

New Jersey Science League  
 Biology I – **BLUE EXAM** Corrections:  
 January 11, 2018

Choose the answer that best completes the statements or questions below in the appropriate response on the Scantrons. If you change your answer, be sure to completely erase your first choice. Please PRINT your name, school, and which test you are taking onto the Scantrons. Please use the same name for all exams.

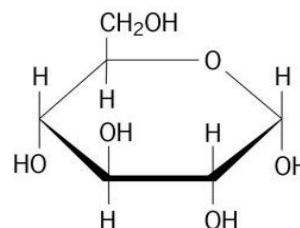
Use the information in the table below to answer questions 1, 2, and 3

Substance	Protons	Neutrons	Electrons
Atom S	23	19	23
Atom Q	76	35	77
Atom P	44	44	44
Atom J	100	54	100

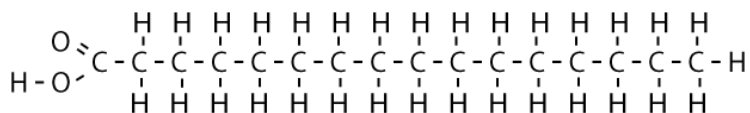
- Which atom is an ion?  
 a. S                                      b. Q                                      c. P                                      d. J
- What is the mass number of atom J?  
 a. 154                                      b. 100                                      c. 254                                      d. 200
- What is the atomic number of atom S?  
 a. 23                                      b. 65                                      c. 42                                      d. 19
- Which property of carbon atom gives it compatibility with a very large number of different elements?  
 a. Carbon has 6 to 8 neutrons.                                      c. Carbon forms ionic bonds.  
 b. Carbon has 4 valence electrons.                                      d. A, B, and C are correct.
- Isotopes can be differentiated from other atoms of the same element by virtue of the number of:  
 a. Electrons                                      c. Neutrons  
 b. Protons                                      d. Both a and b
- Which of the following molecules contain nitrogen atoms?  
 I. DNA                      II. Starch                      III. Protein  
 a. I only.                                      c. I and III only.  
 b. II and III only.                                      d. I, II, and III
- Which of the following is correctly matched with its class of macromolecule?  
 a. Hemoglobin – lipid                                      c. DNA – protein  
 b. Starch – nucleic acid                                      d. Cellulose - carbohydrate

Use the diagram below to answer questions 8, 9, and 10

- How many atoms make up this molecule?  
 a. 11                                      c. 24  
 b. 19                                      d. 30
- The ratio of H to O is:  
 a. 1:1      b. 2:1      c. 3:1      d. 12:5
- This diagram best illustrates which type of a molecule?  
 a. Lipid                                      c. Steroid  
 b. Nucleic acid                                      d. Monosaccharide

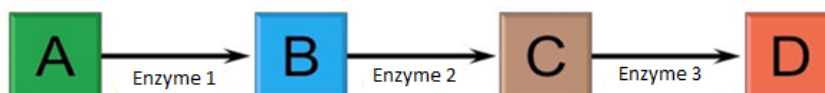


Use the molecule shown below to answer questions 11 and 12.



11. The functional group of the molecule is:  
 a. Hydroxyl                      b. Carboxyl                      c. Carbonyl                      d. Amino
12. The molecule is a:  
 a. Sugar                              b. Oil                              c. Fat                              d. Protein

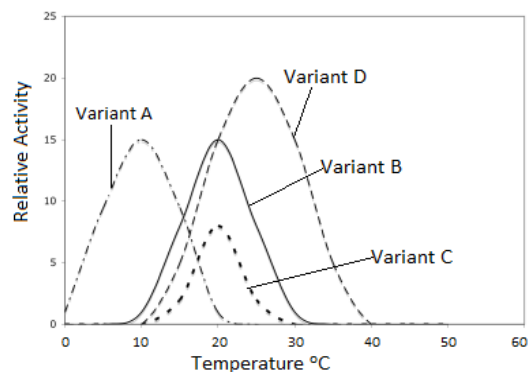
Refer to the following diagram for questions 13 and 14



13. Many metabolic pathways involve multi-step reactions. Feedback inhibition of the following pathway may involve:  
 a. Product D interacting with and inhibiting Enzyme 1  
 b. Product D interacting with and inhibiting Enzyme 3  
 c. Product C interacting with and inhibiting Enzyme 3  
 d. Enzyme 3 interacting with and inhibiting Enzyme 2
14. Molecules responsible for feedback inhibition bind to the enzyme with  
 a. Ionic bonds    c. Hydrogen bonds  
 b. Covalent bonds    d. Van der Waals forces

15. The enzyme subtilisin is a protease, originally found in the bacteria, *Bacillus subtilis* that is produced in vast quantities annually for use in laundry detergents. In order to generate laundry detergents that work over a range of different conditions, subtilisin has been the focus of many protein engineers attempting (and succeeding) to create subtilisin variants that have optimal activity in conditions other than those naturally occurring in *B. subtilis*. The graph below shows the activities of engineered subtilisin variants over a range of temperatures.

Which variant would be most appropriate for use in a cold water laundry detergent at 20°C?



- Ans is B not letter A.  
 a. A.  
 b. B.  
 c. C.  
 d. D.

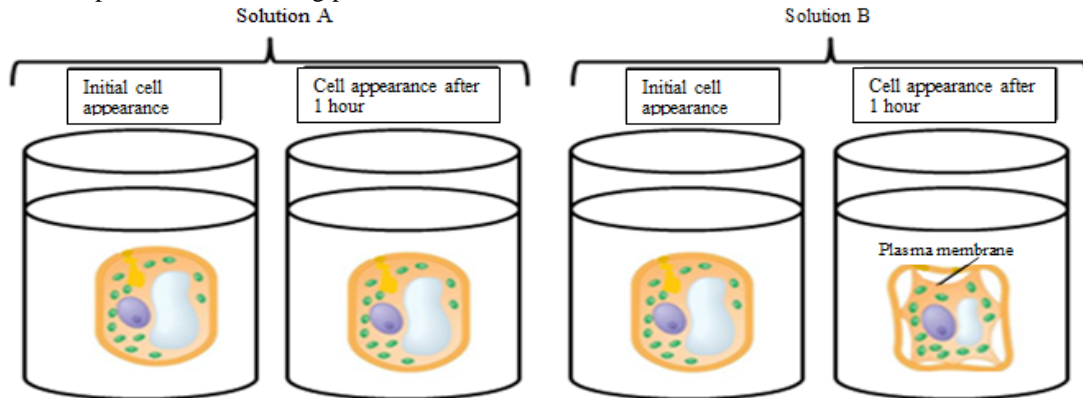
16. Identify the incorrect statement pertaining to chloroplast: **B and C are correct.**  
 a. It contains chlorophyll and the enzymes required for photosynthesis.  
 b. It contains an internal membrane system consisting of stack-like structures called thylakoids.  
 c. It is bound by two membranes, the inner of which is folded into the cristae.  
 d. Understood to be a product of endosymbiosis.

17. A water-soluble dye injected into a plant cell may pass to an adjacent cell through  
 a. tight junctions    c. plasmodesmata  
 b. desmosomes    d. gap junctions

18. Which of the following organelles in a eukaryotic cell are correctly matched with their functions?
- Nucleolus – assembly of nucleus
  - Lysosomes – synthesis of lipids
  - Smooth endoplasmic reticulum – ATP synthesis
  - Rough endoplasmic reticulum – protein synthesis
19. Following synthesis by a ribosome, a protein which is to be exported from a cell is likely to follow which of the pathways below?
- Rough endoplasmic reticulum → Golgi apparatus → vesicle → release
  - Nucleus → nuclear membrane → vesicle encapsulation → release
  - Nucleolus → cytoplasm → nuclear transport protein complex → release
  - Cytoplasm → Golgi apparatus → mitochondria → release
20. The shape of an animal cell is primarily maintained by the
- Exoskeleton
  - Cytoskeleton
  - Cell wall
  - Cell membrane
21. Why of the following do **NOT** contain DNA or RNA?
- Nuclei
  - Lysosomes
  - Cytoplasm
  - Ribosomes
22. Microfilaments and microtubules
- function in cell structure and movement
  - contain digestive enzymes
  - are sites of protein synthesis
  - are sites of photosynthesis
23. Tissues are defined as:
- a group of cells with assorted structures working together
  - a group of cells with different structure and function working together
  - an assorted group of cells that make up an organelle
  - a group of cells with similar structure and function
24. Two organisms, A and B are from the same order but from different families. Therefore organisms A and B belong to **office topic all full credit**.
- the same genus.
  - different phyla.
  - the same species.
  - the same class.
25. Which of the following is a logical hierarchy of organization from simple to complex?
- Tissue, organ, organism, population, individual
  - Atom, molecule, organelle, cell, organ
  - Species, phylum, order, family, kingdom
  - Cell, molecule, tissue, organ, organism
26. The fluidity of a phospholipid bilayer is enhanced with:
- increased unsaturation in fatty acid tails.
  - increased unsaturation in polar head groups.
  - increased saturation in fatty acid tails.
  - increased fatty acid chain length.

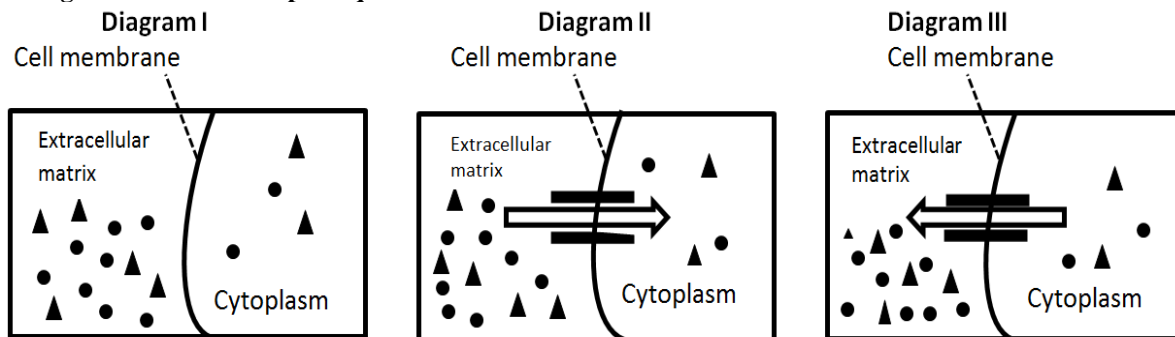
**Use the diagrams below for questions 27 and 28**

Two identical plant cells are placed in solution A and solution B. The diagrams below show the initial and final appearance of the plant cells after being placed in each solution for 1 hour.



27. From the above diagrams, determine which of the following statements is **correct**:
- Solution A has a higher solute concentration than solution B
  - Solution A has the same solute concentration as solution B
  - Solution A has a lower solute concentration than solution B
  - It is not possible to determine the relative solute concentration of solution A and B
28. Observe solution B in the above diagrams. After 1 hour the cell in solution B:
- appears turgid
  - appears flaccid
  - has undergone plasmolysis
  - is undergoing mitosis

**Use diagrams below to complete question 29.**



29. The diagrams above show the number of molecules in the cytoplasm and in the extracellular matrix. When transport of molecules represented by circles and triangles occurs across the cell membrane it takes place in the direction indicated by the arrow. Which of the following options would require a direct input of energy to transport only the molecules represented by circles and triangles?
- I only.
  - III only
  - II and III only
  - All require the input of energy
30. Which of the following statements is false about cell membranes? **Correct ans is b.**
- Transport proteins allow substances to move in and out of the cell.
  - Gap junctions allow molecules to pass to the nucleus of a cell.**
  - Cholesterol provides stability to the membrane.
  - Glycoproteins act as receptors.

