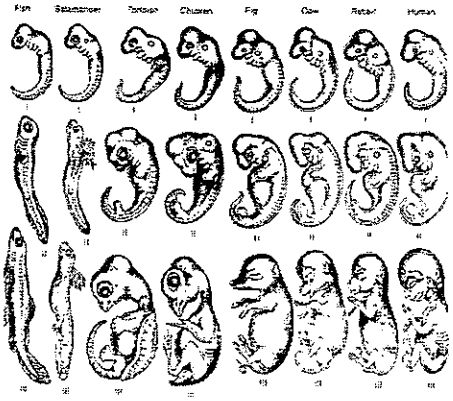
Science League Biology I –March, 2010

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. Fossil evidence suggests that whales evolved from
   A) wolf-like land mammals
   B) marine fish
   C) manatees
   D) land sharks

Use the following illustration to answer questions 2-3.



2. The image above illustrates what evolutionary concept?
   A) homologous structures B) vestigial structures
   C) embryological similarities D) genetic variation

3. Who is credited with the above drawings of vertebrate embryos?
   A) Lamarck B) Mendel C) Darwin D) Haeckel E) Lyell

4. The bones of a human arm are homologous to the structures in all of the following *except*
   A) butterfly wing
   B) bat wing
   C) bird wing
   D) whale flipper
   E) frog forelimb

5. According to the Theory of Evolution, differences between species may be the result of
   A) mutagenic agents B) the disuse of body structures C) natural selection
   D) the transmission of acquired characteristics E) B and C

Use the following choices to answer questions 6-8.

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

6. Which of the above scientists devised a taxonomic system that used morphological features as the primary criteria for classifying organisms?

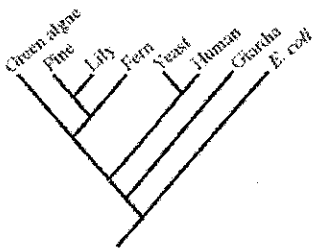
7. Which of the above scientists used Catastrophism to explain the fossil record?

8. The idea that improving the intelligence of an adult through educations will result in that adult's descendants being born with a greater native intelligence belongs to whose school of thought?

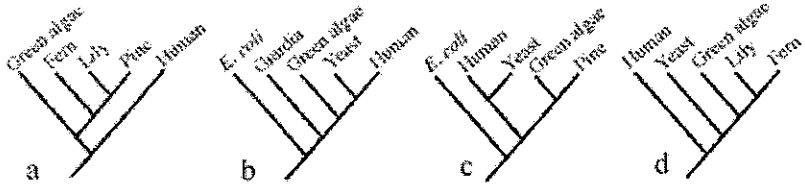
9. Which property of molecules needed for life on Earth is most important to life's evolution?
   A) The molecule contains carbon B) The molecule is self replicating
   C) The molecule is found in modern organisms D) The molecule is a type of protein

10. Which one of the following sources of information used to determine relatedness among different species would provide the MOST SPECIFIC information?
A) comparisons of fossil ancestors
B) comparisons of the embryos from different species
C) comparisons of the sequence of nucleotides in DNA
D) comparative morphology of the different species

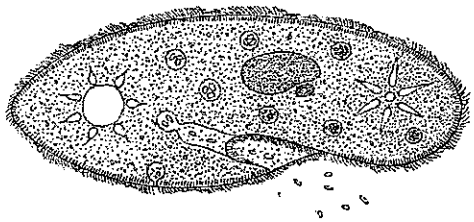
11. The disadvantage of using common names for species is
A) the names may change
B) one name does not apply universally
C) one species may have several common names
D) one common name may be applied to two species
E) all of the above



12. Which of the trees below is false given the larger phylogeny above?



Use the image below to answer questions 13 and 14.



13. The organism above should be classified as a
A) bacterium
B) moneran
C) fungus
D) protist

14. The organism pictured above has the following characteristics
A) unicellular
B) eukaryotic
C) ciliate
D) only A and B
E) A, B and C

Use the following image to answer question 15.

