions 34- 36

A)  B)  C)  D) 

34. Which of the above diagrams represents a prokaryote?

35. Which of the above is most likely a eukaryotic cell taken from a pond sample?

36. Which of the above cells most closely resembles one would you most likely see in a longitudinal section of onion root tip?

37. Of the following, what do both mitochondria and chloroplasts have in common?
A) ATP is produced B) DNA is present C) Ribosomes are present
D) A and B are correct E) A,B and C are correct

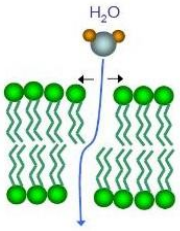
38. Grana, thylakoids, and stroma are all components found in
A) cilia and flagella B) chloroplasts C) mitochondria D) lysosomes E) nuclei

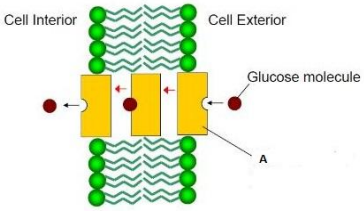
39. Organelles that include DNA include which of the following?
A) mitochondria B) chloroplasts C) ribosomes
D) A and B are correct E) A, B and C are correct

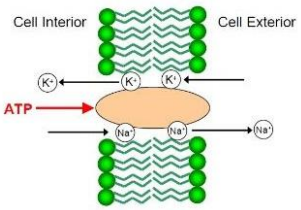
40. A type of hydrolytic enzyme found in animal cells is packaged to prevent general destruction of cellular components. Which of the following plays a key role in this compartmentalization?
A) chloroplast B) peroxisome C) lysosome D) vacuole E) glyoxysome

41. In an experiment, students ground up plant cells, centrifuged the mixture and then tested organelles from the particles at the bottom of the test tube. After further investigation, the students found that under certain conditions the organelles took up CO_2 and gave off O_2. The organelles that the students tested were most likely
A) mitochondria B) chloroplasts C) ribosomes D) nuclei E) golgi apparatus

Use the following choices to answer questions 42-44.

A) 

B) 

C) 

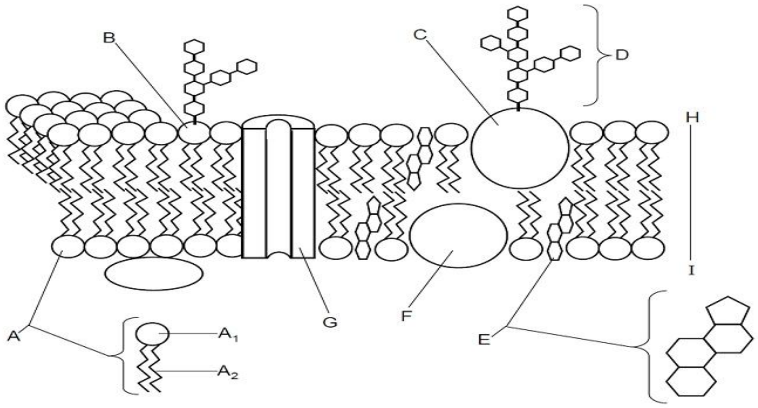
42. Which of the above processes illustrates one example of facilitated diffusion happening in the cells lining the small intestine?

A) A B) B C) C D) none of the above

43. Carrier molecules and metabolic energy are required for which of the above processes?
A) A B) B C) C D) all of the above

44. Which of the above processes can move a solute against its concentration gradient?
A) A B) B C) C D) all of the above E) none of the above

Use the following image to answer questions 45-48.



45. The interior of the above structure, represented by the zigzag lines, is
A) hydrophillic B) hydrophobic C) water D) composed entirely of cholesterol E) 4

46. Water crosses the above structure by
A) osmosis B) phagocytosis C) active transport D) pinocytosis E) passive transport

47. Oxygen crosses the above structure by
A) osmosis B) phagocytosis C) active transport D) pinocytosis E) passive transport

48. What part of the above structure are most likely used in cell-to-cell recognition?
A) A B) G C) E D) D

49. The organelle that is a major producer of ATP and is found in both heterotrophs and autotrophs is the
A) chloroplast B) nucleus C) ribosome D) Golgi apparatus E) mitochondrion

50. The carbon that makes up organic molecules in plants is derived directly from
A) combustion of fuels B) carbon fixed in photosynthesis C) carbon dioxide produced in respiration
D) carbon in the lithosphere E) coal mines

51. When biologists wish to study the internal ultrastructure of cells, they most likely would use
A) light microscope B) scanning electron microscope
C)transmission electron microscope D) A and C E) A, B and C

52. Which of the following best describes metabolism?
A) synthesis of macromolecules
B) breakdown of macromolecules
C)control of enzyme activity
D) A and B
E) A, B, and C

53. Which of the following is true regarding the catabolic process?
A) They release energy as they degrade polymers to monomers.
B) They do not depend on enzymes.
C) They consume energy to build up polymers from monomers.
D) They lead to the synthesis of catabolic compounds.
E) B and C are correct

54. To which of the following is the structure of ATP most closely related?
A) a double helix B) an RNA nucleotide C) a phospholipid
D) a steroid E) an amino with three phosphates attached

55. Which of the following is important about the role that ATP plays in metabolism?
A) It energizes other molecules by transferring phosphate groups
B) Its phosphate bonds are easily formed and broken
C) Hydrolysis of its phosphate groups is endergonic
D) A and B are correct
E) A, B and C are correct

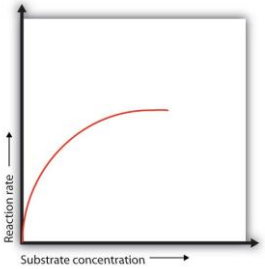
56. Which of the following is true of an enzyme that has undergone denaturation?
A) its primary structure has not been disrupted
B) it is still able to catalyze the reaction for which it is specific
C) it is capable of lowering the activation energy of a reaction
D) its active site can still bind to a ligand

57. A competitive inhibitor of an enzyme exerts its effect by
A) irreversibly forming covalent links with the enzyme, effectively preventing the enzymes dissociation from it
B) irreversibly modifying some of the amino acid residues that help to comprise the enzyme's active site
C) competing with the substrate molecule for the same enzyme but a different binding site than the substrate binding site
D) reversibly decreasing the number of enzyme molecules that are available to bind substrates
E) reversibly decreasing the enzyme's turnover number

58. How does an enzyme catalyze a reaction?
A) by supplying the energy to speed up a reaction
B) by lowering the energy of activation of a reaction
C) by lowering the ΔG of a reaction
D) by changing the equilibrium of a spontaneous reaction
E) by increasing the amount of free energy of a reaction

59. Which of these statements regarding enzymes is *false*?
A) Enzymes are proteins that function as catalysts
B) Enzymes display specificity for certain molecules to which they attach
C) Enzymes provide activation energy for the reactions they catalyze
D) The activity of enzymes can be regulated by factors in their immediate environment
E) An enzyme may be used many times over for a specific reaction

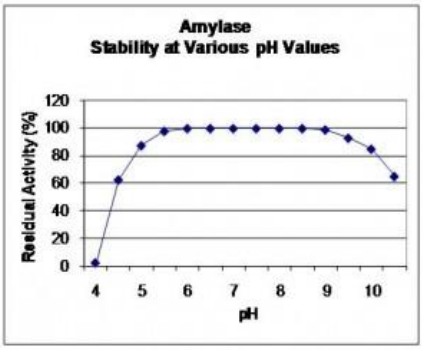
Use the following graph to answer question 60.

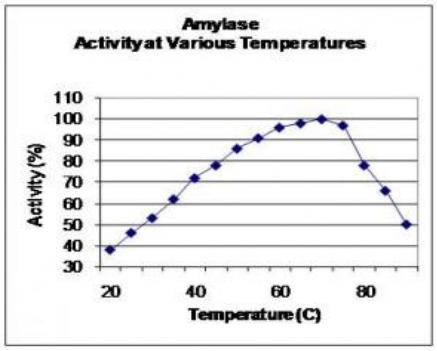


60. Assuming enzyme concentration is constant, why does the graph level off at high substrate concentration?

A) all the enzyme is used up and product formation cannot occur without it
B) there is no more substrate to be converted into product
C) substrate concentration exceeds enzyme concentration and all active sites are saturated
D) the reaction has run to completion
E)an inhibitor has been added and it has slowed down the rate of product formation

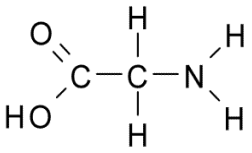
Biology students conducted an experiment to see how the enzyme amylase was affected by temperature and pH. The following graphs show their findings. Use the graphs to answer questions 61-63.



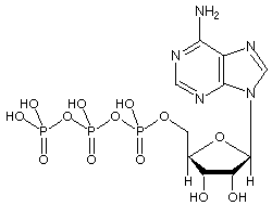


61. The enzyme observed in this experiment breaks down which of the following

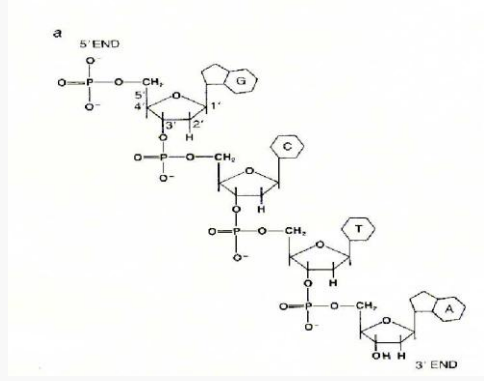
A)



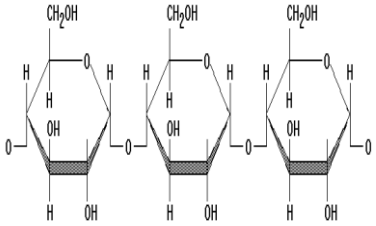
B)



C)



D)

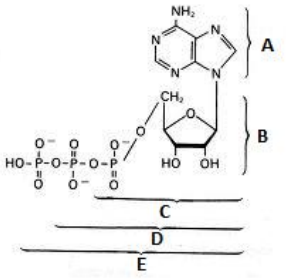


62. The enzyme tested above can be found in humans in which of the following?

A) salivary glands B) pancreas C) intestinal walls
D) A and B are correct E) A, B and C are correct

63. The data in the graph above shows the optimal temperature for amylase is
A) 20°C B) 40°C C) 60°C D) 70°C E) 80°C

Use the following image to answer questions 64-67.



64. The entire molecule above represents which of the following?
A) adenine B) ribose C) phosphate group D) ADP E) ATP

65. What type of reaction is responsible for breaking down molecule "E" to molecule "D" ?
A)anabolism B) hydrolysis C) dehydration decomposition D) dehydration synthesis

66. The reaction described in question 65 is
A) exergonic B) endergonic C) neutral D) polygonic

67. What is the fate of the phosphate group that is removed when molecule "E" is changed to molecule "D"
A) it is used to convert ATP into AQP
B) it is acquired by a reactant in an endergonic reaction
C) it is acquired by a reactant in a spontaneous reaction
D) it is acquired by a reactant in an exergonic reaction
E) it is broken down into one phosphorus and four oxygen atoms

68. During an experiment, students were waiting for a solution of starch to decompose to a sugar solution at room temperature. They found it does not decompose rapidly. Which of the following reasons is the probable inhibitor?
A) the starch solution has less free energy than the sugar solution
B) the hydrolysis of starch to sugar is endergonic
C) the activation energy barrier cannot be surmounted in most of the starch molecules.
D) starch cannot be hydrolyzed in the presence of so much water.
E) starch hydrolysis is nonspontaneous.