31. Which of the following statements best describes homeostasis?
- Keeping the body in a fixed and unaltered state.
  - Dynamic equilibrium.
  - Maintaining a near-constant internal environment.
  - Altering the external environment to accommodate the body's needs.
32. ATP is an important molecule in metabolism because it:
- is extremely stable.
  - contains valuable nutrients.
  - has high-energy phosphate bonds.
  - is readily obtained from an organisms environment.
33. During respiration, glucose gets \_\_\_\_\_ and oxygen gets \_\_\_\_\_
- reduced/oxidized
  - oxidized/ reduced
  - reduced/ reduced
  - oxidized/oxidized
34. Which of the following statements is **FALSE**?
- Thylakoid membranes contain the photosynthetic pigments.
  - The oxygen released during photosynthesis comes from water.
  - RuBP is produced during cyclic electron flow in the light reactions of photosynthesis.
  - Light reactions of photosynthesis provide the energy for the Calvin cycle.
35. The reaction-center chlorophyll of photosystem I is known as P700 because:
- There are 700 chlorophyll molecules in the center.
  - This pigment is best at absorbing light with a wavelength of 700 nm.
  - There are 700 photosystem I components to each chloroplast.
  - It absorbs 700 photons per microsecond.
36. The oxygen gas produced during photosynthesis is derived from the splitting of
- Carbon dioxide
  - Water
  - Light sensitive pigments
  - Chlorophyll A
37. In  $C_3$  plants the conservation of water promotes \_\_\_\_\_.
- photorespiration
  - light reactions
  - a shift to  $C_4$  photosynthesis
  - the opening of stomata
38. Which of the following produces the **most** ATP per mole of glucose during aerobic respiration?
- Glycolysis
  - Electron transport chain and chemiosmosis
  - Substrate level phosphorylation
  - Kreb's cycle
39. Which of the following organisms are used to convert milk into yogurt?
- Bacteria.
  - Viruses.
  - Algae.
  - Fungi.
40. How many ATP molecules are consumed during aerobic respiration of 1 molecule of glucose?
- 2
  - 4
  - 32
  - 36
41. The primary growth phase of a cell is the
- $G_0$
  - $G_1$
  - $G_2$
  - M

42. Where do the microtubules of the spindle originate during mitosis in a human cell?  
 a. centrosome                      b. centromere                      c. chromatid                      d. kinetochore
43. Which phase of mitosis is associated with separation of chromatids?  
 a. prophase                      b. metaphase                      c. anaphase                      d. telophase
44. Just prior to cell division, the diploid human body cell contains \_\_\_\_\_ chromatids.  
 a. 23                      b. 46                      c. 69                      d. 92
45. In plant cytokinesis, cellulose is laid down forming  
 a. a middle lamella                      c. cell walls  
 b. a cell plate                      d. a cleavage furrow

Use the data table below to answer questions 46 and 47

The following data was obtained from a study of the length of time spent in each phase of the cell cycle by cells of three eukaryotic organisms designated X, Y, and Z

Organisms	Minutes spent in cell cycle phases			
	G <sub>1</sub> phase	S phase	G <sub>2</sub> phase	M phase
X	18	24	12	16
Y	100	0	0	0
Z	18	48	14	20

46. Of the following, the best conclusion concerning the difference between the S phases for X and Z is that:  
 a. Z contains more DNA than X  
 b. X and Z contain the same amount of DNA  
 c. X contains more RNA than Z  
 d. Z contains 48 times more DNA and RNA than X
47. The best conclusion concerning organism Y is that the cells:  
 a. Contain no DNA.  
 b. Contain no RNA.  
 c. Contain only one chromosome that is very short.  
 d. Are actually in the G<sub>0</sub> phase.

**Refer to the information in the following experiment for questions 48 – 52**

Students tested the germination of seeds using water of different pH levels. The table below summarizes the data from the experiment.

Daily treatment	pH levels	Number of seeds germinating (out of 40 total possible)			
		After 1 day	After 2 days	After 7 days	After 10 days
25 ml distilled water	7	10	22	35	39
23 ml distilled water + 2 ml 1M HCl	5	4	15	25	27
20 ml distilled water + 5 ml 1M HCl	2	0	2	4	6

48. Which of the following correctly identifies the control group?
- The number of seeds sprouted after 10 days
  - The group watered with distilled water only
  - The group with the pH between the other two
  - Both A and B
49. Which problem, asked in the form of a question, is best addressed by this experiment?
- How does acidity of water affect seed germination?
  - Does acidic water prevent germination?
  - How quickly do seeds sprout when watered?
  - How does HCl affect the pH of water?
50. Which is the most testable hypothesis in this experiment?
- If pH affects seed germination, then acidic water will change the percent of seeds that germinate.
  - If seeds sprout at different rates, then acid rain will increase the sprouting rates.
  - If HCl kills seeds, then they will not sprout.
  - Acidic water causes more seeds to sprout.
51. Based on the data which conclusion is the most valid?
- The more acidic solutions caused more seeds to sprout.
  - Germinating seeds exposed to acidic solutions were adversely affected.
  - Different numbers of seeds sprout depending on how much water they receive.
  - Seeds can germinate at any pH
52. What other factors did the students have to consider to prevent other variables from impacting the data?
- Soil, light, and humidity should be the same in all test groups.
  - The number and type of seeds should be the same in all test groups.
  - The same students should water the tests each day.
  - Both A and B

**For questions 53, 54, and 55 use the information in the experiment described below:**

A sterilized soil sample was equally divided into three similar containers and 15 earthworms of the same size were added to each container. Container # 1 was left covered at room temperature, container # 2 was covered and refrigerated and container # 3 was covered and put into a warming oven. After a period of time, students observed the worms and counted the pulse rate of the dorsal blood vessel visible through the skin. The data from the experiment are shown below:

Container	Temperature	Time at temperature	Average heart rate per minute
1	15°C	2 hrs	30
2	25°C	2 hrs	58
3	35°C	2 hrs	122

53. The problem that this experiment was designed to address is best described as:
- How long can worms live at certain temperatures?
  - What is the average number of beats per minute?
  - How is the heart rate of worms affected by temperature?

- d. Are the heart rates of worms affected by overcrowding?
54. How did the students limit other variables from affecting the experiment?
- Each container was kept in the dark so that light did not play a role in the results.
  - They selected worms of equal size so that the heart rates would be similar.
  - They used sterilized soil to eliminate microbes from altering the results.
  - Both b and c are valid.
55. Which of the following would be the best conclusion based on the data from the experiment?
- Each ten degree interval, caused heart rates to roughly double.
  - Worms like refrigerator temperature better than room temperature.
  - Worms are more active at room temperature than in the warming oven.
  - Optimal heart rates for worms occurs at 25°C
56. To reduce the chance of live *Paramecia* succumbing to too much heat and light, which part of a compound microscope is best adjusted?
- Diaphragm
  - Coarse adjustment
  - Ocular lens
  - Revolving nosepiece
57. Which magnification would yield the largest viewable area under the microscope?
- 20X
  - 100X
  - 400X
  - 1000X
58. The ability to distinguish details of an image in a microscope is known as:
- Magnification
  - Replication
  - Monocular vision
  - Resolution
59. What is the magnification of an objective lens on a compound microscope if the total magnification is 800X and the ocular lens is 20X?
- 820X
  - 40X
  - 780X
  - 1600X
60. A company is developing a system of extracting pigments from plants for use as biodegradable pigments for the printing industry. The system involves collecting, grinding and then boiling the plants so that the cells release the pigments which can then be purified. In the table below are the results from an experiment using the system developed by the company.

Boiling time	Amount of pigment extracted (Kg/ton)			
	Pigment A		Pigment B	
	Plant 1	Plant 2	Plant 1	Plant 2
5	2.0	5.0	1.0	2.5
10	2.5	6.0	2.0	4.0
15	3.0	7.0	3.0	5.5
30	3.3	7.5	3.0	6.0
60	3.5	8.0	3.0	6.0

How many variables are there in the experiment? all full credit.

- One.
- Two.
- Three.
- Four



**New Jersey Science League  
Biology I Answer Key Blue Test Corrections:**

**Date: January 11, 2018**

**Record onto the area record the # correct**

1	B	16	C & B	31	C	46	A
2	A	17	C	32	C	47	D
3	A	18	D	33	B	48	B
4	B	19	A	34	C	49	A
5	C	20	B	35	B	50	A
6	C	21	B	36	B	51	B
7	D	22	A	37	A	52	D
8	C	23	D	38	B	53	C
9	B	24	D all full credit	39	A	54	D
10	D	25	B	40	A	55	A
11	B	26	A	41	B	56	A
12	C	27	C	42	A	57	A
13	A	28	C	43	C	58	D
14	C	29	B	44	D	59	B
15	A B	30	B C	45	B	60	B all full credit

**BIOLOGY I** : No AP or second year students in this category. 60 multiple choice questions per exam.

**JANUARY EXAM** – Scientific Method, Microscope parts and functions, Carbon Compounds and basic chemistry including the chemistry of water and pH, Chemical Reactions, Enzymes, Cell structure and function, Levels of Cellular Organization, Organelles, Prokaryotic and Eukaryotic, Cell membrane structure and function, Cellular and Intracellular transport, Tonicity, Homeostasis, Cellular Energy Flow, Photosynthesis and Respiration, Cellular Division- Mitosis, Cell Regulation.

**FEBRUARY EXAM** - Structure and function of nucleic acids, experiments identifying DNA as the hereditary molecule, DNA replication, roles of DNA and RNA, protein synthesis, viral DNA, Meiosis, chromosomal analysis (pedigree, karyotyping), Mendelian genetics, one and two factor crosses, incomplete dominance, codominance, pleiotropy, polygenic inheritance, sex-linked disorders, mutations and causes, human genetic diseases including chromosomal analysis, Variation of Traits, Genetic engineering, Gene regulation and expression, Plus review of the Jan exams

**MARCH EXAM** - Evidence for evolution: historical thought/experimental theories of evolution..... Biogenesis/Abiogenesis, Comparative anatomy and comparative embryology, Fossil record, Hardy Weinberg, Natural Selection, Speciation and its causes, Taxonomy: Cladograms and Phylogenetic Trees, Genetic change in a population, Patterns and causes of Evolution, Coacervate formation, Miller/Urey experiment. Molecular evidence (nucleotide sequence analysis, amino acid sequence analysis), Plus review of the Jan and Feb exams.

**APRIL EXAM** - Evidence of diversity, Adaptation of organism to the environment, Types of biomes, Limiting factors in Biomes, Population density and dispersal patterns, Carrying capacity of a population, Exponential Growth, Boom-and-bust growth cycles, Interactions of autotrophs and heterotrophs, Flow of energy through an ecosystem, Symbiosis, Food cycles and webs, Cycles of Matter, Ecological succession, Ecosystem models of energy flow, Ecological experimentation and analysis, Factors affecting biodiversity in a population, Human Influence on ecosystems, Plus review of Jan, Feb, and March exams.