Classification	Examples
Kingdom—Animal	dolphin, house cat, songbird, lynx, wolf, earthworm, butterfly, hydra
Phylum—Chordata	dolphin, house cat, songbird, lynx, wolf
Genus—*Felis*	house cat, lynx
Species—*domestica*	house cat

15. The chart above indicates the house cat is most closely related to the
A) wolf B) songbird C) lynx D) dolphin E) earthworm

16. The genus of the fruit fly, *Drosophila melanogaster*, is
A) Insecta B) Drosophila C) Felis D) Arthropoda E) Carabus

Use the dichotomous key below to identify the specimen described in question 17:
1a. leaves needle-like ..... Pinus spp.
1b. leaves not needle-like 2
2a. leaves broad 3
2b. leaves not broad (scaly) .... Juniperus spp.
3a. leaves with rough edges ..... Quercus spp.
3b. leaves with smooth edges .... Gleditsia spp.

17. On a hike you discover a green, broad leaf that is smooth around its perimeter. Identify it using the key above.
A) Pinus
B) Juniperus
C) Quercus
D) Gleditsia
E) unknown

18. Convergent evolution can cause a taxonomist to assume mistakenly that
A) two closely related species are unrelated
B) two unrelated species are closely related
C) members of different subpopulations of the same species are unrelated
D) two closely related species can mate

19. Land plants are composed of all the following tissue types EXCEPT
A) epidermal B) mesoderm C) meristematic D) vascular

20. An evolutionary adaptation that allows a plant to increase its exposure to light in a dense forest is
A) closing of the stomata
B) apical dominance
C) lateral buds
D) adaptable vacuoles
E) root hairs

21. The vascular bundles of monocot stems are
A) arranged in vascular bundles in the cortex
B) scattered throughout the stem
C) arranged in star-shaped patterns projecting from root
D) formed in a continuous cylinder between cortex and pith

Use the following image to answer questions 22-25.

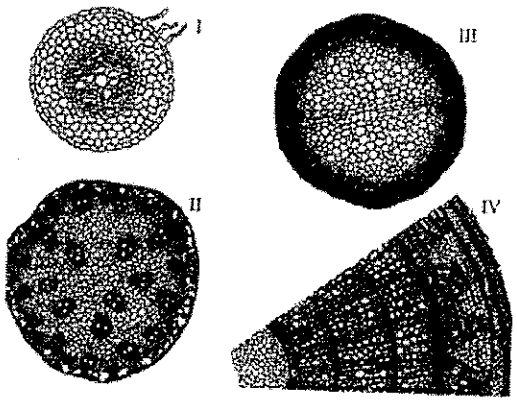
22. The structure pictured above can be found on
    A) mychorrizae
    B) fungi
    C) ground tissue
    D) root hairs
    E) leaves

23. Which of the following conditions could have prompted the structure to go from position A to position B?
    A) Daylight and plenty of moisture
    B) A low concentration of carbon dioxide inside organism
    C) Low light and plenty of oxygen
    D) A & B are both correct
    E) A, B and C are all correct

24. Which position of the structures is more likely during a hot, dry and windy day?
    A) A
    B) B
    C) Cannot tell

25. Which of the following would probably have the least amount of the structure pictured above?
    A) a CAM plant
    B) a conifer
    C) an epiphyte
    D) a bromeliad
    E) a saprophyte

Use the following images to answer question 26-27.



26. Which of the following could be represented by drawing IV?
    A) corn stalk
    B) cattail
    C) maple tree
    D) orchid
    E) all of the above

27. The stem shown in drawing II most likely came from?
    A) a pine tree
    B) a bean plant
    C) a fern
    D) seaweed
    E) a corn plant

28. 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

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

30. What does the gastrovascular cavity of a Hydra and the pulmonary space within the mammalian lung have in common?
A) each allows for the maximum development of internal complexity
B) both are in contact with an efficient blood supply
C) both maximize the surface area in contact with the external environment
D) their structural organization eliminates the need for homeostasis
E) each minimizes contact with the external environment, thus reducing external disturbances and permitting homeostasis to be more easily achieved

31. The arthropod group is the first to have
A) bilateral symmetry
B) jointed legs
C) body segments
D) 4 chambered heart
E) all of the above

32. Which of the following made it possible for reptiles to make a complete transition to land?
A) amniote egg B) three-chambered heart C) double loop circulation
D) nictitating membrane E) lubricated eye