69. The essential trace element, Zinc, is presented in the active site of the enzyme carboxypeptidase. The zinc most likely functions as which of the following?
A) competitive inhibitor of the enzyme
B) noncompetitive inhibitor of the enzyme
C) cofactor necessary for enzyme activity
D) allosteric activator of the enzyme
E) coenzyme derived fro a vitamin

70. Which of the following statements about diffusion is true?
A) It is very rapid over long distances
B) It requires an expenditure of energy by the cell
C) It is a passive process in which molecules move from a region of higher concentration to a region of lower concentration
D) It is an active process in which molecules move from a region of lower concentration to one of higher concentration
E) It requires integral proteins in the cell membrane

71. Which of the following cellular activities does NOT require ATP?
A) protein synthesis
B) movement of O_2 into a lung cell
C) exocytosis
D) Na^+ ions moving out of a nerve cell

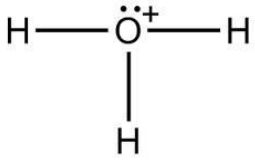
72. If red blood cells are placed in a hypertonic solution, which of the following would occur?
A) hemolysis
B) crenation
C) phagocytosis
D) pinocytosis

Use the following chemical symbol to answer questions 73-74.

73. What is the name of the above chemical symbol?
A) water B) DNA C) hydronium ion D) hydroxide ion E) glucose

74. What is the charge of the above chemical symbol?
A) +2 B) +1 C) 0 D) -1 E) -2

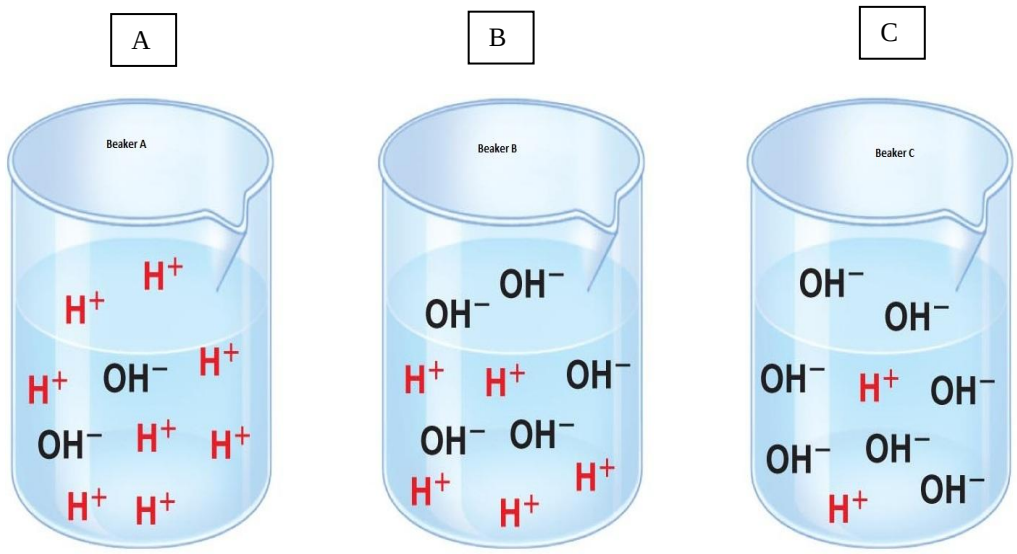
Use the following chemical symbol to answer questions 75-76.



75. What is the name of the above chemical symbol?
A) water B) DNA C) hydronium ion D) hydroxide ion E) glucose

76. How did this molecule form?
A) two water molecules bonded
B) a water molecule gained a hydrogen ion from another water molecule
C) a hydrogen molecule bonded with an OH^- molecule
D) evaporation
E) a water molecule split in half

Use the following image to answer question 77.



77. Which of the beakers above contains a solution considered to be acidic?
A) Beaker A B) Beaker B C) Beaker C D) Beaker A and B E) Beaker A, B and C

78. Modern travel along with migration reduces the probability of _____ having an effect on the evolution of humans.
A) gene flow B) mutation C) disease D) genetic drift E) natural selection

79. Which of these provides the best evidence of the common ancestry of all life?
A) the ubiquitous use of catalysts by living systems
B) the universality of the genetic code
C) the structure of the nucleus
D) the structure of cilia
E) the structure of chloroplasts

80. Which of the following is true of natural selection?
A) requires genetic variation
B) results in descent with modification
C) involves differential reproductive success
D) B and C only
E) A, B and C

New Jersey Science League

Biology I Answer Key

Date: JANUARY 12, 2012

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

BIOLOGY I : No AP or second year students in this category. NOTE: Consistent with a modern approach to biology, principles of evolution will be included in every test as these apply to topics listed.

JANUARY TEST - the process of science, principles of evolution natural selection, structure of matter (basic chemistry including the chemistry of water and pH), "biomolecules" (carbohydrates, proteins, lipids), microscopy, measurement, cell structure and function, diffusion, osmosis, active transport, cell metabolism, enzymes, ATP, philosophy/history and experiments pertaining to the preceding topics.

FEBRUARY TEST - evolution, mitosis/meiosis, patterns of genetic inheritance, DNA/RNA (structure, transcription, translation) ,viruses, bacteria, cell structure and function, photosynthesis, cell respiration, enzymes, philosophy/history and experiments pertaining to the preceding topics.

MARCH TEST - evolution, principles of taxonomy, phylogeny and classification, non-human animal structure/function/systems, plant structure/function/systems, life cycles, embryology, organismic reproduction, fungi, algae, ecology (ecological relationships and succession), disease, mitosis/meiosis, philosophy/history and experiments pertaining to the preceding topics.

APRIL TEST - evolution, biotechnology (genetic engineering, PCR, DNA fingerprinting, DNA manipulation, bioinformatics, stem cells), populations, ecology (matter and energy in the living world), inherited and acquired disease, philosophy/history and experiments pertaining to the preceding topics.

Topic elimination for the April Biology I exam. human anatomy &physiology, human nutrition, embryology, animal/plant behavior.

Testing Dates for 2012

Thursday January 12, 2012, Thursday Feb 9, 2012;

Thursday March 8, 2012; *Thursday April 12, 2012

***The April 2011 exam can be changed based upon the Schools spring break.**

New Jersey Science League

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Science League Biology I February 2012 Exam

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, **scho**ol, **area**, and **which test** you are taking onto the scan-tron.

1) Autotrophic eukaryotes and autotrophic prokaryotes differ in that some autotrophic prokaryotes
A. are decomposers.
B. can use the energy from inorganic chemicals.
C. have membrane-bound organelles.
D. cannot manufacture their own food.

2) Which of the following conditions would be *unsuitable* for any kind of bacteria to grow?
A. temperature of 110ºC (230ºF)
B. absence of oxygen
C. pH of 5
D. None of the above is unsuitable

3) Tobacco mosaic virus
A. is able to be crystallized.
B. causes disease in tobacco plants.
C. is smaller than a bacterium.
D. All of the above are correct

4) Most scientists think that early viruses originated from
A. other viruses.
B. existing cell parts.
C. animals.
D. spontaneous generation.

5) Which of the following is characteristic of the lytic cycle?
A. Viral DNA is incorporated into the host genome.
B. The viral genome replicates without destroying the host.
C. A large number of phages is released at a time.
D. The virus-host relationship usually lasts for generations.

6) Which of the following terms describes bacteriophage DNA that has become integrated into the host cell chromosome?
A. intemperate bacteriophages
B. transposons
C. prophages
D. T-even phages

7) Antiviral drugs that have become useful are usually associated with which of the following properties?
A. ability to remove all viruses from the infected host
B. interference with the viral reproduction
C. prevention of the host from becoming infected
D. removal of viral proteins

8) Emerging viruses arise by
A. mutation of existing viruses.
B. the spread of existing viruses to new host species.
C. the spread of existing viruses more widely within their host species.
D. all of the above

9) To cause a human pandemic, the H5N1 avian flu virus would have to
A. spread to primates such as chimpanzees.
B. develop into a virus with a different host range.
C. become capable of human-to-human transmission.
D. arise independently in chickens in North and South America.

10) Which of these is the *most* common compound in the cell walls of gram-positive bacteria?

A. cellulose
B. lipopolysaccharide
C. lignin
D. peptidoglycan

11) Jams, jellies, preserves, honey, and other foodstuffs with a high sugar content hardly ever become contaminated by bacteria, even when the food containers are left open at room temperature. This is because bacteria that encounter such an environment

A. undergo death by plasmolysis.
B. are unable to metabolize the glucose or fructose, and thus starve to death.
C. undergo death by lysis.
D. are obligate anaerobes.

12) How do the daughter cells at the end of mitosis and cytokinesis compare with their parent cell when it was in G_1 of the cell cycle?

A. The daughter cells have half the amount of cytoplasm and half the amount of DNA.
B. The daughter cells have half the number of chromosomes and half the amount of DNA.
C. The daughter cells have the same number of chromosomes and half the amount of DNA.
D. The daughter cells have the same number of chromosomes and the same amount of DNA.

13) The earliest time in mitosis that we see two centrosomes are arranged at opposite poles of the cell is during

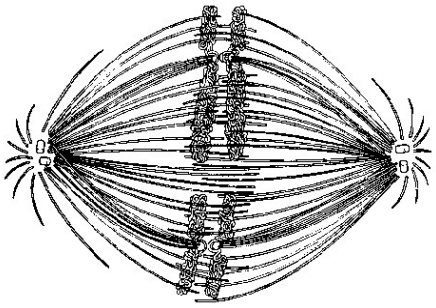
A. late telophase
B. anaphase
C. late prophase
D. metaphase

14) Which of the mitotic stages takes the longest time?

A. telophase
B. anaphase
C. prometaphase
D. metaphase

15) 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



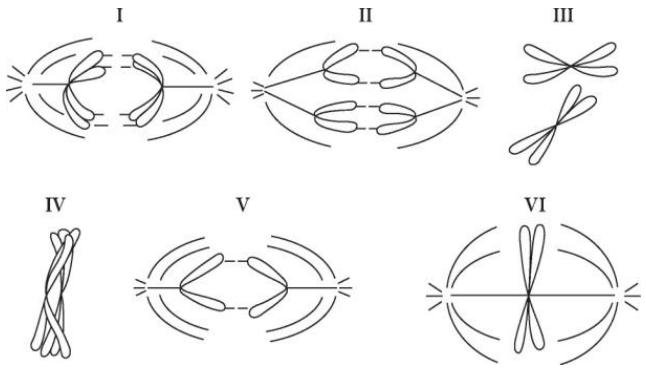
16) If the cell whose nuclear material is shown in the figure above continues toward completion of mitosis, which of the events listed below would be the first to follow?

A. formation of telophase nuclei
B. spindle fiber formation
C. nuclear envelope breakdown
D. cell membrane synthesis

17) A gene's location along a chromosome is known as which of the following?

A. Allele
B. Sequence
C. Locus
D. Variant

Refer to the drawings in the Figure below of a single pair of homologous chromosomes as they might appear during various stages of either mitosis or meiosis, and answer the following question.



18) Which diagram represents prophase I of meiosis?

A. I
B. II
C. IV
D. V

19) Which one of the following statements is *true*?

A. Prokaryotes divide by mitosis.
B. Eukaryotes have circular chromosomes.
C. Animal cells form new cell walls when they divide.
D. Cytokinesis differs in plant cells and animal cells.