Dates for 2018 Season

**Thursday January 11, 2018 Thursday February 8, 2018**

**Thursday March 8, 2018 Thursday April 12, 2018**

**All areas and schools must complete the April exam and mail in the results by April 27<sup>th</sup>, 2018**

**No area may take the April exam during the first week of April or the first week of May**

**New Jersey Science League**

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**Web address: <http://entnet.com/~personal/njscil/html/>**

**What is to be mailed back to our office?**

**PLEASE RETURN THE AREA RECORD AND ALL TEAM MEMBER SCANTRONS (ALL STUDENTS PLACING 1<sup>ST</sup>, 2<sup>ND</sup>, 3<sup>RD</sup>, AND 4<sup>TH</sup>).**

**If you return scantrons of alternates, then label them as ALTERNATES.**

Dates 2019 Season

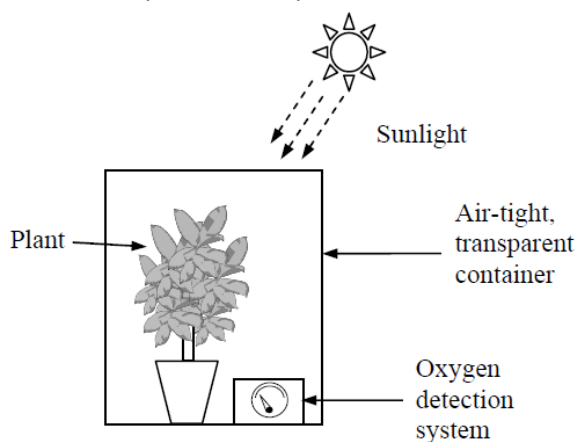
**Thursday January 10, 2019 Thursday February 14, 2019**

**Thursday March 14, 2019 Thursday April 11, 2019**

New Jersey Science League **BLUE EXAM** Corrections  
Biology I –February 8, 2018

Choose the answer that best completes the statements or questions below in the appropriate response on the scantron. If you change your answer, be sure to completely erase your first choice. Please PRINT your name, school, and which test you are taking onto the scantron. Please use the same name for all exams.

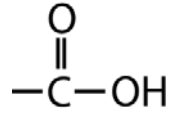
- Which of the following is a logical hierarchy of organization?
  - Organ, organelle, cell, molecule, atom
  - Atom, molecule, organelle, cell, organ
  - Molecule, cell, organelle, atom, organ
  - Cell, organelle, molecule, atom, organ
- You are trying to show that plants require the presence of light to produce oxygen. To do this you assemble the experimental system shown below.



Which of the following setups would be useful as a control for your experiment?

- The setup as above, but placed in a dark room.
  - The setup as above, but with holes in the top of the container.
  - The setup as above, but with the plant removed from the pot.
- I only.
  - II only.
  - III only.
  - I and II only.
- ATP is an important molecule in metabolism because
    - It is readily obtained from an organism's environment
    - It is extremely stable
    - It contains valuable nutrients
    - It has high-energy phosphate bonds
  - Where are you **LEAST** likely to find ribosomes in a cell?
    - Bound to the rough endoplasmic reticulum
    - Inside the vacuole
    - In the cytoplasm
    - Inside a mitochondrion

5. The functional group shown below is called the:
- hydroxyl group.
  - carbonyl group.
  - amino group.
  - carboxyl group.

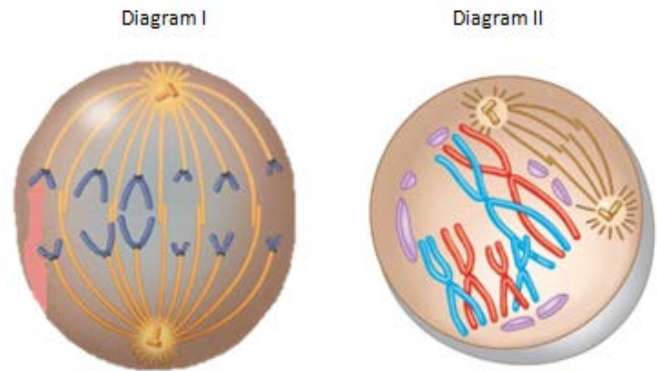


6. Which of the following does Q apply to the chloroplast?
- Contains chlorophyll and the enzymes required for photosynthesis
  - Contains an internal membrane system consisting of stack-like structures called thylakoids.
  - Bound by two membranes, the inner of which is folded into the cristae.
  - Contains ribosomes and DNA.
7. The oxygen gas produced during photosynthesis is derived from the splitting of
- Carbon dioxide
  - Water
  - Light sensitive pigments
  - Chlorophyll A
8. Cells that enter into the quiescent phase are most often found in which phase of the cell cycle?
- G<sub>0</sub>
  - G<sub>1</sub>
  - M
  - S
9. When a DNA molecule is replicated before mitosis the result is:
- two DNA molecules, one of which carries all of the original DNA molecule, while the other is newly synthesized.
  - two DNA molecules, each of which contains half of the original DNA molecule.
  - two DNA molecules, one of which carries all of the original DNA molecule, while the other is newly synthesized, plus the RNA template used as an intermediate.
  - two DNA molecules, each of which contains half of the original DNA molecule, plus the RNA template used as an intermediate.
10. Which statement about meiosis is **FALSE**?
- The two meiotic divisions reduce the DNA content per cell to one half of the initial content.
  - Crossing over occurs in prophase of the second meiotic division.
  - In meiosis, homologous pairs of chromosomes are pulled apart.
  - There is no DNA replication between the first and second meiotic division.
11. If the haploid number for a species is three, each dividing diploid cell during mitosis will have how many chromatids at metaphase?
- 3
  - 6
  - 9
  - 12
12. A certain type of organism has a diploid chromosome number of 8. A similar species has a diploid chromosome number of 10. Interspecific hybridization between the two species results in sterile hybrids. The diploid chromosome number of these hybrids would be:
- 9
  - 16
  - 18
  - 20

13. When a normal diploid cell undergoes complete meiosis it will produce
- a. Four haploid cells
  - b. Four diploid cells
  - c. Two haploid cells
  - d. Two diploid cells

14. Which of the cells below shows a stage of cell division that is **unique** to meiosis?

- a. I only
- b. II only
- c. Both I and II
- d. Neither I or II

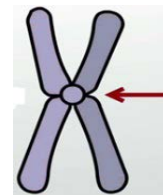


15. Which one of the following choices best describes the behavior of a tetrad during anaphase I of meiosis?
- a. It goes intact to one pole of the dividing cell.
  - b. It splits into two pairs of sister chromatids, and one pair goes to each pole of the dividing cell.
  - c. It splits into two pairs of homologous, non-sister chromatids, and one pair goes to each pole of the dividing cell.
  - d. It splits into four chromosomes, which distribute in random pairs to the two poles of the dividing cell.

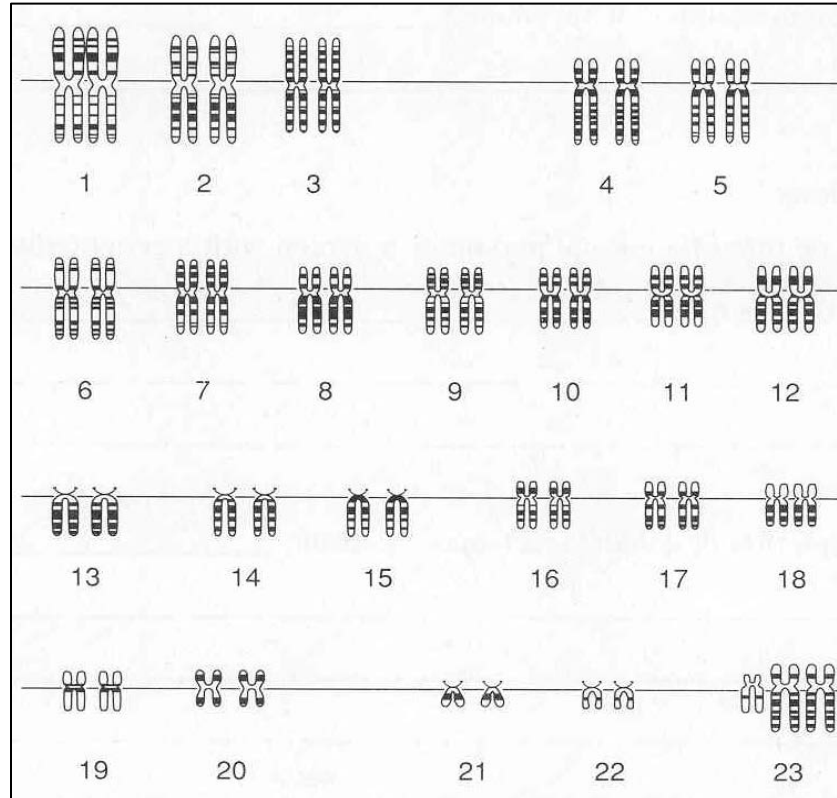
16. Which of the following gives sexual reproduction an advantage over asexual reproduction?
- a. It produces more offspring.
  - b. It increases the variation among the offspring of an individual.
  - c. It preserves parental genotypes.
  - d. It allows evolution due to sexual selection.

17. How do cells at the completion of meiosis compare with the diploid cell from which they were derived?
- a. They have twice the amount of cytoplasm and half the amount of DNA.
  - b. They have half the number of chromosomes and half the amount of DNA.
  - c. They have the same number of chromosomes and half the amount of DNA.
  - d. They have the same number of chromosomes and the same amount of DNA.

18. The region on the chromosome joining the two sister chromatids is called:
- a. Centriole
  - b. Centromere
  - c. Centrosome
  - d. Tetrad



Refer to the karyotype below for questions #s 19 and 20:

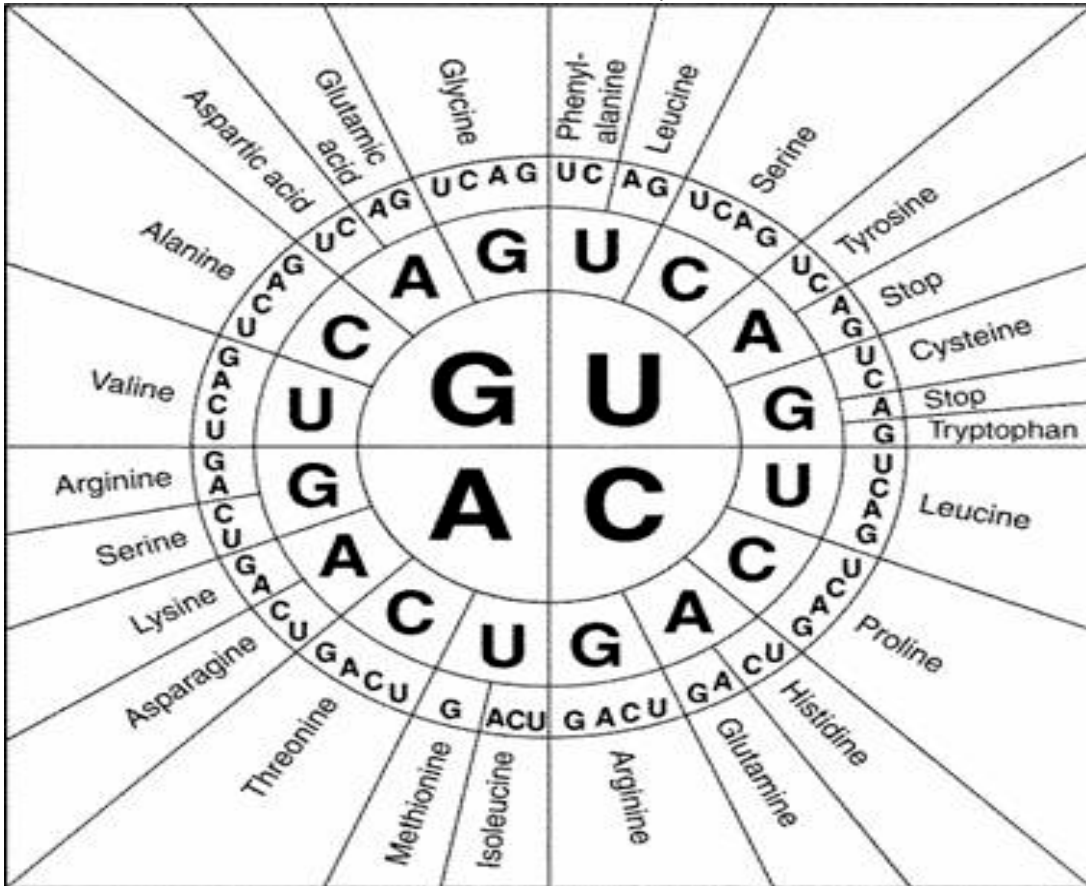


19. The karyotype belongs to a:
- normal male
  - normal female
  - female with Turner syndrome
  - male with Klinefelter syndrome
20. The most number of genes would be found on:
- chromosome # 1
  - chromosome # 3
  - X chromosome
  - Y chromosome
21. In humans, twins that develop from two separately fertilized ova
- Are always identical
  - Will always be different genders.
  - Can have a different appearance but will always be the same gender.
  - Can be the same or different genders.
22. The cause of trisomy 21 (Down's syndrome) is:
- Non-disjunction during meiosis
  - Chromosomal insertion
  - Non-disjunction during mitosis
  - Chromosomal translocation
23. A frameshift mutation could result from:
- a base insertion only.
  - a base deletion only.
  - deletion of three consecutive bases.
  - either an insertion or a deletion of a base.