33. Birds have a ____ heart with _____ circulation.?
A) 3-chambered, single loop B) 4-chambered, single loop
C) 3-chambered, double loop D) 4-chambered, double loop

34. A modern bird normally does not have a
A) crop
B) urinary bladder
C) hollow bones
D) cloaca
E) 3-chambered heart

35. The sponges were the first group to display
A) a complete digestive system B) tissues C) body symmetry D) multicellularity

36. The first animal group to show extracellular digestion were the
A) sponges
B) cnidarians
C) flatworms
D) roundworms

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

38. Reproduction by budding occurs in the
A) earthworm
B) crayfish
C) hydra
D) grasshopper
E) starfish

39. Which method of reproduction is carried out by the paramecium?
A) budding
B) sporulation
C) mitosis and cytokinesis
D) multiple fission

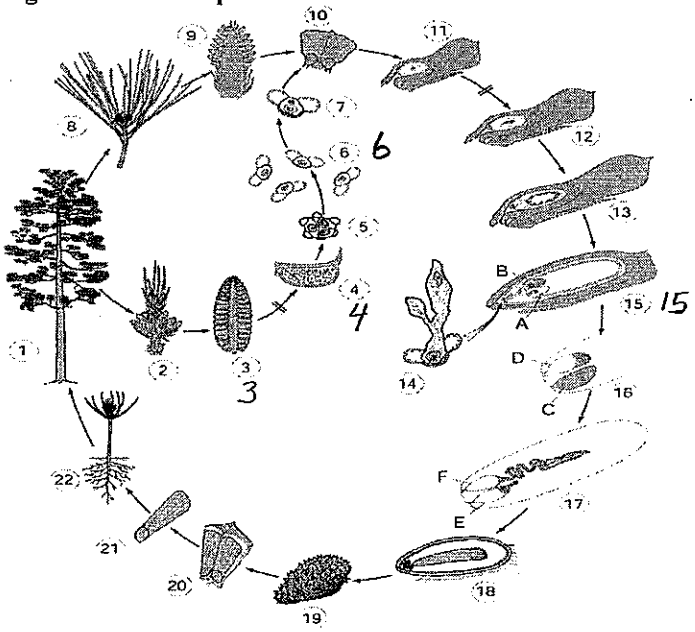
40. The presence of a cancerous mass in the lung is a direct result of
A) the introduction of toxins through breaks in the skin
B) prolonged exposure to very dry air
C) the uncontrolled division and growth of abnormal cells
D) meiotic division of normal cells

Use this image to answer question 41.

41. Which type of reproduction is illustrated in the diagram above?
A) regeneration B) budding C) gametogenesis D) sporulation

42. Why is a seed advantageous for reproduction?
a. Provides food for the developing sporophyte
b. Provides protection
c. Allows for delayed germination until conditions are favorable
d. All of the above

Use the following diagram to answer questions 43-45.

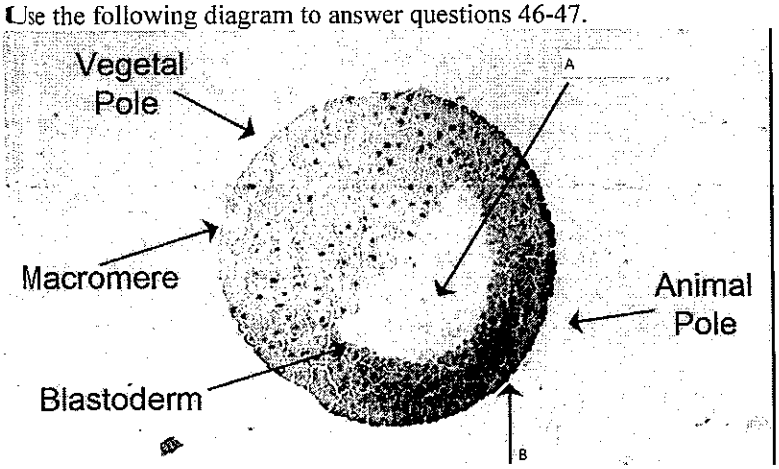


43. The process occurring between #3 and #4 is
a. Mitosis
b. Meiosis
c. Fertilization
d. Germination
e. Sporulation

44. The process occurring at #15 is
a. Mitosis
b. Meiosis
c. Fertilization
d. Germination
e. Sporulation

45. Structure 6 represents the
a. zygote
b. megaspore
c. microspore
d. Archogonia

Use the following diagram to answer questions 46-47.