20) The difference between anaphase of mitosis and anaphase I of meiosis is that

A. the chromosomes line up at the equator in anaphase I.
B. centromeres do not exist in anaphase I.
C. chromatids do not separate at the centromere in anaphase I.
D. crossing-over occurs only in anaphase of mitosis.

21) ATTG : TAAC ::

A. AAAT : TTTG
B. TCGG : AGAT
C. GTCC : CAGG
D. CGAA : TGCG

22) The addition of nucleotides to form a complementary strand of DNA

A. is catalyzed by DNA polymerase.
B. is accomplished only in the presence of tRNA.
C. prevents separation of complementary strands of RNA.
D. is the responsibility of the complementary DNA mutagens.

mRNA: GUCACGUGCUUC
Genetic Code:

	U	C	A	G	
U	Phe	Ser	Tyr	Cys	**U**
	Phe	Ser	Tyr	Cys	**C**
	Leu	Ser	stop	stop	**A**
	Leu	Ser	stop	Trp	**G**
C	Leu	Pro	His	Arg	**U**
	Leu	Pro	His	Arg	**C**
	Leu	Pro	Gln	Arg	**A**
	Leu	Pro	Gln	Arg	**G**
A	Ile	Thr	Asn	Ser	**U**
	Ile	Thr	Asn	Ser	**C**
	Ile	Thr	Lys	Arg	**A**
	Met	Thr	Lys	Arg	**G**
G	Val	Ala	Asp	Gly	**U**
	Val	Ala	Asp	Gly	**C**
	Val	Ala	Glu	Gly	**A**
	Val	Ala	Glu	Gly	**G**

23) Refer to the illustration above. Which of the following is the series of amino acids encoded by the piece of mRNA shown above?

A. Ser—Tyr—Arg—Gly
B. Val—Thr—Cys—Phe
C. Leu—Lys—Cys—Phe
D. Pro—Glu—Leu—Val

24) Suppose that you are given a polypeptide sequence containing the following sequence of amino acids: tyrosine, proline, aspartic acid, isoleucine, and cysteine. Use the portion of the genetic code given in the table below to determine the DNA template strand sequence that codes for this polypeptide sequence.

mRNA	**Amino acid**
UAU, UAC	tyrosine
CCU, CCC, CCA, CCG	proline
GAU, GAC	aspartic acid
AUU, AUC, AUA	isoleucine
UGU, UGC	cysteine

A. AUGGGUCUAUAUACG
B. ATGGGTCTATATACG
C. GCAAACTCGCGCGTA
D. ATTGGGCTTTAAACA

25) Transcription proceeds when RNA polymerase

A. attaches to a ribosome.
B. binds to a promoter on a strand of DNA.
C. binds to a strand of RNA.
D. unwinds the DNA molecule

26) The transfer of genetic material from one cell to another, which Frederick Griffith studied, is called

A. transformation.
B. transduction.
C. recombination.
D. genetic transfer.

27) Cells must control gene expression so that

A. their genes will only be expressed when needed.
B. their genes will always be expressed.
C. their genes will never be expressed.
D. genetic disorders can be corrected

28) Using RNA as a template for protein synthesis instead of translating proteins directly from the DNA is advantageous for the cell because
A. RNA is much more stable than DNA.
B. RNA acts as an expendable copy of the genetic material.
C. only one mRNA molecule can be transcribed from a single gene, lowering the potential rate of gene expression.
D. tRNA, rRNA and others are not transcribed.

29) A particular triplet of bases in the template strand of DNA is 5' AGT 3'. The corresponding codon for the mRNA transcribed is
A. 3' UCA 5'.
B. 3' UGA 5'.
C. 5' TCA 3'.
D. either UCA or TCA, depending on wobble in the first base.

30) Which of the following help(s) to stabilize mRNA by inhibiting its degradation?
A. TATA box
B. spliceosomes
C. 5' cap and poly (A) tail
D. introns

31) Introns are significant to biological evolution because
A. their presence allows exons to be shuffled.
B. they protect the mRNA from degeneration.
C. they are translated into essential amino acids.
D. they maintain the genetic code by preventing incorrect DNA base pairings.

32) How did the improvement of microscopy techniques in the late 1800s set the stage for the emergence of modern genetics?
A. It revealed new and unanticipated features of Mendel's pea plant varieties.
B. It allowed the study of meiosis and mitosis, revealing parallels between behaviors of genes and chromosomes.
C. It allowed scientists to see the DNA present within chromosomes.
D. It led to the discovery of mitochondria.

33) Males are more often affected by sex-linked traits than females because
A. males are hemizygous for the X chromosome.
B. male hormones such as testosterone often alter the effects of mutations on the X chromosome.
C. female hormones such as estrogen often compensate for the effects of mutations on the X.
D. X chromosomes in males generally have more mutations than X chromosomes in females.

34) Red-green color blindness is a sex-linked recessive trait in humans. Two people with normal color vision have a color-blind son. What are the genotypes of the parents?
A. X^cX^c and X^cY
B. X^cX^c and X^CY
C. X^CX^c and X^CY
D. X^CX^C and X

35) A Barr body is normally found in the nucleus of which kind of human cell?
A. Unfertilized egg cells only
B. Sperm cells only
C. Somatic cells of a female only
D. Somatic cells of a male only

36) One possible result of chromosomal breakage is for a fragment to join a nonhomologous chromosome. What is this alteration called?

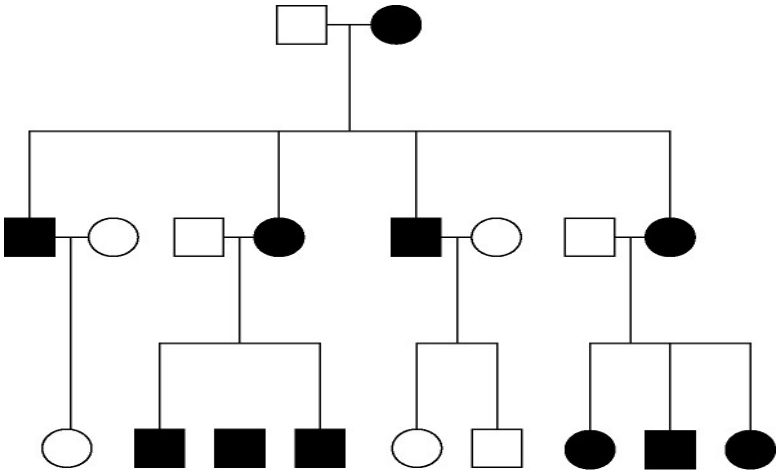
A. Deletion
B. Disjunction
C. Inversion
D. Translocation

37) The frequency of Down syndrome in the human population is most closely correlated with which of the following?

A. Frequency of new meiosis
B. Average of the ages of mother and father
C. Age of the mother
D. Exposure of pregnant women to environmental pollutants

38) What is the source of the extra chromosome 21 in an individual with Down syndrome?

A. Nondisjunction in the mother only
B. Nondisjunction in the father only
C. Duplication of the chromosome in the zygote after fertilization
D. Nondisjunction or translocation in either parent



39) The pedigree in the Figure above shows the transmission of a trait in a particular family. Based on this pattern of transmission, the trait is most likely

A. mitochondrial.
B. inherited by non-dominance.
C. sex-linked dominant.
D. sex-linked recessive.

40) Which of the following investigators was/were responsible for the following discovery? In DNA from any species, the amount of adenine equals the amount of thymine, and the amount of guanine equals the amount of cytosine.

A. Frederick Griffith
B. Alfred Hershey and Martha Chase
C. Oswald Avery, Maclyn McCarty, and Colin MacLeod
D. Erwin Chargaff

41) Which would you expect of a eukaryotic cell lacking telomerase?

A. a high probability of becoming cancerous
B. production of Okazaki fragments
C. inability to repair thymine dimers
D. a reduction in chromosome length

42) How do histones bind tightly to DNA?
A. Histones are positively charged, and DNA is negatively charged.
B. Histones are negatively charged, and DNA is positively charged.
C. Both histones and DNA are strongly hydrophobic.
D. Histones are covalently linked to the DNA.

43) In his work with pneumonia-causing bacteria and mice, Griffith found that
A. the protein coat from pathogenic cells was able to transform nonpathogenic cells.
B. heat-killed pathogenic cells caused pneumonia.
C. some substance from pathogenic cells was transferred to nonpathogenic cells, making them pathogenic.
D. the polysaccharide coat of bacteria caused pneumonia.

44) The enzyme amylase can break glycosidic linkages between glucose monomers only if the monomers are the α form. Which of the following could amylase break down?
A. glycogen
B. cellulose
C. chitin
D. A and B only

45) Humans can digest starch but not cellulose because
A. the monomer of starch is glucose, while the monomer of cellulose is galactose.
B. humans have enzymes that can hydrolyze the beta (β) glycosidic linkages of starch but not the alpha (α) glycosidic linkages of cellulose.
C. humans have enzymes that can hydrolyze the alpha (α) glycosidic linkages of starch but not the beta (β) glycosidic linkages of cellulose.
D. humans harbor starch-digesting bacteria in the digestive tract.

46) DNAase is an enzyme that catalyzes the hydrolysis of the covalent bonds that join nucleotides together. What would first happen to DNA molecules treated with DNAase?
A. The two strands of the double helix would separate.
B. The phosphodiester bonds between deoxyribose sugars would be broken.
C. The purines would be separated from the deoxyribose sugars.
D. The pyrimidines would be separated from the deoxyribose sugars.

47) Enzymes are
A. carbohydrates.
B. lipids.
C. proteins.
D. nucleic acids.

48) A model of enzyme action is the
A. induced fit model.
B. lipid bilayer model.
C. activator action model.
D. active site model.

49) Without enzymes, the 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.

50) Enzymes
A. are able to heat up molecules so that they can react.
B. provide CO_2 for chemical reactions.
C. are biological catalysts.
D. absorb excess heat so that reactions occur at low temperatures.

51) 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.

52) A cell that can change its shape would be well suited for
A. receiving and transmitting nerve impulses.
B. forming sheets of tissue that cover the body surface.
C. moving to different tissues through narrow openings.
D. All of the above

53) One difference between prokaryotic cell and eukaryotic cells is that
A. nucleic acids are found only in prokaryotes.
B. eukaryotic cells contain greater numbers of mitochondria than do prokaryotic cells
C. the Golgi apparatus is found only in prokaryotes.
D. prokaryotes have no nuclear membrane.

54) 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.

55) 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.

56) The volume enclosed by the plasma membrane of plant cells is often much larger than the corresponding volume in animal cells. The most reasonable explanation for this observation is that
A. plant cells are capable of having a much higher surface-to-volume ratio than animal cells.
B. plant cells have a much more highly convoluted (folded) plasma membrane than animal cells.
C. plant cells contain a large vacuole that reduces the volume of the cytoplasm.
D. animal cells are more spherical, while plant cells are elongated.

57) Which of the following is a major cause of the size limits for certain types of cells?
A. the evolution of larger cells after the evolution of smaller cells
B. the difference in plasma membranes between prokaryotes and eukaryotes
C. the evolution of eukaryotes after the evolution of prokaryotes
D. the need for a surface area of sufficient area to allow the cell's function

58) Which type of organelle is primarily involved in the synthesis of oils, phospholipids, and steroids?
A. ribosome
B. lysosome
C. smooth endoplasmic reticulum
D. mitochondrion

59) In animal cells, hydrolytic enzymes are packaged to prevent general destruction of cellular components. Which of the following organelles functions in this compartmentalization?

A. chloroplast
B. lysosome
C. central vacuole
D. peroxisome

60) Which of the following produces and modifies polysaccharides that will be secreted?