24. Dominant mutations are easier to detect than recessive mutations because they:
- are always lethal and so their appearance is unmistakable.
  - are expressed in both homozygotes and heterozygotes.
  - are always favored by selection
  - are always neutral in their effect.
25. Which one of the following is FALSE?
- RNA uses the sugar dextrose.
  - RNA uses the nitrogenous base uracil.
  - One RNA molecule can include four different nucleotides in its structure.
  - RNA molecules have a sugar-phosphate backbone.
26. The term *gene expression* refers to the
- fact that each individual of a species has a unique set of genes.
  - fact that certain genes are visible as dark stripes on a chromosome.
  - process by which genetic information flows from genes to proteins.
  - flow of information from parent to offspring.
27. The coding regions of a gene (the portions that are expressed as polypeptide sequences) are called
- introns.
  - exons.
  - redundant coding sections.
  - nucleosomes.
28. The two strands of the DNA double helix are held together by:
- hydrogen bonds.
  - C=C double bonds.
  - hydrophobic bonds.
  - phosphodiester bonds.
29. If 35% of the bases of a DNA molecule are thymine, it follows that it also contains:
- 30% adenine.
  - 30% cytosine.
  - 15% guanine.
  - 35% uracil.
30. A segment of template DNA strand has the nucleotide sequence 3'– ATTCGCTAGACC –5'  
What will be the nucleotide sequence of the complementary mRNA?
- 5' – UAAGCGAUCUGG – 3'
  - 3' – AUUCGCUAGACC – 5'
  - 5' – TAAGCGATCAGG – 3'
  - 3' – ATTCGCTAGACC – 5'
31. Which of the following is NOT an accurate description of protein synthesis and folding?
- Many copies of a protein can be synthesized simultaneously from the same mRNA.
  - The 3D shape of a protein is determined largely by the ribosome forming the protein.
  - The entire chain of amino acid exits the ribosome before it begins folding into its 3D shape.
  - The first encoded amino acid in every protein is methionine.
32. Which of the following statements is correct about the synthesis of proteins?
- Protein synthesis only takes place by ribosomes bound to the endoplasmic reticulum.
  - tRNA molecules transport amino acids to ribosomes during protein synthesis.
  - A codon can code for more than one amino acid.
- I only
  - II only
  - III only
  - I and II only

33. Molecular biologists cracked the code of life in the 1960s, when a series of elaborate experiments disclosed the amino acid translations of each of the mRNA codons. How many triplet mRNA codons are there?
- a. 16                                      b. 20                                      c. 32                                      d. 64

Use the circular codon table below for the next three questions: #s 34, 35, 36.



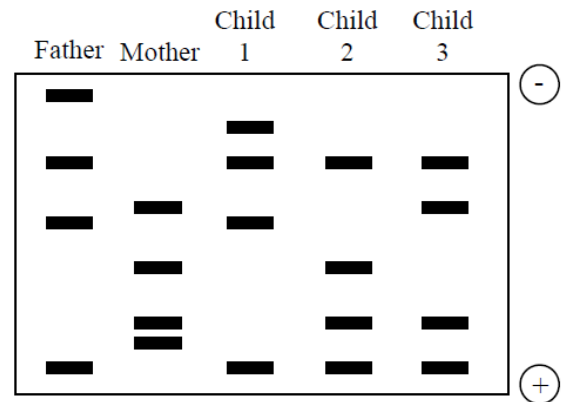
34. The DNA triplet 3' GAC 5' codes for the amino acid
- a. Aspartic acid                      b. Leucine                              c. Glutamine                          d. Valine
35. The tRNA molecule that will carry amino acid methionine has the anti-codon
- a. AUG                                      b. GUA                                      c. CAG                                      d. UAC
36. The codon for amino acid histidine is:
- a. UAC                                      b. CAU                                      c. GUA                                      d. GUG
37. The term "translation" refers to:
- a. a specific type of DNA repair.
- b. the synthesis of a polypeptide according to a RNA sequence.
- c. the synthesis of RNA according to a DNA sequence.
- d. the synthesis of DNA according to an RNA sequence.

38. The anticodon region is an important structural component of:
- a. mRNA
  - b. DNA
  - c. tRNA
  - d. rRNA
39. Which of the following mutations in a gene would MOST likely result in a non-functional protein being synthesized?
- a. Substitution of a base pair near the end of the coding sequence.
  - b. A deletion of 3 base pairs near the middle of the coding sequence.
  - c. An insertion of 3 base pairs near the middle of the coding sequence.
  - d. An insertion of 1 base pair near the start of the coding sequence.
40. Which of the following is the correct sequence of involvement in the process of protein synthesis?
- a. Nucleus, mRNA, ribosome, cytoplasm
  - b. Ribosome, smooth endoplasmic reticulum, mitochondria, tRNA
  - c. mRNA, tRNA, endoplasmic reticulum, ribosome
  - d. tRNA, endoplasmic reticulum, ribosome, nucleus
41. We would expect that a 15-nucleotide sequence before a stop codon will direct the production of a polypeptide that consists of
- a. 3 amino acids.
  - b. 5 amino acids.
  - c. 7 amino acids.
  - d. 15 amino acids.
42. The goal of the polymerase chain reaction is to:
- a. speed up protein synthesis for the production of new drugs.
  - b. create many copies of a DNA sequence from a very small sample.
  - c. create many copies of messenger RNA molecules.
  - d. investigate the properties of organisms which normally grow at very high temperatures.
43. The feature of "sticky ends" that makes them especially useful in DNA recombination is their ability to
- a. bind to ribosomes and thereby activate translation.
  - b. form hydrogen-bonded base pairs with complementary single-stranded stretches of DNA.
  - c. allow plasmids to attach to the main bacterial chromosome.
  - d. insert a segment of RNA into a bacterial chromosome.
44. Ethidium Bromide is used in electrophoresis of DNA fragments because:
- a. It makes the fragments visible under UV light
  - b. It makes the DNA fragments more mobile in the gel
  - c. It helps determine the size of the fragments
  - d. It maintains a stable pH
45. Insulin injected by diabetics to control blood sugar levels is derived from bacteria whose DNA has been modified by the addition of the human gene for insulin, which is then produced by the prokaryotes. This is an example of: The word this is not clear to its reference.
- a. Acid therapy
  - b. Cloning
  - c. Genetic engineering
  - d. Gene therapy



46. Restriction enzymes are used in recombinant DNA technology to:
- cut large DNA molecules at sequence-specific sites.
  - carry foreign genes along with viral DNA into the host cell.
  - join DNA fragments.
  - clone DNA fragments.
47. DNA fingerprinting is often used to confirm the identity of an individual. In a family, a child's DNA must be derived either from his mother or father, with approximately half the child's genetic material coming from each parent. The diagram below shows a small section of the gel electrophoresis results from a DNA fingerprint analysis of a family. Which of the children is LEAST likely to be the offspring of BOTH parents?

- Child 1.
- Child 2.
- Child 3.
- These children are definitely offspring of both parents.

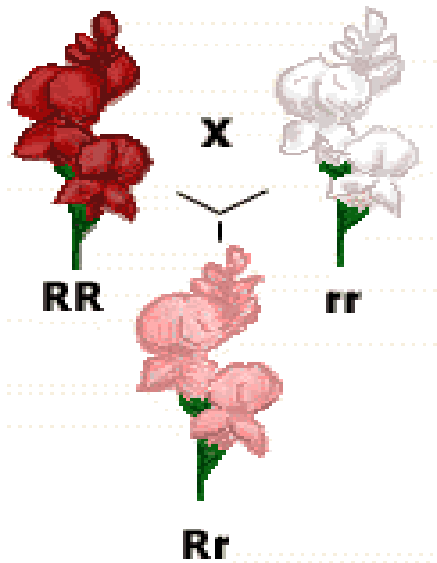


48. Scientists induced a single diploid cell from an adult sheep (the "mother") to grow into a lamb, named Dolly. How closely were Dolly and her "mother" related?
- They were completely unrelated.
  - They were about as related as a brother and a sister would be.
  - They were about as related as fraternal twins.
  - They were about as related as identical twins.
49. Which of the following statements about Mendelian genetics is FALSE?
- Alternate forms of genes are called alleles.
  - Only two alleles can exist for a given gene.
  - A genotype is a description of the alleles that represent an individual's genes.
  - Individuals with the same phenotype can have different genotypes.
50. Before beginning a genetic analysis how would you best assure that you have homozygous genotypes?
- Examine each individual very closely for signs of variation.
  - Start with individuals who are all homozygotes for recessive alleles.
  - Start with individuals from different species.
  - Start with individuals which look very different from other individuals.
51. In pea seeds, round (R) is dominant to wrinkled (r) and yellow (Y) is dominant to green (y). What percentage of round yellow seeds is expected from the cross: RrYY x RRYy?
- 100 %
  - 75 %
  - 50 %
  - 25 %

52. If two animals with the genotype AaBb X AaBb are mated, what is the probability of generating an offspring with the genotype AABb? Assume there is no linkage between the two genes.
- a. 1/8                      b. 1/4                      c. 3/8                      d. 1/2
53. Phenylketonuria and albinism are two autosomal recessive disorders caused by single unlinked genes. If a normal couple produced a child with both disorders, what is the probability that their second child will also have both disorders?
- a. 1/2                      b. 1/4                      c. 1/8                      d. 1/16
54. In a certain species of rat, fur color is controlled by a single gene. There are two alleles for this gene, the black fur allele and the white fur allele. If these alleles were found to be incompletely dominant with respect to one another, then this species of rat would most likely have:
- a. only black fur.                      c. two possible genotypes for fur color.  
 b. only white fur.                      d. three possible phenotypes for fur color.
55. A man who carries an X-linked allele will pass it on to:
- a. all of his daughters.                      c. all of his sons.  
 b. half of his daughters.                      d. all of his children.
56. Mendel's law of independent assortment states that
- a. chromosomes sort independently of each other during mitosis and meiosis.  
 b. genes sort independently of each other in animals but not in plants.  
 c. independent sorting of genes produces polyploid plants under some circumstances.  
 d. each pair of alleles segregates independently of the other pairs of alleles during gamete formation.
57. Linked genes generally
- a. follow the laws of independent assortment.  
 b. do not follow the laws of independent assortment.  
 c. show incomplete dominance.  
 d. reflect a pattern of codominance.
58. With regard to the AB blood group typing system, two parents have children with the following blood types
- Child 1 – Group A                      Child 2 – Group O                      Child 3 – Group B
- If the father has blood group A what blood group must the mother have?
- a. Group A                      b. Group O                      c. Group AB                      d. Group B

59. The picture below shows a cross between a red-flowered snapdragon plant and a white-flowered snapdragon plant.

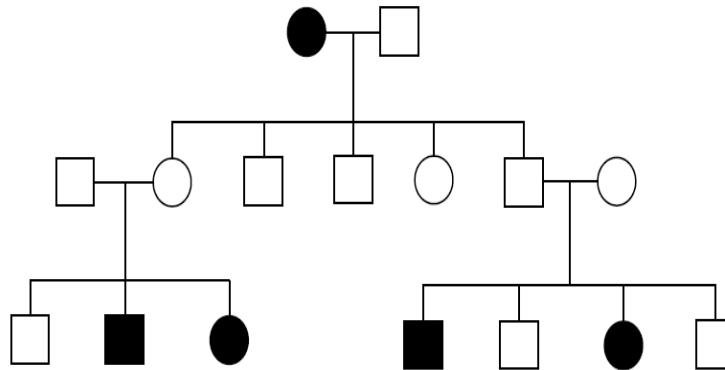
**F1 Hybrids**



All the F1 hybrid offspring of a cross between the red-flowered snapdragon plant and a white-flowered snapdragon plant have pink flowers. This means that the allele for red flowers is \_\_\_\_\_ to the allele for white flowers.