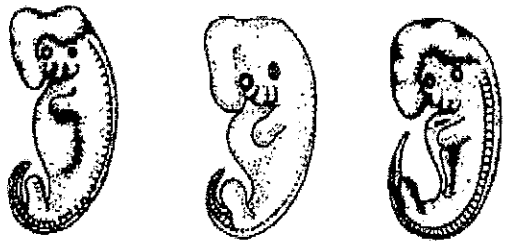
46. What stage is shown of the frog embryo above?
    A) gametogenesis
    B) metamorphosis
    C) blastulation
    D) gastrulation
    E) organogenesis

47. Which of the following would directly follow the stage shown above?
    A) gametogenesis
    B) metamorphosis
    C) blastulation
    D) gastrulation
    E) organogenesis

48. Which of the following organisms has an open circulatory system?
A) earthworm B) grasshopper C) octopus D) salmon E) bluebird

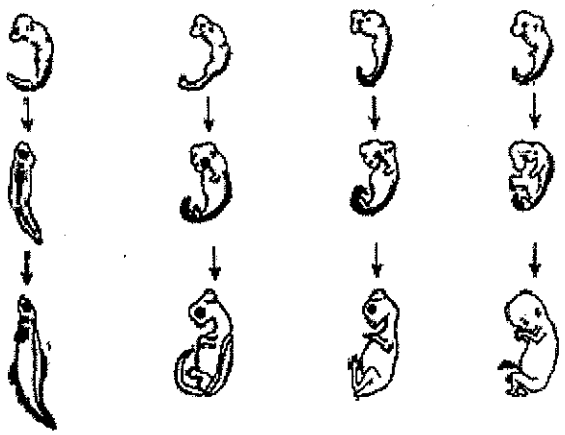
49. In spermatogenesis, which cell types are diploid (2N)?
    A) primary spermatocytes, secondary spermatocytes and spermatids
    B) spermatagonia and secondary spermatocytes
    C) all stages prior to the second meiotic reduction that generates haploid spermatids
    D) spermatagonia, primary spermatocytes and secondary spermatocytes
    E) none of the above

Use the diagram below to answer question #50.



50. The diagrams above show embryos of three different vertebrate species. According to one interpretation, similarities in these embryos suggest common ancestry. As these embryos mature, they will most likely
    A) develop new organs according to the nutritional requirements of each organism
    B) show no similarity as adults
    C) continue to closely resemble each other as adults
    D) develop the distinctive characteristics of their species

Use the following diagram to answer question #51.



51. The diagrams above represent stages in the embryonic development of four organisms. The similarities in embryonic development shown in the diagram suggest that these organisms
    A) are all members of the same species
    B) all undergo external development
    C) may have evolved from a common ancestor
    D) have adaptations for the same environment as adults

52. Most cells spend their lives in
    A) prophase B) metaphase C) anaphase
    D) telophase E) interphase

53. A cell that has 20 chromosomes undergoes mitosis. Which of the following is true??
    A) two daughter cells will be created, each have 20 chromosomes
    B) two daughter cells will be created, each have 40 chromosomes
    C) 4 daughter cells will be created, each having 10 chromosomes
    D) 2 daughter cells will be created, each having 10 chromosomes

54. Which of the following cells undergo meiosis?
    A) unicellular organisms B) skin cells C) liver cells
    D) primary spermatocytes E) all of the above

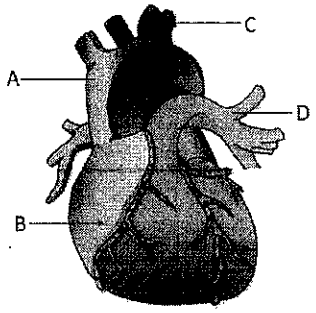
55. Crossing-over occurs during
    A) prophase I B) metaphase I C) anaphase I D) prophase II E) metaphase II

56. Meiosis is a type of cell division that produces
    A) zygotes
    B) chromosomes
    C) DNA
    D) gametes
    E) identical copy of parent cell

57. Some strains of the bacteria *E. coli*
    A) can cause diarrhea and other types of illness
    B) are found in animal feces
    C) are used as markers for water contamination
    D) A and B are correct
    E) A, B and C are correct

58. *Salmonella*
    A) can cause diarrhea and other types of illness
    B) are found in animal feces
    C) are used as markers for water contamination
    D) A and B are correct
    E) A, B and C are correct

Use the following image to answer questions 59-60. The arrows and lines point to different vessels.