A. lysosome
B. vacuole
C. mitochondrion
D. Golgi apparatus

61) Which is one of the main energy transformers of cells?

A. lysosome
B. vacuole
C. mitochondrion
D. Golgi apparatus

62) Which of the following contains its own DNA and ribosomes?

A. lysosome
B. vacuole
C. mitochondrion
D. Golgi apparatus

63) A biologist ground up some plant leaf cells and then centrifuged the mixture to fractionate the organelles. Organelles in one of the heavier fractions could produce ATP only in the light, while organelles in the lighter fraction could also produce ATP in the dark. The heavier and lighter fractions are most likely to contain, respectively,

A. mitochondria and chloroplasts.
B. chloroplasts and mitochondria.
C. peroxisomes and chloroplasts.
D. chloroplasts and peroxisome

64) Which of the following contain the 9 + 2 arrangement of microtubules?

A. cilia
B. centrioles
C. flagella
D. A and C only

65) Cyanide binds with at least one molecule involved in producing ATP. If a cell is exposed to cyanide, most of the cyanide would be found within the

A. mitochondria.
B. ribosomes.
C. peroxisomes.
D. lysosomes.

66) Who proposed that the membrane is a mosaic of protein molecules bobbing in a fluid bilayer of phospholipids?

A. H. Davson and J. Danielli
B. I. Langmuir
C. C. Overton
D. S. Singer and G. Nicolson

67) Which of the following statements describes the results of this reaction?

$$C_6H_{12}O_6 + 6\,O_2 \rightarrow 6\,CO_2 + 6H_2O + \text{Energy}$$

A. $C_6H_{12}O_6$ is oxidized and O_2 is reduced.
B. O_2 is oxidized and H_2O is reduced.
C. CO_2 is reduced and O_2 is oxidized.
D. $C_6H_{12}O_6$ is reduced and CO_2 is oxidized.

68) Where does glycolysis take place?

A. cytosol
B. mitochondrial outer membrane
C. mitochondrial inner membrane
D. mitochondrial matrix

69) During glycolysis, when glucose is catabolized to pyruvate, most of the energy of glucose is

A. transferred to ADP, forming ATP.
B. transferred directly to ATP.
C. retained in the pyruvate.
D. stored in the NADH produced.

70) How does pyruvate enter the mitochondrion?

A. active transport
B. diffusion
C. facilitated diffusion
D. through a channel

71) The primary role of oxygen in cellular respiration is to
A. yield energy in the form of ATP as it is passed down the respiratory chain.
B. act as an acceptor for electrons and hydrogen, forming water.
C. combine with carbon, forming CO_2.
D. combine with lactate, forming pyruvate.

72) Which of the following produces the most ATP when glucose ($C_6H_{12}O_6$) is completely oxidized to carbon dioxide, CO_2 and water?
A. glycolysis
B. fermentation
C. oxidation of pyruvate to acetyl CoA
D. oxidative phosphorylation (chemiosmosis)

73) Which metabolic pathway is common to both cellular respiration and fermentation?
A. the oxidation of pyruvate to acetyl CoA
B. glycolysis
C. oxidative phosphorylation
D. chemiosmosis

74) Where does the Calvin cycle take place?
A. stroma of the chloroplast
B. thylakoid membrane
C. cytoplasm surrounding the chloroplast
D. chlorophyll molecule

75) In autotrophic bacteria, where are the enzymes located that can carry on organic synthesis?
A. chloroplast membranes
B. along the inner surface of the plasma membrane
C. free in the cytosol
D. along the outer edge of the nucleoid

76) CAM plants keep stomata closed in daytime, thus reducing loss of water. They can do this because they
A. fix CO_2 into organic acids during the night.
B. fix CO_2 into sugars in the bundle-sheath cells.
C. fix CO_2 into pyruvate in the mesophyll cells.
D. use the enzyme phosphofructokinase, which outcompetes rubisco for CO_2.

77) As a young biologist, Charles Darwin had expected the living plants of temperate South America would resemble those of temperate Europe, but he was surprised to find that they more closely resembled the plants of *tropical* South America. The biological explanation for this observation is most properly associated with the field of
A. biogeography.
B. embryology.
C. vertebrate anatomy.
D. bioengineering

78) If the HMS *Beagle* had completely bypassed the Galapagos Islands, Darwin would have had a much poorer understanding of the
A. relative stability of a well-adapted population's numbers over many generations.
B. ability of populations to undergo modification as they adapt to a particular environment.
C. tendency of organisms to produce the exact number of offspring that the environment can support.
D. unlimited resources that support population growth in most natural environments.

79) Which of these is the smallest unit upon which natural selection directly acts?
A. a species' gene frequency
B. an individual's phenotype
C. an individual's genome
D. an individual's genotype

80) Artificial selection has been used by humans to
A. speed up the process of divergent evolution.
B. slow down the process of convergent evolution.
C. stop evolution in domestic animals.
D. study the process of coevolution.

New Jersey Science League
Biology 1 Answer Key
Date: February 2012

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

BIOLOGY I : No AP or second year students in this category. NOTE: Consistent with a modern approach to biology, principles of evolution will be included in every test as these apply to the topics listed.

JANUARY TEST - the process of science, principles of evolution natural selection, structure of matter (basic chemistry including the chemistry of water and pH), "biomolecules" (carbohydrates, proteins, lipids), microscopy, measurement, cell structure and function, diffusion, osmosis, active transport, cell metabolism, enzymes, ATP, philosophy/history and experiments pertaining to the preceding topics.

FEBRUARY TEST - evolution, mitosis/meiosis, patterns of genetic inheritance, DNA/RNA (structure, transcription, translation) , viruses, bacteria, cell structure and function, photosynthesis, cell respiration, enzymes, philosophy/history and experiments pertaining to the preceding topics.

MARCH TEST - evolution, principles of taxonomy, phylogeny and classification, non-human animal structure/function/systems, plant structure/function/systems, life cycles, embryology, organismic reproduction, fungi, algae, ecology (ecological relationships and succession), disease, mitosis/meiosis, philosophy/history and experiments pertaining to the preceding topics.

APRIL TEST - evolution, biotechnology (genetic engineering, PCR, DNA fingerprinting, DNA manipulation, bioinformatics, stem cells), populations, ecology (matter and energy in the living world), inherited and acquired disease, philosophy/history and experiments pertaining to the preceding topics.

**Topic elimination for the April Biology I exam. human anatomy &physiology, human nutrition, embryology, animal/plant behavior.

TESTING DATES FOR THE NEW JERSEY SCIENCE LEAGUE
Thursday January 12, 2012, Thursday Feb 9, 2012;
Thursday March 8, 2012; *Thursday April 12, 2012

*The April exam must be completed by April 30th. No area may take the April exam during the first week of April or during the first week of May.

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Science League Biology I –March 8, 2012

Choose the best answer to the following:

Match the following names appropriately for questions 1-5.

A. Ernst Haeckel
B. Charles Lyell
C. Charles Darwin
D. Thomas Malthus
E. Jean Baptist LaMarck

1. He wrote theories about populations in response to various factors in his Essay on the Principle of Population.

2. This botanist and expert on invertebrates propose a theory regarding change through use and disuse.

3. Wrote *Origin of Species* and is considered to be father of evolution

4. He used embryology as evidence of ancestral relationships and coined terms and idea that ontogeny recapitulates phylogeny.

5. Author of *Principles of Geology*.

6. Two populations of mice were separated by the formation of a new river. Over time, the northern mice became smaller and whiter, while the southern mice became larger and browner. This is an example of

A. divergence B. homology C. gigantification D. industrial melanism

7. Dog breeds we have today, have been developed by

A. natural selection B. artificial selection C. sexual selection D. acquired selection

8. In natural selection, an adaptation

A. increases fitness B. decreases reproductive success C. increases competition
D. often results in the developing of vestigial structures

9. Which would be the best technique for determining the evolutionary relationships among several closely related living species?

A) examining the fossil record
B) comparison of homologous structures
C) comparative embryology
D) comparative anatomy
E) comparative DNA or RNA analysis

10. Which of the following disciplines has contributed least to the modern body of physical evidence for evolution?

A) biogeography
B) paleontology
C) taxonomy
D) molecular biology
E) comparative anatomy

11. Which of the following people (who will be referred to in questions 12 and 13) devised a taxonomic system that used morphological features as the primary criteria for classifying organisms?

A) Charles Darwin
B) Alfred Wallace
C) Charles Lyell
D) Jean Baptiste Lamarck
E) Carolus Linnaeus

12. On which of the following did the person in question #11 base his classification system?

A) evolutionary history
B) the fossil record
C) morphology and anatomy
D) embryology
E) all of the above

13. The person from #11 stated that, in evolutionary terms, the more closely related two species are, the

A) more similar they are in size
B) more similar their habitats are
C) more recently they shared a common ancestor
D) less similar their DNA sequences are
E) less likely they are to be related to fossil forms

14. The most basic classification unit of living things is
A)phylum B) class C) genus D) species E) kingdom

15. Which of the following is the correct scientific name of a species?
A) *Canis familiaris* B) *saccharum* C) coliform bacteria D) Darwin's turtles E) common quail

16. Use the following list to determine which pair represents the two most closely related plants.

broad bean *Vicia faba*
castor bean *Ricinus communis*
kidney bean *Phaseolus vulgaris*
potato bean *Apios americana*
scarlet runner bean *Phaseolus coccineus*

A) broad bean and castor bean B) castor bean and kidney bean C) kidney bean and potato bean
D) potato bean and scarlet runner bean E) scarlet runner bean and kidney bean

17. What trait differentiates wind-pollinated plants from insect-pollinated plants?
A) Wind-pollinated plants tend to have brighter petals than insect-pollinated plants.
B) Wind-pollinated plants tend to produce more nectar than insect-pollinated plants.
C) Insect-pollinated plants usually produce either pollen or ovules, but not both.
D) Wind-pollinated plants tend to produce pollen more copiously than insect-pollinated plants.

18. Unicellular prokaryotes are grouped into
A) fungi and protists
B) fungi and eubacteria
C) only fungi
D) only protists
E) fungi, protists, and eubacteria

19. Both unicellular yeasts and multicellular mushrooms are classified as
A) Animalia
B) Plantae
C) Protista
D) Fungi
E) Eubacteria

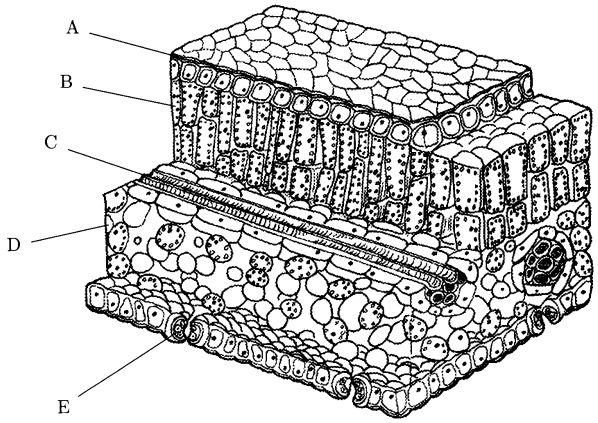
20. Viruses are usually classified as
A) Animalia
B) Plantae
C) Fungi
D) Eubacteria
E) none of the above

Use the labeled parts of the leaf diagram to answer questions 21-23.