- a. dominant
- b. codominant
- c. incompletely dominant
- d. recessive

60. The pedigree below shows the inheritance of a genetically inherited blood disorder in a family. Circles represent females, squares represent males and dark colored shapes represent effected individuals.



What is the most likely mode of inheritance of this disorder?

- a. X-linked dominant
- b. X-linked recessive
- c. Autosomal dominant
- d. Autosomal recessive

New Jersey Science League  
**Biology I Answer Key Blue Test Corrections**

Date: February 8, 2018

**Record onto the area record the # correct**

1	B	16	B	31	B	46	A
2	A	17	B	32	B	47	A
3	D	18	B	33	D	48	D
4	B	19	D	34	B	49	B
5	D	20	A	35	D	50	B
6	C	21	D	36	B	51	A
7	B	22	A	37	B	52	A
8	A	23	D	38	C	53	D
9	B	24	B	39	D	54	D
10	B	25	A	40	A	55	A
11	D	26	C	41	B	56	D
12	A	27	B	42	B	57	B
13	A	28	A	43	B	58	D
14	B	29	C	44	A	59	C
15	B	30	A	45	C & D	60	D

**BIOLOGY I**: No AP or second year students in this category. 60 multiple choice questions per exam.

**JANUARY EXAM** – Scientific Method, Microscope parts and functions, Carbon Compounds and basic chemistry including the chemistry of water and pH, Chemical Reactions, Enzymes, Cell structure and function, Levels of Cellular Organization, Organelles, Prokaryotic and Eukaryotic, Cell membrane structure and function, Cellular and Intracellular transport, Tonicity, Homeostasis, Cellular Energy Flow, Photosynthesis and Respiration, Cellular Division- Mitosis, Cell Regulation.

**FEBRUARY EXAM** - Structure and function of nucleic acids, experiments identifying DNA as the hereditary molecule, DNA replication, roles of DNA and RNA, protein synthesis, viral DNA, Meiosis, chromosomal analysis (pedigree, karyotyping), Mendelian genetics, one and two factor crosses, incomplete dominance, codominance, pleiotropy, polygenic inheritance, sex-linked disorders, mutations and causes, human genetic diseases including chromosomal analysis, Variation of Traits, Genetic engineering, Gene regulation and expression, Plus review of the Jan exams

**MARCH EXAM** - Evidence for evolution: historical thought/experimental theories of evolution..... Biogenesis/Abiogenesis, Comparative anatomy and comparative embryology, Fossil record, Hardy Weinberg, Natural Selection, Speciation and its causes, Taxonomy: Cladograms and Phylogenetic Trees, Genetic change in a population, Patterns and causes of Evolution, Coacervate formation, Miller/Urey experiment. Molecular evidence (nucleotide sequence analysis, amino acid sequence analysis), Plus review of the Jan and Feb exams.

**APRIL EXAM** - Evidence of diversity, Adaptation of organism to the environment, Types of biomes, Limiting factors in Biomes, Population density and dispersal patterns, Carrying capacity of a population, Exponential Growth, Boom-and-bust growth cycles, Interactions of autotrophs and heterotrophs, Flow of energy through an ecosystem, Symbiosis, Food cycles and webs, Cycles of Matter, Ecological succession, Ecosystem models of energy flow, Ecological experimentation and analysis, Factors affecting biodiversity in a population, Human Influence on ecosystems, Plus review of Jan, Feb, and March exams.

Dates for 2018 Season

Thursday February 8, 2018

Thursday March 8, 2018    Thursday April 12, 2018

All areas and schools must complete the April exam and mail in the results by April 27<sup>th</sup>, 2018

No area may take the April exam during the first week of April or the first week of May

New Jersey Science League

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Web address: <http://entnet.com/~personal/njscil/html/>

What is to be mailed back to our office?

**PLEASE RETURN THE AREA RECORD AND ALL TEAM MEMBER SCANTRONS (ALL STUDENTS PLACING 1<sup>ST</sup>, 2<sup>ND</sup>, 3<sup>RD</sup>, AND 4<sup>TH</sup>).**

If you return scantrons of alternates, then label them as ALTERNATES.

Dates 2019 Season

Thursday January 10, 2019    Thursday February 14, 2019

Thursday March 14, 2019    Thursday April 11, 2019

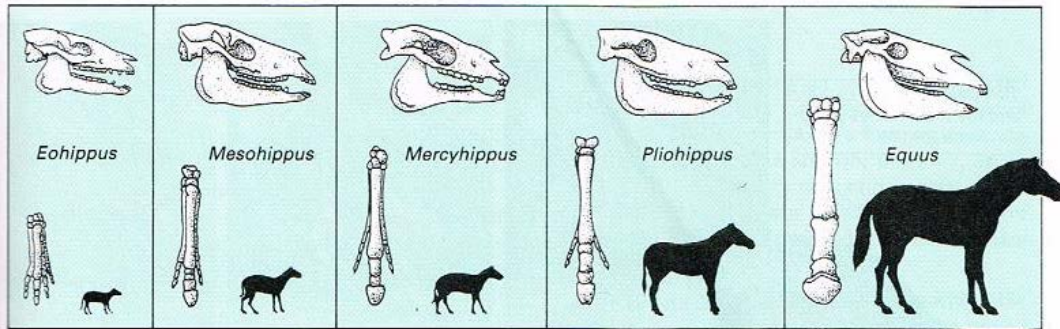
New Jersey Science League **BLUE EXAM** Corrections:  
Biology I –March 8, 2018

Choose the answer that best completes the statements or questions below in the appropriate response on the scantron. If you change your answer, be sure to completely erase your first choice. Please PRINT your name, school, and which test you are taking onto the scantron. Please use the same name for all exams.

1. Jean Baptiste Lamarck published his theory of evolution in 1809. Lamarck's theory of evolution has been rejected by modern biologists because:
  - a. his theory provided a genetic mechanism for how evolutionary change occurred.
  - b. his theory was based on special creation.
  - c. the selection experiments he conducted on giraffe's necks involved artificial and not natural selection.
  - d. the characteristics an organism acquires during its lifetime cannot be passed on to its offspring.
  
2. The similarities between marsupials in Australia and placental mammals elsewhere are examples of
  - a. emigration
  - b. immigration
  - c. adaptive radiation
  - d. convergent evolution
  
3. The sequence of events in geographic speciation is most likely to be:
  - a. Genetic divergence → geographic barrier → reproductive isolation.
  - b. Geographic barrier → genetic divergence → reproductive isolation.
  - c. Reproductive isolation → genetic divergence → geographic barrier.
  - d. Genetic divergence → reproductive isolation → geographic barrier.
  
4. Many people were skeptical of the theory of evolution when Darwin first proposed it. Darwin received such sharp criticism because:
  - a. he could not explain completely how evolution occurred because he did not know the mechanism of inheritance.
  - b. the fossil record indicated that there were links between birds and reptiles.
  - c. Earth was thought to be much older than it actually is.
  - d. he proposed that chimpanzees had evolved into humans.
  
5. A population is in genetic equilibrium when genotype and allele frequencies remain the same from one generation to the next. Genetic equilibrium will occur when:
  - a. populations are small, thus more likely to be affected by genetic drift.
  - b. beneficial mutations arise.
  - c. there is no immigration and emigration.
  - d. there is natural selection.
  
6. What does the term “reproductive isolation” refer to?
  - a. An individual is unable to fertilize itself.
  - b. Genes are not exchanged between two populations.
  - c. Individuals from two populations never produce offspring.
  - d. Individuals are solitary breeders.

7. Which statement best defines evolution?
- Change in genetic composition of a population
  - The close resemblance between parents and their offspring
  - Difference between individuals in survival
  - Change in the phenotype of an individual through time

8. The picture below shows the evolution of horse.

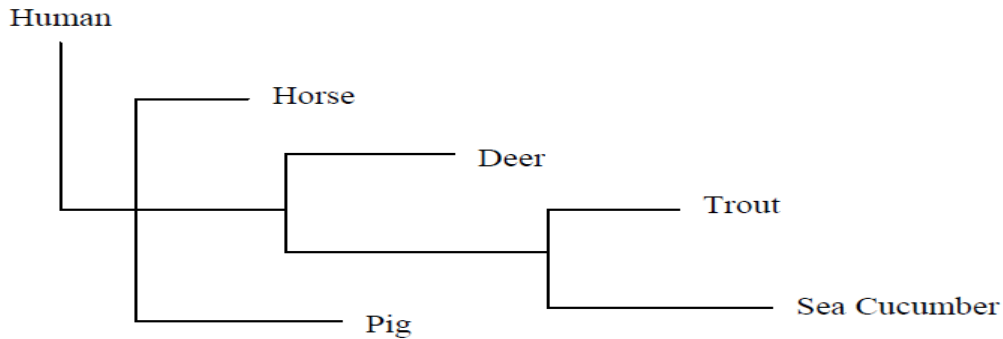


According to the pictures above, the horse has had a reduction in:

- Toe number
  - Body height
  - Skull size
  - Leg length
9. Which of the following would generally reduce the likelihood of speciation?
- Geographical isolation
  - Natural selection
  - Genetic drift
  - Immigration and emigration
10. Which of the following is true about Darwinian evolution?
- Predators are not the only selection pressure faced by most populations.
  - Bacteria are no longer evolving
  - An organism evolves through its lifespan
  - Species that reproduce asexually don't evolve
11. According to the Darwinian theory of evolution, which of the following is true?
- A father that has had his appendix removed will have children with no appendix
  - Squids have longer arms because previous generations of squid stretched their tentacles to catch prey.
  - An increasing proportion of Australian rabbits are immune to the myxomatosis virus because those that are resistant are able to breed.
  - Giraffes have long necks because each generation stretches their neck longer so that they can eat leaves higher on trees.
12. Which of the following situations is MOST likely to cause speciation?
- Two different species of animals living in the same habitat.
  - Many different species of animals living in the same habitat.
  - Interbreeding between two existing species that produce infertile offspring.
  - A species of animals living in the same habitat which become physically separated by a watercourse.

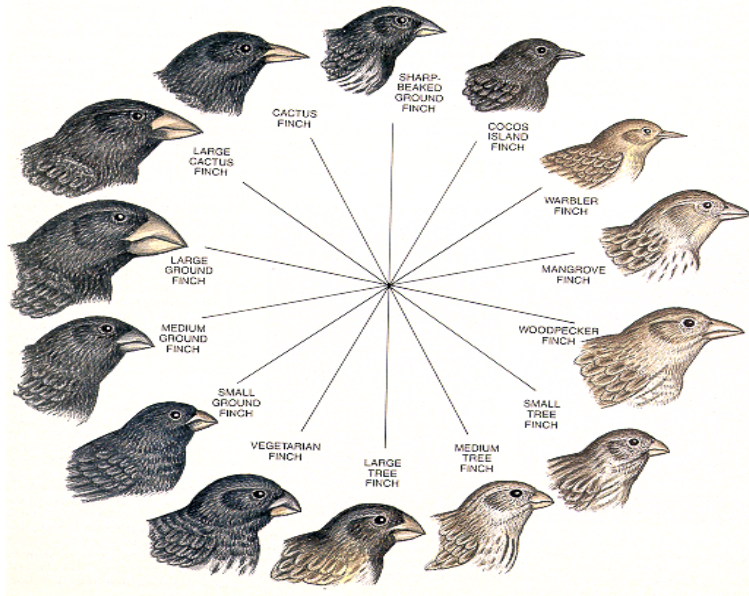
Refer to the following information to answer questions # 13 and 14.