59. Atherosclerosis is a condition when fatty material and plaque build up at which of the above structures of the heart?
A) A
B) B
C) C
D) D
E) part not labeled

60. The condition identified in number 59 can cause
A) coronary heart disease
B) cystic fibrosis
C) a stroke
D) A and B are correct
E) A, B and C are correct

The following is a list of lung diseases. Please match the disease with the correct description in 61-63.

A. lung Cancer B. emphysema C. asthma D. mesothelioma E. cystic fibrosis

61. A genetic, chronic and usually fatal disease which involves an abnormality in the glands that produce sweat and mucus.

62. A form of cancer usually caused by long-term exposure to asbestos

63. A chronic lung disease in which the bronchi become inflamed and narrowed

64. A wildlife pathologist is examining some skin tissue from a dead frog. She notes the presence of a fungus. She cultures some of the fungal cells and notices that some of the cells are flagellated. She concludes that the frog has a fungal disease caused by
A) an ascomycete
B) a zygomycete
C) a basidiomycete
D) a chytrid

65. A basidium is typically observed in the common
A) bread mold B) gilled mushroom C) chytrid D) lichen E) tree mold

66. A lichen is a mutualistic symbiosis between an ascomycete and a(n)
A) chytrid B) archaebacteria C) green algae D) angiosperm root E) water mold

67. Many biologists agree that the group that was probably the ancestor of plants is the
A) water molds B) green algae
C) diatoms D) cyano bacteria E) brown algae

68. A phylum of algae that are unicellular and have silica shells is
A) water molds B) green algae
C) diatoms D) cyanobacteria E) brown algae

69. Unlike animals, algae and plants alternate between _____ and _____ stages.
A) animal-like , plantlike
B) gametophyte, sporophyte
C) fragmentation, alternation
D) vegetative, seed

70. These algae are single-celled and each cell has two flagella, one longitudinal and one transverse.
A) green algae B) brown algae C) red algae D) diatoms E) dinoflagellates

Use the table below to answer questions 71-72. The table describes the flora that can exist in a given natural community

Stage	Dominant Flora
Z	None (freshly plowed land)
Y	Various Shrubs
X	Beech-maple forest
W	Birch and cherry trees
V	Annual grasses

71. Which stage represents a pioneer community?
A) Z B) V C) X D) W E) Y

72. Sustained ecological succession would most likely culminate in stage
A) Z B) V C) X D) W E) Y

73. Ecology involves all of the following levels of biological organization ***except***
A) population B) cellular C) organismal D) ecosystem E) community

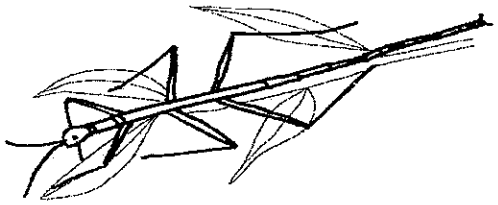
74. Although it is not a native species to the Americas, Zebra mussel populations are growing explosively in the Mississippi river. The best explanation for this unchecked population growth is that
A) they muddy the water around them, making it difficult for their natural enemies to see them
B) predators are too few to slow down population growth of the mussels
C) they are better adapted to the environment than competing species
D) they are feeding on a source of food that had previously been underutilized
E) a mutation caused by pollution has increased their reproductive rate

75. The biogeological realms described by Darwin, Wallace, and others are associated with patterns of
A) continental drift
B) precipitation and temperature
C) rocks and soil
D) climate
E) light intensity

76. Which of the following is **not** used in calculating an ecological footprint?
A) land that can be cultivated to grow crops
B) land used as pasture C) built-up land
D) fossil energy land E) demographically transitional land