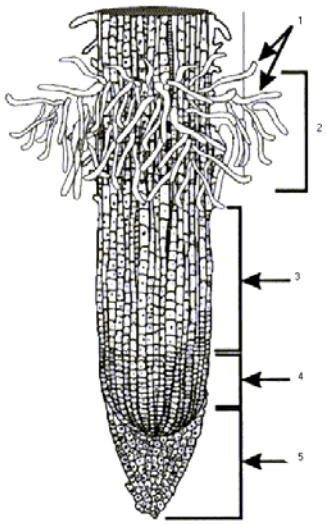
21. Transport occurs at

22. Most photosynthesis occurs at

23. Gas exchange and water loss occurs at



Use the following diagram of a root to answer questions 24-25.



24. One important difference between the anatomy of the leaf and the anatomy of the root is that
    A) leaves have epidermal tissue but roots do not
    B) only leaves have phloem and only roots have xylem
    C) root cells have cell walls, but leaf cells don't
    D) a waxy cuticle covers leaves but is absent in roots

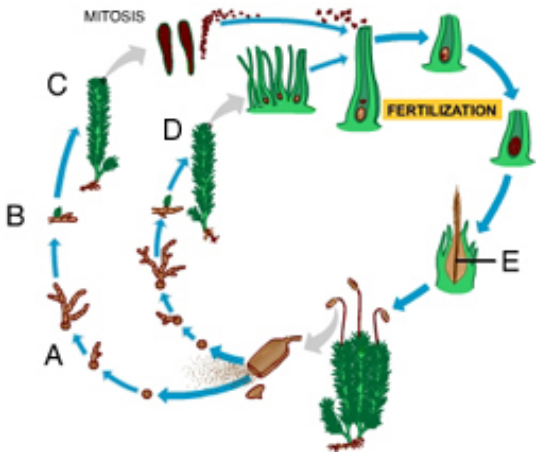
25. Which of the following is most important regarding the part labeled #1?
    A) anchor a plant in the soil
    B) store starches
    C) increase the surface area for absorption
    D) provide a habitat for nitrogen-fixing bacteria
    E) contain xylem tissue

26. Mychorrhizae enhance plant nutrition mainly by
    A) absorbing water and minerals through the fungal hyphae
    B) stimulating root hair development
    C) enabling the roots to parasitize surrounding plants
    D) changing atmospheric nitrogen to ammonia
    E) providing sugar to root cells

27. Which of the following are always products of meiosis in flowering plants?
    A) mature ovules
    B) sperm nuclei
    C) megaspores
    D) seeds

28. How and where are sperm produced in plants?
    A) meiosis in pollen grains
    B) meiosis in anthers
    C) mitosis in male gametophytes
    D) mitosis in the micropyle
    E) mitosis in the embryo sac

29. The main difference between a fruit and a seed
    A. is that a seed is a mature ovule and a fruit is amature ovary.
    B. is that a seed is diploid and a fruit is monoploid.
    C. is that a seed develops from the pistil and a fruit from the anther
    D. is that a seed develops from an ovary and a fruit develops from an ovule.



Use the diagram to the right to answer question #30.

30. Which choice labels the sporophyte generation of the moss life cycle?

31. In the angiosperm lifecycle, which of the following is not a member of the sporophyte generation?
    A) anther
    B) ovary
    C) carpel
    D) pollen

32. Which of the following parts of an earthworm provides the same function as the malpighian tubules of the grasshopper?
    A) Gizzard
    B) Crop
    C) Esophagus
    D) Ganglia
    E) Nephridia

33. Which of the following choices is not a site of gas exchange in animals?
A) skin
B) crop
C) lungs
D) spiracles
E) gills

Use the following answers for question 34.
A. Reptile B. Amphibian C. Grasshopper D. Earthworm E. Mammal

34. Which of the above organisms has an open circulatory system?

35. Which of these pairs of traits is characteristic of all vertebrates?
A) bilateral symmetry and a closed circulatory system
B) an exoskeleton and an open circulatory system
C) an efficient respiratory system and an asymmetrical body plan
D) a notochord and a complex brain

36. Eggs with shells evolved first in which of the following groups?
A) Birds B) Amphibians C) Fish D) Reptiles E) Mammals

37. Key evolutionary advances of the flatworms are bilateral symmetry and
A) internal organs
B) a coelom
C) a one-way digestive tract
D) a body cavity

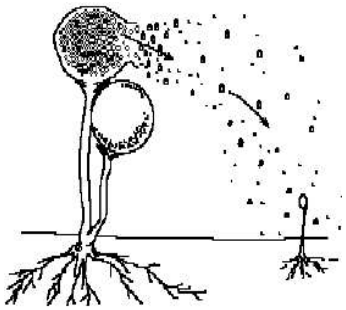
38. Most sponges are
A) asexual
B) hermaphrodites
C) predators
D) vertebrates
E) bilaterally symmetrical

39. In deuterostomes the blastopore develops into the
A) coelom
B) anus
C) brain
D) mouth
E) gastrula

40. Which statement is true regarding the development of vertebrates from zygote to fetus?
A. An organism's embryological development recapitulates its evolutionary history
B. Early embryos of different classes (e.g. mammals, birds, amphibians) are identical in structure
C. An early human embryo has features that resemble those found in the embryos of fish and birds
D. At various stages in its development, a human embryo displays features of mature, developed, adult fish and birds
E. An embryo begins as highly specialized and develops into more generalized features

41. In embryology, a morula
A) precedes a zygote but develops after a blastula
B) develops from a gastrula
C) consists of a ball of undifferentiated cells
D) has many of the features of the adult of the species

42. What type of reproduction is shown in the diagram to the right?
A) budding B) sporulation C) gametogenesis
D) regeneration



43. Which statement best explains why invertebrates are generally better able to regenerate tissues and organs than vertebrates can?
A) Invertebrates have a more highly developed circulatory system than vertebrates have.
B) Vertebrates have specialized cells, tissues, and organs for sexual reproduction, but invertebrates do not.
C) Invertebrates have more undifferentiated cells than vertebrates have.
D) Vertebrates have a central nervous system containing a brain and spinal cord, but invertebrates do not.

A student placed a leaf from the plant *Bryophyllum pinnata* on a pot of damp sandy soil. His observations show that several weeks later, young plants were growing from the edges of the leaf. Use this information to answer questions 44 and 45.

44. Which of the following methods of reproduction were demonstrated by the student's experiment?
    A) budding
    B) regeneration
    C) sexual reproduction
    D) vegetative propagation

45. The chromosomes in the young plants growing from the leaf are produced by
    A) mitosis
    B) meiosis
    C) sporulation
    D) buds

46. The release of spores from a mushroom is one type of
    A) binary fission
    B) gametogenesis
    C) meiosis
    D) asexual reproduction

47. If fungi did not exist, it would be really difficult…
    A) to make yogurt
    B) to grow plants in the desert
    C) to make wine
    D) to maintain a clean aquarium

48. Which of the following form the basic structural units of a multi-cellular fungus?
    A) septa B) chitins C) nuclei D) hyphae

49. Algal phyla are often differentiated by
    A) whether they can grow in salt water or fresh water
    B) the size of their flagella
    C) the kinds of photosynthetic pigments they possess
    D) the number of nuclei in each cell

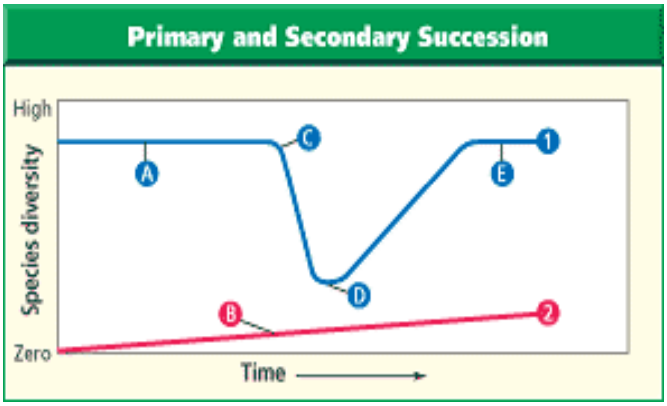
50. Which algal group has chloroplasts much like those of green plants in structure and pigment makeup?
    A) red algae
    B) brown algae
    C) golden algae
    D) diatoms
    E) chlorophytes

51. HABs, Harmful Algal Blooms, can have an adverse affect on
    A) humans B) coastal economies C) marine environments
    D) marine organisms E) all of the above

52. Harmful Algal Blooms are probably helped by
    A) increased competition for limited nutrients
    B) an increase in the population of filter feeders
    C) zebra mussels
    D) run off from agricultural fertilizer

53. Which type of organism is responsible for chestnut blight, a disease that has drastically reduced the population of chestnut trees in the United States and parts of Europe?
    A) a slime mold
    B) a fungus
    C) Harmful Algal Bloom
    D) protozoan
    E) diatom

54. What does line #2 (the bottom plotted line) represent in the graph to the right?
A) climax community
B) limiting factor
C) primary succession
D) secondary succession



55. Primary succession can begin after
A) a forest fire.
B) a lava flow.
C) farm land is abandoned.
D) a severe storm.

56. The symbiotic relationship between a flower and the insect that feeds on its nectar is an example of
A) mutualism because the flower provides the insect with food, and the insect pollinates the flower.
B) parasitism because the insect lives off the nectar from the flower.
C) commensalism because the insect does not harm the flower and the flower does not benefit from the relationship.
D) predation because the insect feeds on the flower.

57. Which is a biotic factor that affects the size of a population in a specific ecosystem?
A) average temperature of the ecosystem
B) type of soil in the ecosystem
C) number and kinds of predators in the ecosystem
D) concentration of oxygen in the ecosystem

58. Introduced species can have important effects on biological communities by
A) preying upon native species
B) competing with native species for resources
C) displacing native species
D) reducing biodiversity
E) doing all of the above

59. Which of the following can contribute to density-dependent regulation of populations?
A) the accumulation of toxic wastes
B) intraspecific competition for nutrients
C) predation
D) all of the above
E) none of the above

60. Which of the following major events stimulated an increase in human population?
A) advent of agriculture
B) industrial revolution
C) discovery of vaccines
D) discovery of antibiotics
E) all of the above

61. In a mature forest consisting of oak, maple and hickory trees, a disease causes a reduction in the number of acorns produced by oak trees. Of the scenarios below, which would be the LEAST likely to result from this event?
A) There might be fewer squirrels because they feed on acorns
B) There might be fewer mice and seed-eating birds because squirrels would eat more seeds and compete with the mice and birds
C) There might be an increase in the number of hickory seedlings because the competition between hickory nuts and acorns for germination sites would be reduced or eliminated
D) The owl population may decline because owl feed on squirrels and mice, whose populations would be reduced
E) There might be a decrease in the number of maple seedlings as the disease spreads to other trees in the forest.

62. Which of the following would most likely reduce your ecological footprint?
A) moving to a large house in the suburbs from an apartment in the city
B) buying your groceries at Wal-Mart instead of Shop-Rite
C) heating your home with coal instead of fuel oil
D) replacing the incandescent bulbs in your home with compact fluorescent ones
E) drinking bottled water instead of tap water

63. What is one difference between mitotic cell division in plants and mitotic cell division in animals?
A) The replicated chromosomes separate in plants but animals.
B) The nuclear membrane reforms in plants but not in animals.
C) A cell plate divides the cytoplasm in plants but not in animals.
D) Chromosomes are replicated in plants but not in animals.

Use the microscopic image to the right to answer questions 64-65.