A cladogram is a graphical way to represent the similarities between protein sequences of different species, shown by the length and branching of lines. Below is the cladogram generated when the sequence of the hemoglobin protein is compared between species.



13. The species most closely related to humans is \_\_\_\_\_, and the species least related to humans is \_\_\_\_\_.
- Horse; pig
  - Sea cucumber; horse
  - Horse; sea cucumber
  - Pig; horse
14. From the information shown in this cladogram, you hypothesize that the horse is more closely related to the pig than to humans. What is the best way to test this theory?
- Compare the vestigial structures of humans, horses and pigs.
  - Compare the genetic information contained in liver cells of humans, horses and pigs.
  - Compare the gross morphology (overall shape) and organ systems of humans, horses and pigs.
  - Compare the behavior of humans, horses and pigs and the ecological niches they occupy.
15. Which of the following populations is most likely to be close to Hardy-Weinberg equilibrium?
- A population of 100 fruit flies living in a habitat with little environmental fluctuation that has no other populations of fruit flies nearby.
  - A population of 1 million fruit flies living in a habitat with little environmental fluctuation that has many other populations of fruit flies nearby.
  - A population of 100 fruit flies living in a habitat with little environmental fluctuation that has many other populations of fruit flies nearby.
  - A population of 1million fruit flies living in a habitat with little environmental fluctuation that has no other populations of fruit flies nearby.
16. The emergence of a plant species over a brief period of time followed by periods of little change would support which of the following theories?
- The gradualism model
  - Allopatric speciation
  - Punctuated equilibrium
  - Phylogenetic divergence

17. All of the following statements about the process of natural selection are true **EXCEPT**:
- Natural selection causes evolution.
  - Natural selection changes allele frequencies.
  - Natural selection changes genotype frequencies.
  - Natural selection explains inheritance of acquired characteristics
18. Genetic drift is best described as:
- A random change in allele frequencies that benefits the population
  - Changes in the proportion of homozygous recessive individuals due to random mating
  - Evolutionary change due to natural selection
  - Evolutionary change due to random events
19. Genetic drift resulting from a disaster that drastically reduces population size is called
- natural selection.
  - gene flow.
  - the bottleneck effect.
  - the founder effect.
20. Darwin's finches are a prime example of adaptive radiation. Which of the following best describes this adaptive radiation correctly?



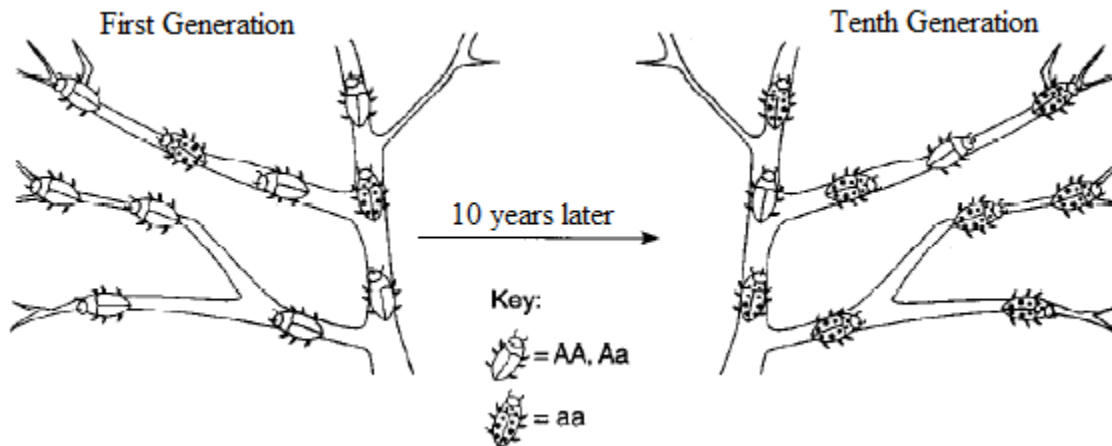
- The genetic variability that can be found among individuals of the same species
  - The evolutionary process by which different forms, adapted to different niches arose from a common ancestor
  - The evolutionary process that allows for the changes that occur within the same lineage
  - A sudden diversification of a group of organisms from closely related species
21. The strongest evidence for the endosymbiotic origin of animal organelles is the similarity between:
- Prokaryotic and eukaryotic flagella
  - Prokaryotic and eukaryotic cell walls
  - Some prokaryotes and mitochondria
  - Some prokaryotes and ribosomes



22. To keep their dog breeds “pure,” breeders will keep dogs of different breeds in physically separate areas when the female is in heat. This aspect of artificial selection is most closely analogous to which of the following reproductive isolating mechanisms?

- a. Mechanical isolation
- b. Cooperative breeding
- c. Ecological isolation
- d. Hybrid breakdown

23. Population genetics shows us that certain traits of a species will become more abundant, if they benefit the species. The diagram below illustrates the change that occurred in the frequency of phenotypes in an insect population over 10 generations. A probable explanation for this change would be that over time there was:



- a. An increase in the population of this insect.
- b. A decrease in the adaptive value of allele a.
- c. An increase in the adaptive value of allele a.
- d. A decrease in the mutation rate of allele A.

24. For high school students, the tendency to panic before exams is a dominant trait (P). Out of 2500 students, 900 students stayed calm before exams. In terms of the Hardy/Weinberg equilibrium equation, the students who panic are represented by which choice below. **A and b correct**

Hardy-Weinberg Equations

$$p^2 + 2pq + q^2 = 1$$

p = frequency of dominant allele in a population

Q = frequency of the recessive allele in a population

**a.  $p^2$**

**b.  $2pq$**

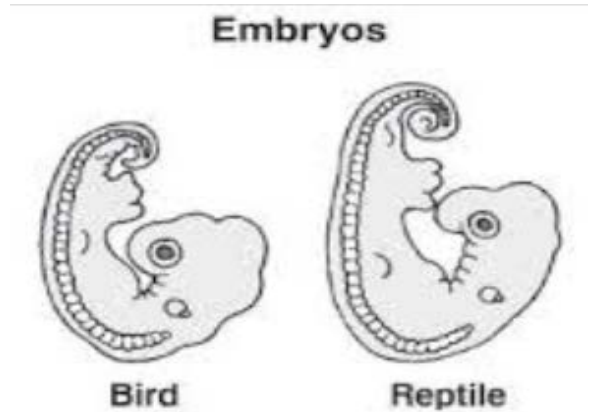
c.  $q^2$

d.  $p^2 + q^2$

25. The diagram below illustrates an embryonic stage of two organisms.

Which of the following can be determined by observing the embryos shown in the diagram above?

- a. The organisms share a common ancestry.
- b. The organisms belong to the same genus.
- c. The organisms are native to the same geographic areas.
- d. The organisms will grow into anatomically similar adults.



26. What is NOT true about the evidence that fossils provide?

- a. Some fossil organisms are transitional forms between groups of organisms.
- b. Fossil organisms often share physical similarities with living organisms.
- c. Fossil records have provided us evidence with representatives of every species that ever inhabited the earth.
- d. Fossil ages can often be determined by testing nearby rocks.

27. Convergent evolution produces

- a. Analogous structures
- b. Homologous structures
- c. Divergent structures
- d. Vestigial structures

28. What term is used to refer to structures that have a similar origin or ancestry even though they may be very different in appearance?

- a. convergent
- b. analogous
- c. divergent
- d. homologous

29. Which one of the following represents two structures that are homologous?

- a. the wing of a bat and the scales of a fish
- b. the wing of a bat and the flipper of a whale
- c. the antennae of an insect and the eyes of a bird
- d. the legs of a fly and the wings of a bird

30. Which of the following is not an example of a vestigial structure in humans?

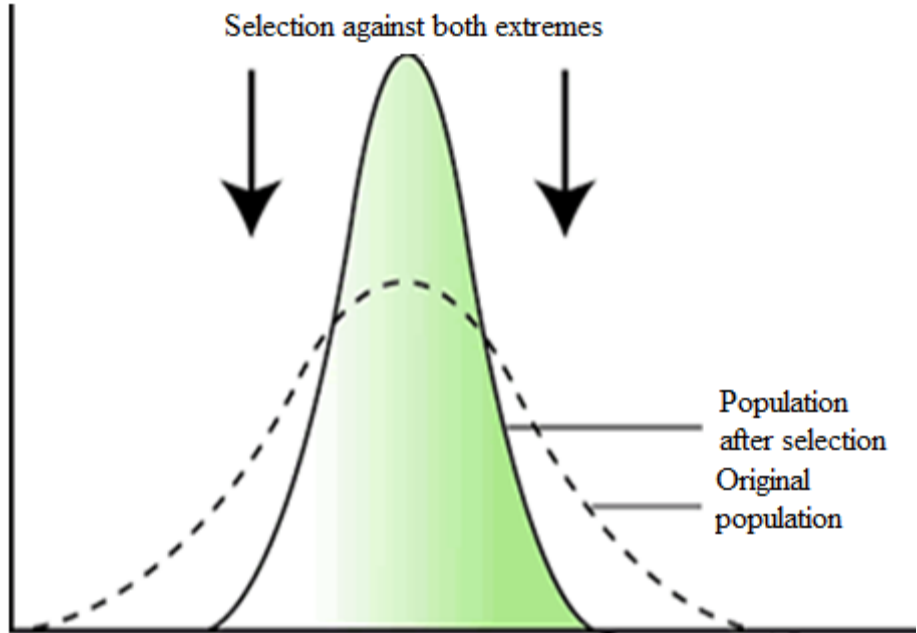
- a. tail bone
- b. pelvis
- c. appendix
- d. wisdom teeth

31. Which of the following constitutes a basic, modern definition of a sexually reproducing species?

- a. a group of individuals living in the same place at the same time
- b. a group of populations whose members can interbreed and produce fertile offspring
- c. a group of individuals who interbreed
- d. the smallest unit that can engage in microevolution

32. What type of selection is illustrated in the picture below?

- a. Sexual
- b. Disruptive
- c. Directional
- d. Stabilizing



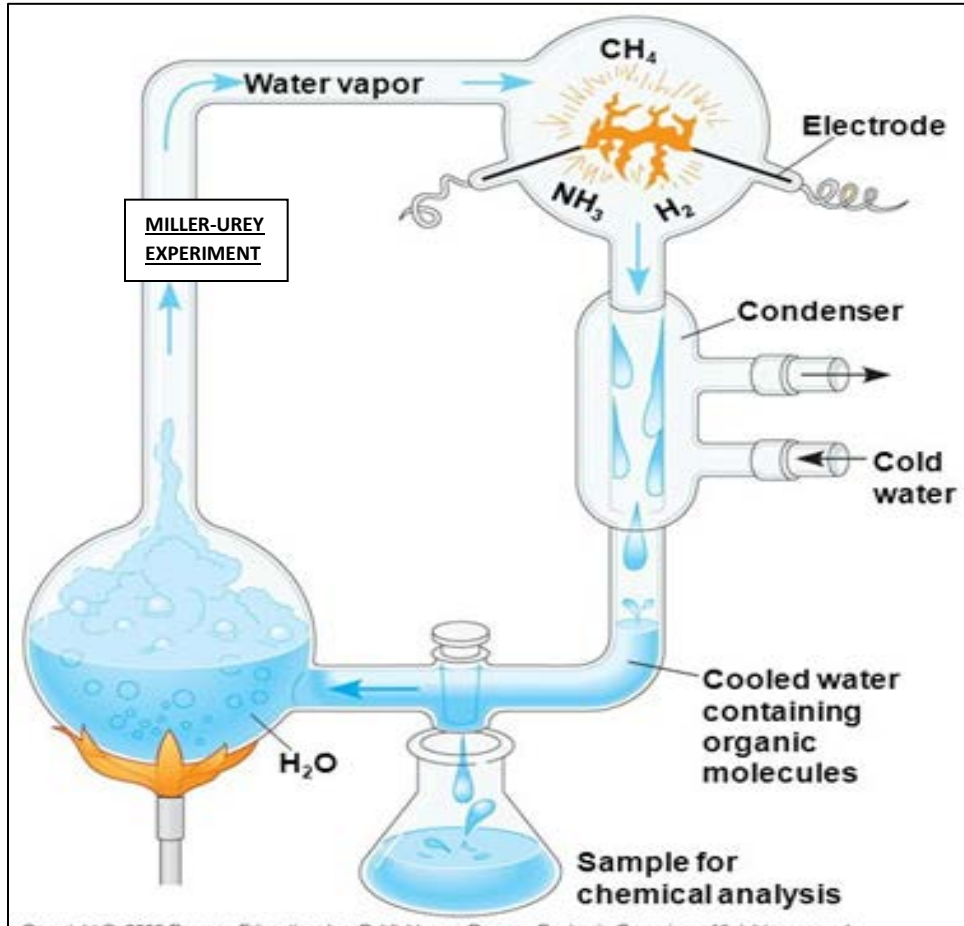
33. A classic example of natural selection is the population change in the color of peppered moths. As a consequence of air pollution during the industrial revolution, the frequency of dark-colored moths increased at that time.