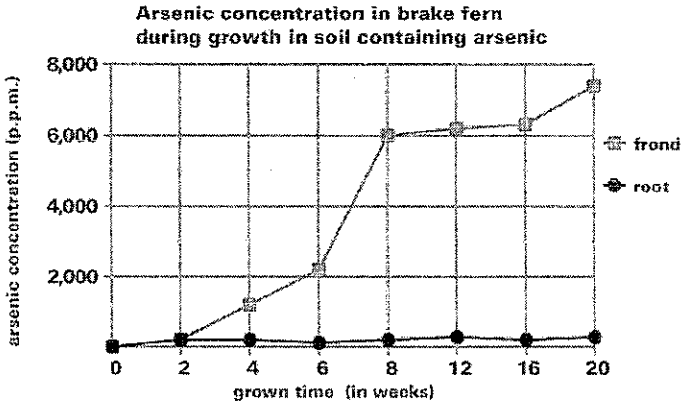
77. Which of the following is a density-independent factor limiting human population growth?
A) pollution
B) social pressure for birth control
C) tornadoes
D) famine
E) plagues

Observe the image below and answer question 78.



78. Due to its appearance, the insect above will probably be able to avoid
    A) parasitism
    B) symbiosis
    C) predation
    D) competition
    E) commensalis

Use the following data to answer question 79.



79. An experiment was conducted over a 20 week period involving arsenic uptake in ferns. The data are shown in the graph above. Which of the following is consistent with the data shown above?
    A) brake fern is a good candidate for phytoremediation of arsenic contaminated soils
    B) the below ground biomass was less productive in storing the leached contaminant from the soil
    C) brake fern should be used in the phytoremediation of lead
    D) A and B are correct
    E) A, B and C are correct

Data were collected in a Brazilian study concerning the occurrence of the most widely seen infection-causing pathogens during a three year period Use the table below to answer question 80.

Table 1. Occurrence of the major pathogens isolated in Brazil in 1997, 1998, and 1999

	% Occurrence in				
Organisms in rank order	**BSI (2008)[a]**	**LRTI (822)[b]**	**SSTI (430)[c]**	**UTI[d] (468)**	**All sites (3728)**
S. aureus	23.6	21.0	45.8	1.9	22.8 (852)
E. coli	11.3	4.4	7.2	47.6	13.8 (516)
P. aeruginosa	7.5	29.4	10.5	12.6	13.3 (496)
K. pneumoniae	8.9	9.2	4.2	9.8	8.5 (318)
Enterobacter spp.	8.3	6.8	6.7	5.8	7.5 (279)
CoNS[e]	12.0	0.5	3.0	0.6	7.0 (261)
Acinetobacter spp.	6.8	10.8	2.8	3.0	6.7 (252)
Enterococcus spp.	2.7	4.0	8.4	5.1	4.0 (147)
Serratia spp.	2.5	3.3	2.8	2.7	2.7 (102)
Proteus spp.	0.7	-	3.5	5.1	1.4 (54)

[a] BSI: blood stream infection; [b] LRTI: lower respiratory tract infection; [c] WSSTI: wound or skin and soft tissue infection; [d] UTI: urinary tract infection; [e] CoNS: Coagulase-negative staphylococci.

80. Which of the following bacteria is probably most responsible for pathogen-caused pneumonia in Brazil from 1997-1999?
    A) *S. aureus*
    B) *P. aeruginosa*
    C) *E. coli*
    D) *Staphylocci*
    E) *Prote*

New Jersey Science League
Biology I Answer Key
Date: March, 2010

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

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), human anatomy &physiology, human nutrition, embryology, populations, animal/plant behavior, ecology (matter and energy in the living world), inherited and acquired disease, philosophy/history and experiments pertaining to the preceding topics.

TESTING DATES FOR THE NEW JERSEY SCIENCE LEAGUE

Thursday January 14, 2010, Thursday Feb 11, 2010;

Thursday March 11, 2010; Thursday April 8, 2010

* The testing date for the April will be decided by each local area during the January exam. The date of the April exam should be a date that all schools in the area can attend. The April exam must be completed by April 30th. No area may take the April exam during the first week of April.

Testing Dates for 2011

Thursday January 13, 2011, Thursday Feb 11, 2011;

****Thursday March 17, 2011; *Thursday April 14, 2011**

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

****Changed due to HSPA testing.**

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