64. What phase is shown in the microscopic image to the right?
A) prophase B) metaphase C) anaphase D) telophase

65. Which of the following organisms does not reproduce cells by the process shown above?
A) dog B) Pine tree C) bacterium D) ant E) mushroom

66. During which phase does a cell make a copy of its DNA?
A) interphase B) prophase C) metaphase
D) anaphase E) telophase

Use the image to the right to answer question 67.
67. Which phase does the image depict from meiosis?
A) prophase 1 B) metaphase 1 C) anaphase 1
D) prophase 2 E) metaphase 2

68. After fertilization the resulting zygote begins to divide by
A) syngamy
B) binary fission
C) mitosis
D) synapsis
E) meiosis

69. Which of the following cells are produced by meiosis?
A) epidermal cells B) liver cells C) sperm cells D) somatic cells E) all of the above

70. At which stage of mitosis are chromosomes photographed in the preparation of a karyotype?
A) prophase B) metaphase C) anaphase D) telophase E) interphase

71. One difference between a cancer cell and a normal cell is that
A) the cancer cell is unable to synthesize DNA
B) the cell cycle of the cancer cell is arrested at the S phase
C) cancer cells continue to divide even when they are tightly packed together
D) cancer cells cannot function properly because they suffer from density-dependent inhibition
E) cancer cells are always in the M phase of the cell cycle

72. Vinblastine, a standard chemotherapeutic drug used to treat cancer Since it interferes with the assembly of microtubules, its effectiveness must be related to
A) inhibition of regulatory protein phosphorylation
B) disruption of mitotic spindle formation
C) suppression of cyclin production
D) myosin denaturation and inhibition of cleavage furrow formation
E) inhibition of DNA synthesis

73. The presence of a cancerous mass in the lung is a direct result of
A) the introduction of toxins through breaks in the skin
B) prolonged exposure to very dry air
C) the uncontrolled division and growth of abnormal cells
D) meiotic division of normal cells

Table 39.1 Human Infectious Disease

Disease	Cause	Affected Organ System	Transmission
Smallpox	Virus	Skin	Droplet
Chicken pox	Virus	Skin	Droplet
Rabies	Virus	Nervous system	Animal bite
Poliomyelitis	Virus	Nervous system	Contaminated water
Colds	Viruses	Respiratory system	Direct contact
Influenza	Viruses	Respiratory system	Direct contact
HIV/AIDS	Virus	Immune system	Exchange of body fluids
Hepatitis B	Virus	Liver	Exchange of body fluids
Tetanus	Bacteria	Nervous system	Puncture wound
Food poisoning	Bacteria	Digestive system	Contaminated food/water
Strep throat	Bacteria	Respiratory system	Droplet
Diphtheria	Bacteria	Respiratory system	Droplet
Tuberculosis	Bacteria	Respiratory system	Droplet
Spinal meningitis	Bacteria	Nervous system	Droplet

74. Using table 39.1 which pair of diseases is transported by droplets?
A) smallpox and tuberculosis
B) diphtheria and rabies
C) hepatitis B and chicken pox
D) HIV/AIDS and influenza

75. Some fungi such as *Penicillium notatum* are known to produce antibiotics which prevent bacteria from growing near the fungus. This ability of fungi to produce antibiotics probably evolved
A. to prevent bacteria from breeding with fungi
B. because the fungus preys on the bacteria.
C. so humans could use the antibiotics in medicine.
D. because the fungi and the bacteria compete for similar resources.

76. In comparing and contrasting lung cancer and sickle cell anemia, which of the statements below is true?
A) Sickle cell anemia is curable. Lung cancer is not
B) Both can be caused by exposure to tobacco smoke
C) Both respond well to antibiotic therapy
D) Like lung cancer, sickle cell anemia is rarely fatal
E) Neither disease can be transmitted from person to person

77. English physician Edward Jenner worked in the late 1790s to develop safe vaccines that provided artificial acquired active immunity to _____.
A) measles
B) smallpox
C) polio
D) tetanus
E) malaria

78. Jonas Salk, the American medical researcher and virologist, is best known for the discovery and development of the first safe and effective vaccine for which of the following?
A) measles
B) smallpox
C) polio
D) tetanus
E) malaria

79. Vineyards sometimes experience an infestation of pathogenic fungi that grow on the roots of grape vines. The treatment often used is to cover the ground surrounding the vines with plastic sheets and then spraying a fungicide gas into the soil. Viticulturists involved in this practice are concerned that the
A) fungicide does not kill the native yeasts on the surfaces of the grapes
B) fungicide does not adversely affect insects
C) lichens on the plants are not adversely affected
D) fungicide does not affect the size or taste of the grapes
E) fungicide does not also kill the mycorrhizae

80. The coastal waters of New Jersey polluted with phosphate and nitrogen compounds from chicken farms showed above average levels of phosphates but not nitrogen. In an experiment, algae were grown in water samples some of which were controls, others of which had added phosphate or added ammonium. The nitrogen-enriched samples had the greatest algal growth; the phosphate-enriched and control samples both resulted in similar growth. The results of this experiment show
A) added nitrogen reduces eutrophication
B) above average levels of phosphate help control algal growth
C) nitrogen is the limiting nutrient in the water
D) reducing phosphate levels does not reduce phytoplankton production

New Jersey Science League
Biology I Answer Key
Date: March, 2012

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

BIOLOGY I TOPICS OF STUDY 2012 SEASON

January - cell structure, metabolism, enzymes, experiments, inorganic/organic compounds, photosynthesis, respiration, philosophy/history, structure of matter, diffusion, energy, ATP/P, measurement, pH, microscope.

February - classification, mitosis/meiosis, genetics, DNA/RNA, evolution, virus, experiments, cell structure, philosophy/history, photosynthesis, anaerobic/aerobic respiration, bacteria.

March - animal structure/function/systems, plant structure/function/systems, cycles, evolution, embryology, reproduction, history/philosophy, experiments, fungi, algae, ecology, disease, mitosis/meiosis.

April - human anatomy &physiology, nutrition, enzymes, embryology, populations, animal/plant behavior, ecology, cycles, regulation/homeostasis, disease, experiments, philosophy/history.

TESTING DATES FOR THE NEW JERSEY SCIENCE LEAGUE

Testing Dates for 2012

Thursday March 8, 2012; *Thursday April 12, 2012

***The April 2012 exam can be changed based upon the School's spring break.**

New Jersey Science League
PO Box 65 Stewartsville, NJ 08886-0065
phone # 908-213-8923 fax # 908-213-8924 email newjsl@ptd.net Web address www.enter.net/~njscil

Testing Dates 2013

Thursday January 10, 2013, Thursday Feb 14, 2013; Thursday March 14, 2013; *Thursday April 11, 2013

***The April 2013 exam can be changed based upon the School's spring break.**

NJSL Biology I
April Exam 2012

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.

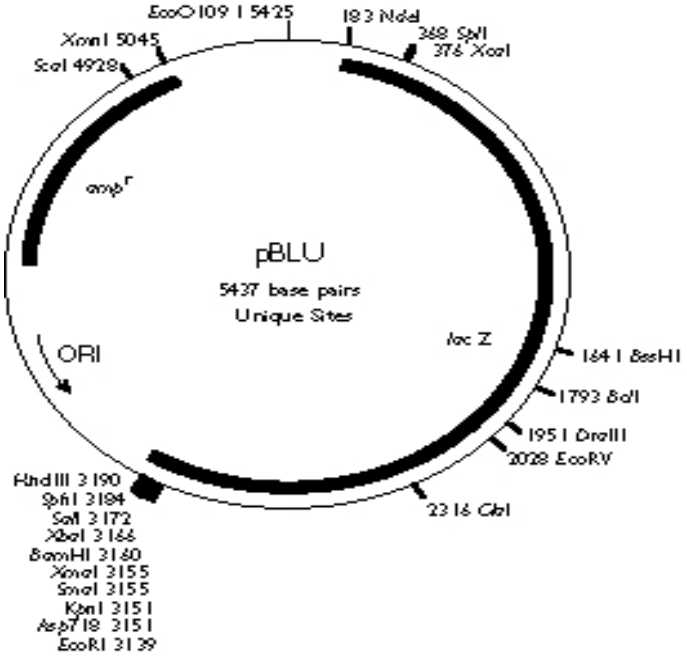
1. Features shared by two or more species that are inherited from the same common ancestor are
a. analogous.
b. aligned.
c. homologous.
d. coincident.
e. coordinate.

2. A hypothetical protein sequence taken from humans is 161 amino acids long. The homologous sequence in chimpanzees is 160 amino acids long. Which of the following is most likely needed to align the sequences?
a. A single substitution
b. A parallel substitution
c. A gap
d. A similarity matrix
e. An amino acid replacement

3. Which term includes all the others?
a. parasitism
b. symbiosis
c. mutualism
d. commensalism

4. When researchers apply the principles of evolution to produce new molecules that can be used for pharmaceuticals, they are
a. bioprospecting.
b. performing *in vitro* evolution.
c. performing concerted evolution.
d. using biomes.
e. ribozyming.

5. Examine the map of Plasmid pBLU. E. coli. Cells transformed with this plasmid
a. will glow in the dark
b. will be able to grow on medium containing ampicillin
c. can make insulin
d. cannot grow in the presence of antibiotics of any kind.



6. Individuals with PKU (phenylketonuria) are missing a(n)
a. lipoprotein.
b. prion.
c. oncogene.
d. enzyme.

7. People with sickle-cell disease have a(n) _____ abnormality.
a. phenylalanine hydrolyase
b. oncogene
c. cholesterol transport
d. hemoglobin
e. None of the above

8. Which of the following diseases is caused by a prion?
a. Sickle-cell anemia
b. PKU
c. Hemophilia
d. BSE (a.k.a. "mad cow disease")
e. Familial hypercholesterolemia

9. Cystic fibrosis results from
a. a non-functional membrane protein.
b. prions.
c. an improperly functioning enzyme.
d. genomic imprinting.
e. a bacterial infection

10. Which of the following diseases is a consequence of the absence of at least one blood clotting factor?
a. Huntington's disease
b. Fragile-X syndrome
c. Hemophilia
d. Kuru

11. Individuals who are heterozygous carriers of the gene for sickle cell anemia are often resistant to
a. mad cow disease.
b. tuberculosis.
c. malaria.
d. bubonic plague.
e. yellow fever

12. Individuals who are heterozygous carriers of the gene for PKU
a. show symptoms of the disease
b. can't have children
c. produce lower than normal levels of phenylalanine hydroxylase enzyme
d. are resistant to malaria

13. Individuals with a higher than average number of oncogenes
a. often develop color blindness.
b. have a greater than average life span.
c. are at greater risk of heart attack.
d. are at increased risk of developing cancer.
e. tend to die as fetuses.

14. Gene therapy is least likely to benefit individuals who suffer from
a. Type I diabetes
b. PKU
c. Sickle Cell Anemia
d. AIDS

15. The Hershey–Chase experiment persuaded most scientists that
a. bacteria can be transformed.
b. DNA is indeed the carrier of hereditary information.
c. DNA replication is semiconservative.
d. the transforming principle requires host factors.
e. All of the above

16. The base composition of DNA isolated from a newly discovered virus is found to be 32 percent A, 17 percent C, 32 percent G, and 19 percent T. What would be a reasonable explanation for this observation?
a. The virus must be extraterrestrial.
b. In some viruses, double-stranded DNA is made up of base pairs containing two purines or two pyrimidines.
c. Some of the T was converted to C during the isolation procedure.
d. The genome of the phage is single-stranded, not double-stranded.
e. The genome of the phage must be circular, not linear.