The change in color of the peppered moth is an example of:

- a. population with disruptive selection
- b. population with directional selection
- c. population with stabilizing selection
- d. population with no selection



Review the image below to answer questions #34, 35, 36, 37.

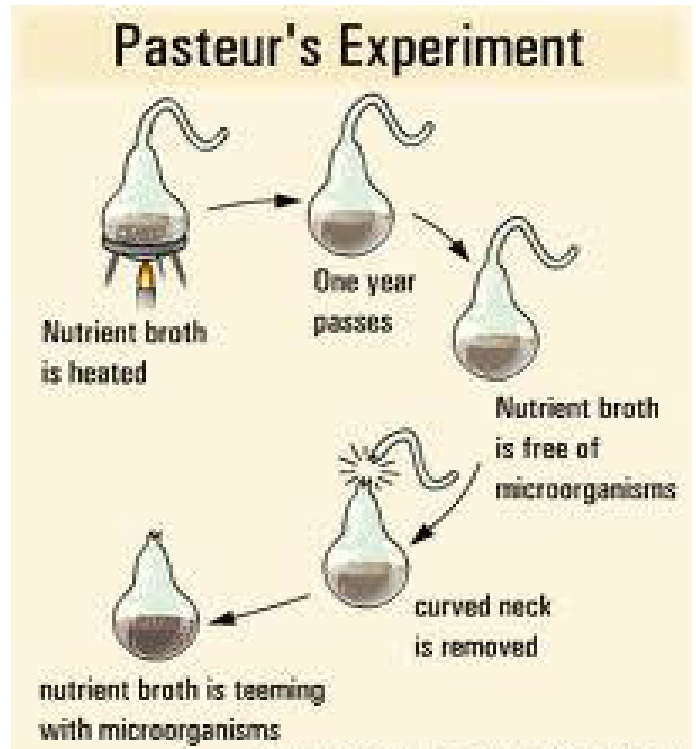


34. What did the Miller-Urey experiment prove?
- It was designed to show the existence of life on other planets.
  - It proved that bacteria were the first type of living organisms to appear on the earth.
  - It was designed to simulate the formation of organic molecules in the early atmosphere.
  - Miller and Urey set out to disprove spontaneous generation.
35. What is the purpose of the sparks from the electrodes in the chamber?
- These sparks simulated lightning.
  - The sparks superheated the water in the condenser to simulate volcanic action.
  - The sparks kept the mixture from freezing in an unheated laboratory.
  - The sparks simulated daylight.
36. The Miller-Urey experiments initially yielded:
- |                                   |                          |
|-----------------------------------|--------------------------|
| a. urea only                      | c. amino acids only      |
| b. hydrogen cyanide and urea only | d. hydrogen cyanide only |
37. Which of the following gases is least likely to have existed in the early atmosphere of the earth?
- |           |           |           |          |
|-----------|-----------|-----------|----------|
| a. $NH_3$ | b. $CO_2$ | c. $H_2O$ | d. $O_2$ |
|-----------|-----------|-----------|----------|

38. Which of the following scientists believed that coacervates (microscopic spontaneously formed spherical aggregates of lipid molecules) may have been precursors of cells:
- a. Redi                                      b. Spallanzani                                      c. Oparin                                      d. Needham
39. Which of the following is not found in a lipid coacervate droplet or a proteinoid microsphere?
- a. the ability to grow                                      c. a two-layer boundary  
b. a nucleus                                      d. division by pinching in two

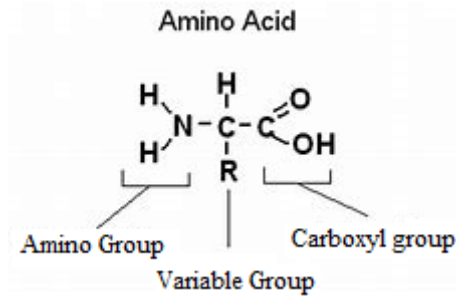
In the 1850s Louis Pasteur conducted the following experiment:

40. Which statement is NOT true about Louis Pasteur's experiment?
- a. He proved cells can only grow from other cells  
b. He disproved spontaneous generation  
c. He proved that microorganisms grow from nutrient broth  
d. He provided evidence that any appearance of life in nonliving solutions can be attributed to microbes that already exist in the air or in the fluids themselves



41. Which scientist disproved spontaneous generation of large organisms by showing maggots came from flies not from rotting meat?
- a. Redi                                      b. Needham                                      c. Spallanzani                                      d. Pasteur
42. Which of the following terms refers to life arising from other living things?
- a. Abiogenesis                                      c. Spontaneous generation  
b. Biogenesis                                      d. Endosymbiosis

43. The diagram below shows the general structure of an amino acid.



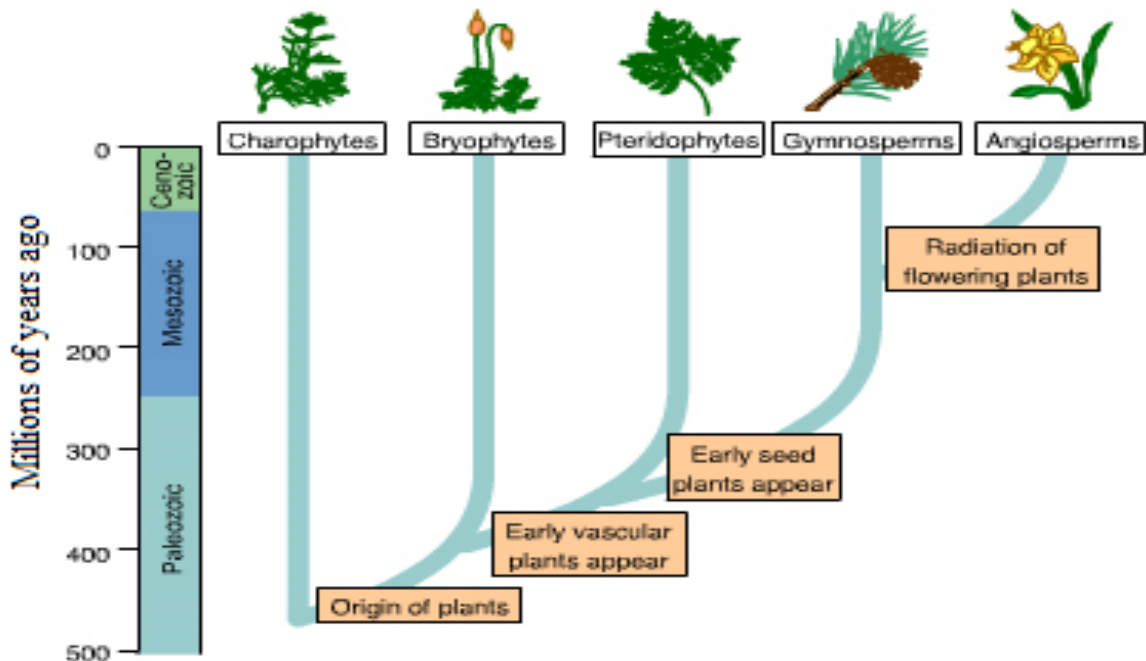
Which of the amino acid's chemical groups can form part of a peptide bond in a protein?

- a. The carboxyl group only.
- b. The amino group only.
- c. The carboxyl and amino groups only.
- d. The amino and variable groups only.

44. Assuming that the probability of having a female child is 50% and the probability of having a male child is also 50%, what is the probability that a couple's first-born child is female and second-born is male?

- a. 25%
- b. 50%
- c. 75%
- d. 100%

Observe the phylogenetic tree below:



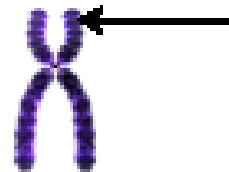
45. According to the above phylogenetic tree, angiosperms are most closely related to \_\_\_\_\_.

- a. charophyceans
- b. bryophytes
- c. seedless vascular plants
- d. gymnosperms

46. The essential characteristic of a polar molecule is that it:
- contains hydrogen.
  - has an asymmetrical distribution of electrical charge.
  - is formed at extremely low temperatures.
  - contains double or triple bonds.
47. Which statement best explains why protozoans that live in pond water must pump out excess water from their cytoplasm?
- The pond water is hypotonic to the protozoan cytoplasm.
  - The pond water is hypertonic to the protozoan cytoplasm.
  - The pond water is isotonic to the protozoan cytoplasm.
  - Water cannot diffuse across the protozoan plasma membrane.
48. The enzymes of the citric acid (Krebs) cycle are located in the:
- stroma of the chloroplast.
  - cristae of the mitochondrion.
  - matrix of the mitochondrion.
  - thylakoid space of the chloroplast
49. A cell cycle consists of:
- mitosis and meiosis.
  - prophase, metaphase, anaphase, telophase.
  - G1, the S phase, and G2.
  - interphase and mitosis.
50. Heating inactivates enzymes by:
- attaching inhibitors to the enzyme.
  - removing phosphate groups from the enzyme.
  - causing enzyme molecules to stick together
  - changing the enzyme's three-dimensional shape
51. Which one of the following is not the proper pairing of a macromolecule and its corresponding monomer?
- Carbohydrate and monosaccharide
  - Lipid and triglyceride
  - Nucleic acid and nucleotide
  - Protein and amino acid

52. What is the designation for the region of the chromosome indicated by the arrow?

- s arm
- p arm
- q arm
- r arm



53. Restriction enzymes
- Edit proteins
  - Cut DNA at specific sites
  - Stop transcription
  - Bind DNA strands together

54. Linnaeus used binomial nomenclature to identify organisms. What is the most specific binomial used to identify an organism?
- a. class and species.
  - b. class and order.
  - c. family and genus.
  - d. genus and species.
55. All of the following are advantages of using scientific names over common names to identify organisms **EXCEPT**:
- a. Common names may change
  - b. One species may have several common names
  - c. Scientific name will apply universally
  - d. The scientific name may be applied to two species
56. Prior to mitosis, each chromosome of a eukaryotic cell consists of a pair of identical structures called:
- a. Chromatin
  - b. Sister chromatids
  - c. Centrioles
  - d. Centrosomes
57. A cell that has 20 chromosomes undergoes mitosis. Which of the following is true?
- a. Two daughter cells will be created, each having 20 chromosomes
  - b. Two daughter cells will be created, each having 40 chromosomes
  - c. Four daughter cells will be created, each having 10 chromosomes
  - d. Two daughter cells will be created, each having 10 chromosomes
58. During cellular respiration, glucose gets \_\_\_\_\_ and oxygen gets \_\_\_\_\_.
- a. reduced/oxidized
  - b. oxidized/reduced
  - c. reduced/reduced
  - d. oxidized/oxidized
59. If you consume 1 gram of each of the following, which will yield the most ATP?
- a. Oil
  - b. Sucrose
  - c. Protein
  - d. Starch
60. Dog breeds such as Beagles, Border Collies, and German Shepherds, were produced by the process of:
- a. Natural selection
  - b. Artificial selection
  - c. Decent without modification
  - d. Inheritance of acquired characteristics



New Jersey Science League  
**Biology I Answer Key Blue Test Corrections**

Date: March 8, 2018

**Record onto the area record the # correct**

**Deadline:** All March exam results must be post marked by March 16<sup>th</sup> or scan the record sheet and email to [newjsl@ptd.net](mailto:newjsl@ptd.net) or the scores will not count.