17. Large molecules of DNA can be broken down into smaller fragments by enzymes. These fragments can then be separated by
a. PCR
b. transformation
c. ligation
d. DNA sequencing
e. gel electrophoresis

18. The biome that makes up most of the central part of the United States is
a. deciduous forest b. tundra c. savanna d. temperate grassland e. coniferous forest

19. In the Meselson–Stahl experiment, the conservative model of DNA replication was ruled out by which of the following observations?
a. No completely "heavy" DNA was observed after the first round of replication.
b. No completely "light" DNA ever appeared, even after several replications.
c. The product that accumulated after two rounds of replication was completely "heavy."
d. Completely "heavy" DNA was observed throughout the experiment.
e. Three different DNA densities were observed after a single round of replication.

20. DNA sequencing technology is useful in all of the following except
a. Cutting a piece of DNA into R.F.L.P.'s.
b. Comparing the gene for Huntington's disease with a normal gene.
c. Determining what bases make up the gene for Green Fluorescent Protein.
d. Finding a site at which a particular restriction enzyme could cut a piece of DNA.

21. In DNA polymerization,
a. DNA polymerases add deoxyribonucleotides only to the 3'; end of a growing strand.
b. the 3' end of the primer contains a free 3'-hydroxyl group.
c. the strand grows from the 3' end to the 5' end.
d. Both a and b.
e. Both b and c.

22. When E. coli bacteria are grown on agar that contains lactose...
a. the lactose will act as an inducer to turn on the Lac operon.
b. the lactose will bind to the repressor protein.
c. the repressor protein's shape is altered due to the lactose.
d. All of the above are correct

23. In a sample of double-stranded DNA from a human, you have determined that 20 percent of the nitrogenous base is adenine. What percentage should be cytosine?
a. 15
b. 30
c 70
d. 35
e. 40

24. DNA is _____ charged due to the presence of a _____ group.
a. negatively; methyl
b. negatively; phosphate
c. negatively; carbon
d. positively; methyl
e. positively; phosphate

25. Which of the following is a palindromic recognition sequence?
a. 5'. . . CAATAG . . . 3'
b. 5'. . . CAATTG . . . 3'
c. 5'. . . CATTTG . . . 3'
d. 5'. . . AAAAAA . . . 3'

26. Which two methods are most often used in DNA fingerprinting?
a. Homologous and antisense RNA recombination
b. Pharming and phishing
c. Restriction digestion and gel electrophoresis
d. Gel electrophoresis and creation of expression vectors
e. Homologous recombination and the construction of gene libraries

27. Which of the following techniques can, in principle, amplify DNA from a single cell to produce sufficient quantities of DNA for DNA fingerprinting?
a. gel electrophoresis
b. restriction digest
c. sequencing
d. PCR
e. reverse transcription

28. A single hair is found at the scene of a crime. Which technology would you use *first* to determine if the hair could have come from a certain suspect?
a. PCR
b. DNA sequencing
c. Fragment cloning
d. Probing
e. Antisense RNA

29. The two enzymes that are most important in the construction of recombinant DNA are _____ and _____.
a. restriction enzymes; reverse transcriptase
b. restriction enzymes; ligase
c. reverse transcriptase; DNA polymerase
d. TPA; reverse transcriptase
e. cytochrome oxidase; DNA polymerase

30. Yeasts are useful eukaryotic hosts for recombinant DNA studies because of their
a. rapid rate of cell division.
b. small genome size.
c. ease of growth in the laboratory.
d. All of the above

31. The enzyme that can join pieces of DNA together is
a. RNA polymerase.
b. DNA polymerase.
c. DNA ligase.
d. α-galactosidase.

32. A researcher inserts a new DNA segment into the tetracycline resistance gene of a plasmid. This plasmid also has a gene for ampicillin resistance. E. coli cells transformed with this recombinant plasmid
a. will grow on ampicillin but are sensitive to tetracycline.
b. are sensitive to both antibiotics.
c. are resistant to both antibiotics.
d. will grow on tetracycline but are sensitive to ampicillin.
e. grow only on an enriched medium.

33. What does the "c" in "cDNA library" stand for?
a. Cytoplasmic
b. Cellular
c. Compatible
d. Chip
e. Complementary

34. Who discovered that a mold makes the antibiotic penicillin?
a. Laura van't Veer
b. Alexander Fleming
c. Louis Pasteur
d. Francis Crick
e. Leroy Hood

35. Salt-tolerant tomato plants are an example of
a. a transgenic crop that is adapted to its environment.
b. tailoring the environment to the needs of crop plants.
c. a chloroplast enzyme system that has been inhibited.
d. plants that are able to make -carotene.
e. a medically useful product of biotechnology.

36. R.F.L.P.'s are produced by
a. cloning
b. restriction enzymes
c. transformation
d. DNA sequencing

37. After irradiating *Neurospora*, Beadle and Tatum collected mutants that would
a. not grow on a minimal medium but would grow on a minimal medium with arginine.
b. grow on any minimal medium.
c. not grow on any minimal medium.
d. grow on a minimal medium but would not grow on a minimal medium with arginine.

38. How might a mutation in the promoter region of the Lac Operon cause the gene to stay off even in the presence of lactose?
a. The lactose could no longer bind to the promoter.
b. The RNA polymerase could not longer bind to the promoter.
c. The lactose could no longer bind to the repressor.
d. The lactose could no longer bind to the RNA polymerase.

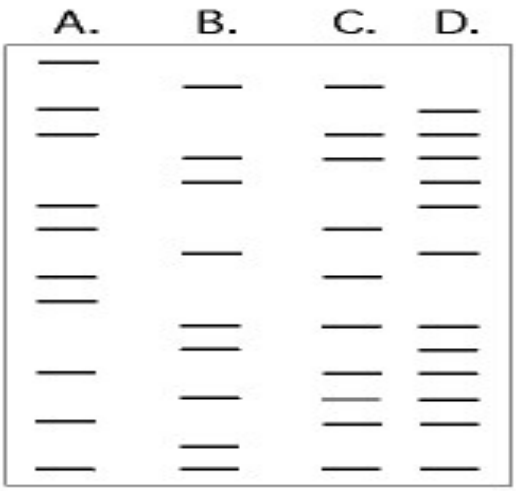
39. In the presence of lactose, E. coli bacteria start producing enzymes to digest the lactose. In other words lactose induces the Lac Operon by
a. binding to the repressor protein so it can no longer block RNA polymerase
b. binding directly to the DNA and turning on the gene
c. mutating the DNA
d. binding to RNA polymerase, thereby changing this enzyme's shape so that it can bind to DNA

40. A mutation that occurs when a mutagen causes a permanent change in DNA is
a. inversion.
b. deletion.
c. duplication.
d. induced mutation.
e. translocation.

41. Which of the following is true of embryonic stem cells but not of adult stem cells?
a. They are totipotent.
b. They make up the majority of cells of the tissue from which they are derived.
c. They can continue to replicate for an indefinite period.
d. They can provide enormous amounts of information about the process of gene regulation.
e. One aim of using them is to provide cells for repair of diseased tissue.

42. The DNA profiles to the right represent four different individuals.

Which of the following statements is consistent with the results?
a. B is the child of A and C.
b. C is the child of A and B.
c. D is the child of B and C.
d. A is the child of B and C.
e. A is the child of C and D



43. Pharmaceutical and chemical companies use genetic engineering to produce
a. insulin
b. human growth hormone
c. tissue plasminogen activator
d. genetically modified plants
e. all of the above

44. Demographic studies of populations must take into consideration
a. population size.
b. population density.
c. population dispersion.
d. All of the above

45. Trees growing along the banks of a river but not growing in the surrounding area would best be described as a ____ dispersion of the trees.
a. clumped
b. uniform
c. random
d. mixture of clumped, uniform, and random

46. A population of organisms grows
a. with no natural restrictions except the availability of food.
b. when the birth rate exceeds the death rate.
c. only in the absence of predators or natural diseases.
d. All of the above

47. The agricultural revolution enabled Earth's human population to increase dramatically because it
a. allowed people to live in one place instead of moving from place to place in search of food.
b. stabilized and increased available food supplies.
c. resulted in people having more free time.
d. provided plenty of work for most of Earth's population.

48. Ecological models are useful for all of the following purposes *except*
a. making predictions about future ecological changes.
b. testing predictions about future ecological changes.
c. evaluating proposed solutions to environmental problems.
d. accounting for all the variables that exist in a real environment.

49. Water and minerals needed by all organisms on Earth pass back and forth between the biotic and abiotic portions of the environment in a process called
a. a trophic cycle.
b. a trophic pathway.
c. a biogeochemical cycle.
d. a biochemical pathway.

50. Which of the following is *not* part of the nitrogen cycle?
a. conversion of atmospheric nitrogen into usable organic compounds by bacteria
b. conversion of nitrogen from decaying organisms into ammonia
c. nitrogen fixation
d. nitrogen evaporation

51. In the nitrogen cycle, plants use nitrates and nitrites to form
a. ammonia.
b. nitrogen gas.
c. fats.
d. proteins and nucleic acids.

52. Which of the following is common to the carbon cycle, the nitrogen cycle, and the water cycle?
a. The substance is rearranged into different types of molecules as it moves through its cycle.
b. The substance must pass through decomposers in order to complete its cycle.
c. The largest reserves of the substance are always in organisms.
d. The substance is required by all living things and is involved in many processes that occur in living things.

53. A mutation caused by a piece of DNA breaking away from its chromosome and becoming attached to a nonhomologous chromosome is called
a. translocation.
b. duplication.
c. inversion.
d. deletion.

54. If both parents carry the recessive allele that causes cystic fibrosis, the chance that their child will develop the disease is
a. one in two.
b. one in four.
c. two in five.
d. 100%.

55. If nondisjunction occurs,
a. there will be too many gametes produced.
b. no gametes will be produced.
c. a gamete will receive too many or too few copies of a chromosome.
d. mitosis cannot take place.

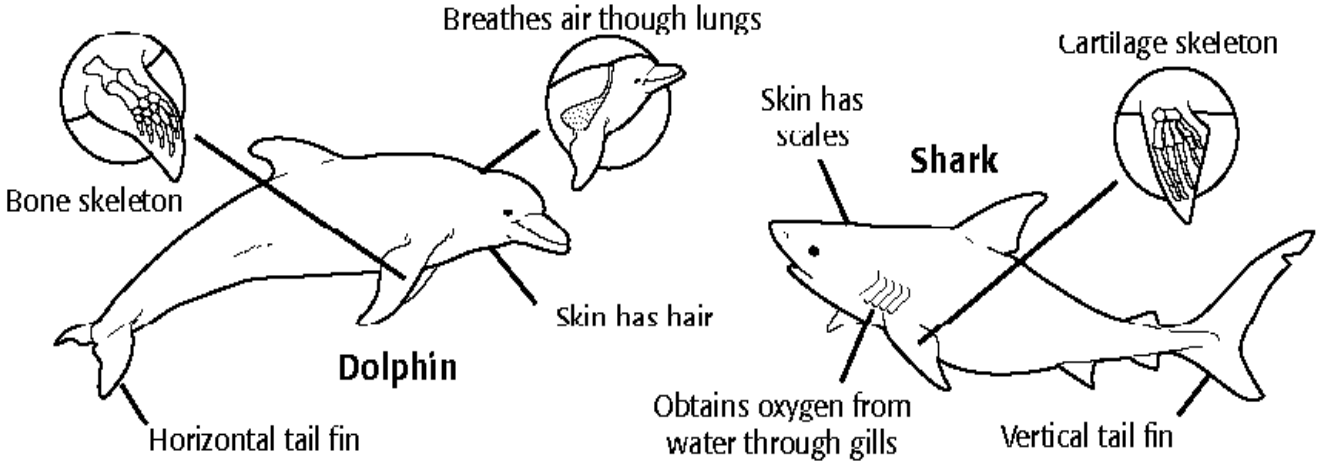
56. DNA fingerprinting has been used in criminal investigations because
a. criminals leave DNA samples behind them when they touch objects at a crime scene.
b. DNA analysis is believed to allow investigators to distinguish body cells of different individuals, who are unlikely to have the same DNA.
c. bacterial DNA on the hands of criminals may provide a clue as to where that person was when the crime was committed.
d. DNA found on murder weapons is easy to identify.

57. A gene that codes for resistance to an herbicide has been added to the genome of certain plants. These plants will
a. produce chemicals that kill weeds growing near them.
b. die when exposed to the herbicide.
c. convert the herbicide to fertilizer.
d. survive when the herbicide is sprayed on the field.

58. Anatomical structures that appear to be derived from a functional structure in an ancestor, but that currently do not serve an important function, are called
a. inorganic. c. fossilized.
b. mutated. d. vestigial.

59. The accumulation of differences between populations that once formed a single population is called
a. coevolution. c. divergent evolution.
b. adaptation. d. cumulative differentiation.

A Comparison of Dolphins and Sharks



60. Refer to the illustration of dolphins and sharks above.
While the shark and dolphin are similar in appearance, dolphins evolved from ancestors that were very different from sharks. The current similarity between sharks and dolphins is an example of
a. coevolution. c. convergent evolution.
b. biogeography. d. divergent evolution.

61. The process in which two or more species become more adapted over time to each other's presence is called
a. divergence. c. coevolution.
b. radiation. d. competition.

62. Oncologists often treat cancer patients by using
a. recombinant DNA therapy.
b. acupuncture.
c. hormone replacement therapy.
d. chemotherapy

63. Analysis of a human karyotype from a patient reveals a 14:21 translocation. There is a complete pair of chromosome #21, plus a small extra segment of chromosome 21 attached to one end of one chromosome #14. The patient most likely exhibits symptoms of
a. Klinefelter syndrome
b. Down syndrome
c. Turner syndrome
d. Edward syndrome

64. In 1997, Dolly the sheep was cloned. Which of the following processes was used?
a. use of mitochondrial DNA from adult female cells of another ewe
b. replication and dedifferentiation of adult stem cells from sheep bone marrow
c. separation of an early stage sheep blastula into separate cells, one of which was incubated in a surrogate ewe
d. fusion of an adult cell's nucleus with an enucleated sheep egg, followed by incubation in a surrogate
e. isolation of stem cells from a lamb embryo and production of a zygote equivalent

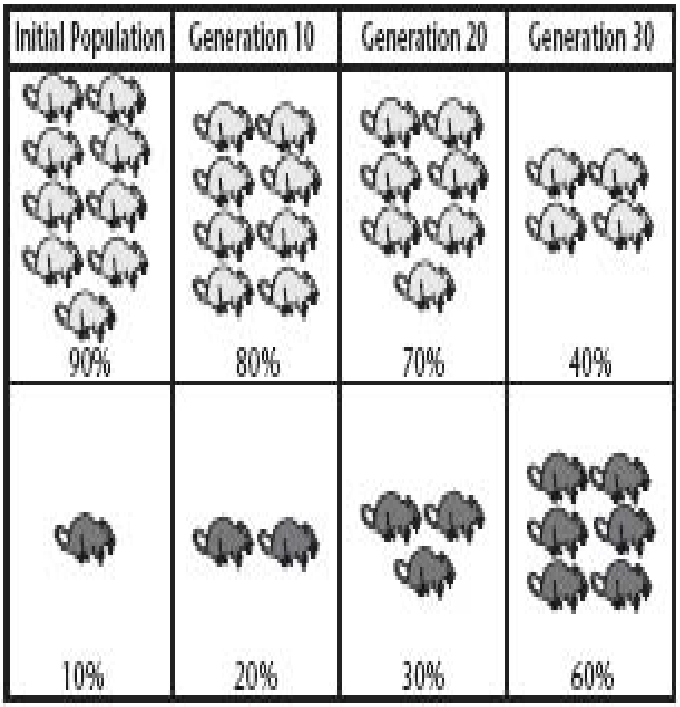
65. Which of these is a statement that Darwin would have rejected?
a. Environmental change plays a role in evolution.
b. The smallest entity that can evolve is an individual organism.
c. Individuals can acquire new characteristics as they respond to new environments or situations.
d. Inherited variation in a population is a necessary precondition for natural selection to operate.
e. Natural populations tend to produce more offspring than the environment can support.

66. Which of these evolutionary agents is most consistent at causing populations to become better suited to their environments over the course of generations?
a. Mutation
b. Non-random mating
c. Gene flow
d. Natural selection
e. Genetic drift

67. You are studying three populations of birds. Population A has ten birds, of which one is brown (a recessive trait) and nine are red. Population B has 100 birds, of which ten are brown. Population C has 30 birds, and three of them are brown. Which population is *most* likely to be subject to the bottleneck effect?
a. Population A.
b. Population B.
c. Population C.
d. They are all the same.
e. It is impossible to tell from the information given.

68. A dark fur mutation occurred in a mouse population. The chart to the right shows how the population changed over 30 generations. Which statement **MOST** likely explains the change shown in the chart?

a. Light mice are less likely to mate.
b. Light mice are better able to find food.
c. Dark mice are harder for predators to see.
d. Dark mice are more susceptible to disease.



69. After an earthquake, a river changes its course and travels through the habitat of a ground-dwelling beetle, splitting the population in two. Over time, the two populations develop different adaptations and become two species. This is an example of
a. stabilizing selection.
b. behavioral isolation.
c. genetic drift.
d. geographic isolation.

70. Two populations are said to belong to different species if they
a. differ enough in physical characteristics to be identified as different.
b. do not mate when placed together.
c. cannot produce fertile offspring.
d. have different common names.

71. Gould's and Eldredge's theory of Punctuated Equilibrium helps explain
a. the extinction of the dinosaurs.
b. long geologic time periods during which species do not undergo significant evolutionary changes.
c. the fossil record of hominid evolution.
d. the discovery of bloodless fish in the oceans of Antartica.

72. The high rate at which species are going extinct is most likely attributed to
a. the impact of drought
b. ecological succession
c. evolution
d. human activity

73. A company develops a pesticide that when applied kills 95% of all roaches. If this pesticide is used commercially over an extended period of time, we can expect that
a. the pesticide will be so effective that it will cause roaches to become extinct.
b. the effectiveness of the pesticide will stay the same over time, but a few roaches will survive and continue to cause pest-control problems.
c. the effectiveness of the pesticide will increase over time due to disruptive selection.
d. the effectiveness of the pesticide will decrease over time due to natural selection.

74. During metamorphosis, an organism may modify gene expression in response to the environment. Which of the following conditions would most likely cause the acceleration of metamorphosis of a tadpole to an adult frog in a woodland pond?

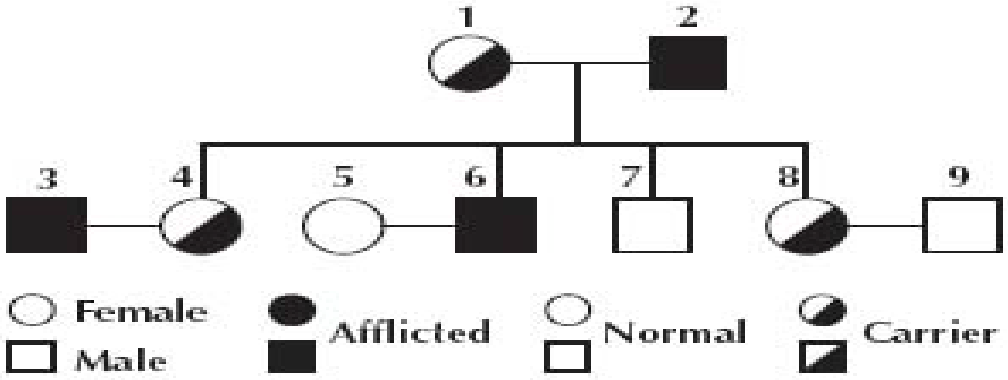
a. a lack of predators
b. a drying pond
c. the pond freezing over
d. an increase in the availability of food

75. A lab worker examines a slide of human chromosomes. After sorting and counting the chromosomes, she determines that they come from a female. How did she make this conclusion?

a. There were 46 chromosomes on the slide.
b. There were 47 chromosomes on the slide.
c. There were 23 similar pairs of chromosomes on the slide.
d. There were 22 similar pairs and one pair of very unequal size.

76. A scientist is examining the karyotype of a human male. The male has two X chromosomes and one Y chromosome. What disorder does this individual most likely have?

a. Down syndrome
b. Klinefelter syndrome
c. sickle cell anemia
d. cystic fibrosis



77. The pedigree chart above shows the inheritance of baldness, a sex-linked trait. What is the probability that a daughter of the marriage between 8 and 9 will be a carrier?

a. 100%
b. 50%
c. 25%
d. 0%

78. HeLa cells were isolated from a cervical cancer biopsy of one Henrietta Lacks in 1951. These cells are still used in research today. What makes them special?

a. They are innately resistant to antibiotics
b. They have been used to clone humans
c. They are immortal
d. They have been transformed to produce insulin

79. Individual cells can be isolated from a mature plant and grown with special mixtures of growth hormones to produce a number of genetically identical plants. This process is known as

a. cloning
b. meiotic division
c. recombinant DNA technology
d. selective breeding

80. Why is the discovery of multipotent cells valuable?

a. because multipotent cells have the ability to specialize and heal damaged tissue
b. because multipotent cells can be harnessed to produce hormones for commercial production
c. because multipotent cell lines are easy to establish and maintain for research
d. because multipotent cells are the key to understanding many different cancers

New Jersey Science League
Biology 1 Answer Key
Date: April 2012

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

BIOLOGY I : No AP or second year students in this category. NOTE: Consistent with a modern approach to biology, principles of evolution will be included in every test as these apply to the topics listed.
JANUARY TEST - the process of science, principles of evolution natural selection, structure of matter (basic chemistry including the chemistry of water and pH), "biomolecules" (carbohydrates, proteins, lipids), microscopy, measurement, cell structure and function, diffusion, osmosis, active transport, cell metabolism, enzymes, ATP, philosophy/history and experiments pertaining to the preceding topics.
FEBRUARY TEST - evolution, mitosis/meiosis, patterns of genetic inheritance, DNA/RNA (structure, transcription, translation) , viruses, bacteria, cell structure and function, photosynthesis, cell respiration, enzymes, philosophy/history and experiments pertaining to the preceding topics.
MARCH TEST - evolution, principles of taxonomy, phylogeny and classification, non-human animal structure/function/systems, plant structure/function/systems, life cycles, embryology, organismic reproduction, fungi, algae, ecology (ecological relationships and succession), disease, mitosis/meiosis, philosophy/history and experiments pertaining to the preceding topics. Lieutenant
APRIL TEST - evolution, biotechnology (genetic engineering, PCR, DNA fingerprinting, DNA manipulation, bioinformatics, stem cells), populations, ecology (matter and energy in the living world), inherited and acquired disease, philosophy/history and experiments pertaining to the preceding topics.

Testing Dates 2013

Thursday January 10, 2013, Thursday Feb 14, 2013; Thursday March 14, 2013; *Thursday April 11, 2013

***The April 2013 exam can be changed based upon the School's spring break.**

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Please review the topics above. Considering that the last test is in April which topics would you leave out?
Please send your comments to newjsl@ptd.net