1	D	16	C	31	B	46	B
2	D	17	D	32	D	47	A
3	B	18	D	33	B	48	C
4	A	19	C	34	C	49	D
5	C	20	B	35	A	50	D
6	B	21	C	36	C	51	B
7	A	22	C	37	D	52	B
8	A	23	C	38	C	53	B
9	D	24	A & B	39	B	54	D
10	A	25	A	40	C	55	D
11	C	26	C	41	A	56	B
12	D	27	A	42	B	57	A
13	C	28	D	43	C	58	B
14	B	29	B	44	A	59	A
15	D	30	B	45	D	60	B

**BIOLOGY I** : No AP or second year students in this category. 60 multiple choice questions per exam.

**JANUARY EXAM** – Scientific Method, Microscope parts and functions, Carbon Compounds and basic chemistry including the chemistry of water and pH, Chemical Reactions, Enzymes, Cell structure and function, Levels of Cellular Organization, Organelles, Prokaryotic and Eukaryotic, Cell membrane structure and function, Cellular and Intracellular transport, Tonicity, Homeostasis, Cellular Energy Flow, Photosynthesis and Respiration, Cellular Division- Mitosis, Cell Regulation.

**FEBRUARY EXAM** - Structure and function of nucleic acids, experiments identifying DNA as the hereditary molecule, DNA replication, roles of DNA and RNA, protein synthesis, viral DNA, Meiosis, chromosomal analysis (pedigree, karyotyping), Mendelian genetics, one and two factor crosses, incomplete dominance, codominance, pleiotropy, polygenic inheritance, sex-linked disorders, mutations and causes, human genetic diseases including chromosomal analysis, Variation of Traits, Genetic engineering, Gene regulation and expression, Plus review of the Jan exams

**MARCH EXAM** - Evidence for evolution: historical thought/experimental theories of evolution..... Biogenesis/Abiogenesis, Comparative anatomy and comparative embryology, Fossil record, Hardy Weinberg, Natural Selection, Speciation and its causes, Taxonomy: Cladograms and Phylogenetic Trees, Genetic change in a population, Patterns and causes of Evolution, Coacervate formation, Miller/Urey experiment. Molecular evidence (nucleotide sequence analysis, amino acid sequence analysis), Plus review of the Jan and Feb exams.

**APRIL EXAM** - Evidence of diversity, Adaptation of organism to the environment, Types of biomes, Limiting factors in Biomes, Population density and dispersal patterns, Carrying capacity of a population, Exponential Growth, Boom-and-bust growth cycles, Interactions of autotrophs and heterotrophs, Flow of energy through an ecosystem, Symbiosis, Food cycles and webs, Cycles of Matter, Ecological succession, Ecosystem models of energy flow, Ecological experimentation and analysis, Factors affecting biodiversity in a population, Human Influence on ecosystems, Plus review of Jan, Feb, and March exams.

Dates for 2018 Season

Thursday March 8, 2018    Thursday April 12, 2018

All areas and schools must complete the April exam and mail in the results by April 27<sup>th</sup>, 2018

No area may take the April exam during the first week of April or the first week of May

New Jersey Science League

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Web address: <http://entnet.com/~personal/njscil/html/>

What is to be mailed back to our office?

**PLEASE RETURN THE AREA RECORD AND ALL TEAM MEMBER SCANTRONS (ALL STUDENTS PLACING 1<sup>ST</sup>, 2<sup>ND</sup>, 3<sup>RD</sup>, AND 4<sup>TH</sup>).**

If you return scantrons of alternates, then label them as ALTERNATES.

Dates 2019 Season

Thursday January 10, 2019    Thursday February 14, 2019

Thursday March 14, 2019    Thursday April 11, 2019

New Jersey Science League **Corrections: None**  
Biology I – BLUE EXAM April 12, 2018

Choose the answer that best completes the statements or questions below in the appropriate response on the scantron. If you change your answer, be sure to completely erase your first choice. Please PRINT your name, school, and which test you are taking onto the scantron. Please use the same name for all exams.

- In a forest, two different species of rat are observed to compete for a particular type of berry. This competition involves the two species fighting and often sustaining injury. What can you deduce about this type of berry?
  - It is a resource which both species preferentially eat.
  - It is available in a limited quantity.
  - It is not consumed by any other species.
  - There are few seeds inside the berries.

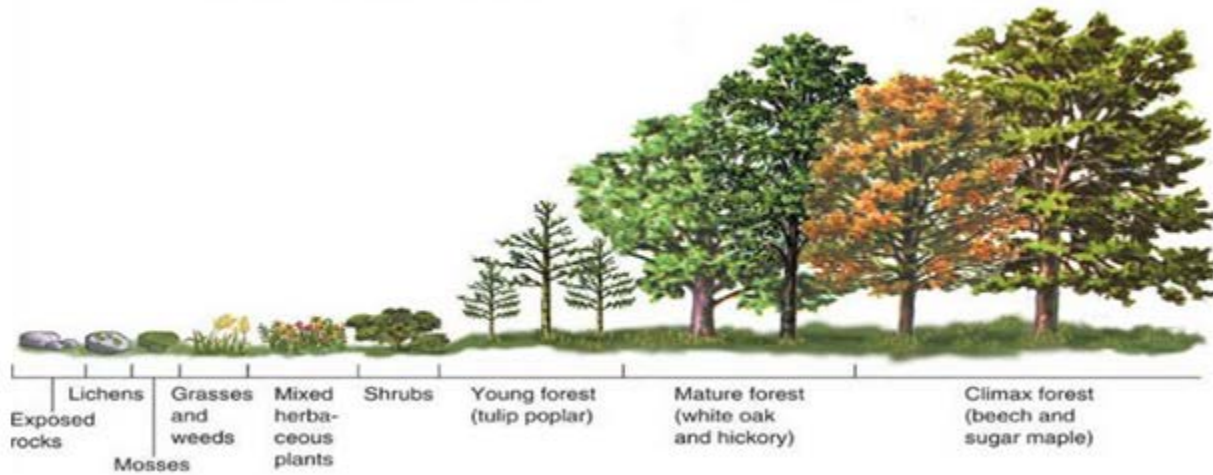
a. I only.                      b. II only.                      c. I and II only.                      d. II and IV only.
- A species of insect was found to have resistance to a commonly used insecticide. Which of the following is the most likely explanation?
  - Stabilizing selection caused development of resistance in the insect population
  - The original gene pool included genes that conferred resistance to the insecticide
  - The insecticide stimulated development of resistance in certain individuals and this was inherited
  - The insecticide caused a mutation that was favorable to resistance and this was inherited
- In a particular environment, there are no obvious fitness differences among individuals with dark hair and individuals with light hair. The term that best describes this situation is
  - random selection.
  - natural selection.
  - random variation.
  - neutral variation.
- The biodiversity of a community is measured by the following:
  - Number of different species
  - Abundance of mammals
  - Total biomass in a given area
  - Ratio of plant to animal species
- Earth's four major terrestrial biomes are:
  - Forest, taiga, grassland, desert
  - Forest, grassland, tundra, desert
  - Forest, grassland, savanna, desert
  - Savanna, forest, grassland, tundra
- In a forest, a group consisting of all the maple trees would be considered a:
  - Population
  - Community
  - Ecosystem
  - Biome

Refer to the graph below for questions #7, 8, 9, 10:

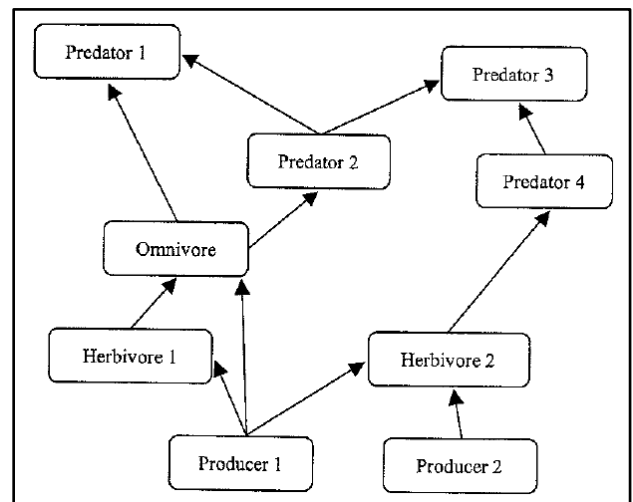


7. What is the “carrying capacity” of a population?
  - a. The rate at which the density of individuals increases over time.
  - b. The maximum number of individuals which can be supported in a given environment.
  - c. The proportion of individuals which are most responsible for population growth.
  - d. The minimum number of individuals necessary to avoid extinction of the population.
  
8. Identify the correct statement with reference to the graph above:
  - a. Curve 1 exhibits exponential growth and curve 2 exhibits carrying capacity
  - b. Curve 1 exhibits carrying capacity and curve 2 exhibits exponential growth
  - c. Both curves 1 and 2 exhibit carrying capacities of a certain population at different times during the year
  - d. Curve 1 exhibits the carrying capacity of a certain population and curve 2 exhibits the carrying capacity of a different population
  
9. What is the carrying capacity of curve #2?
  - a. 200 individuals
  - b. 1000 individuals
  - c. 1100 individuals
  - d. 1200 individuals
  
10. In what generation does the population in curve #2 above reach its carrying capacity?
  - a. Around Generation 10
  - b. Around Generation 14
  - c. Around Generation 23
  - d. Around Generation 30
  
11. Select a statement that accurately describes an ecosystem?
  - a. Energy flow from trophic level to trophic level is 90% efficient.
  - b. Energy may only flow from the biotic to the abiotic portions of ecosystems.
  - c. Heterotrophs supply 10% of the energy needed by autotrophs.
  - d. Some energy lost during transfers from trophic level to trophic level is in the form of heat.

Refer to the picture below for questions # 12, 13:



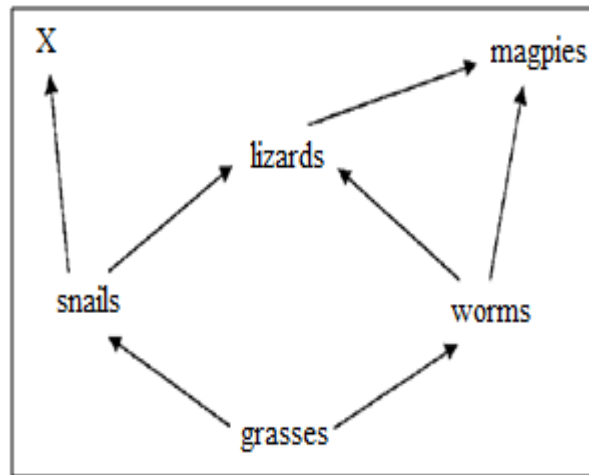
12. Progressive change towards a climax in a community is called:
- Evolutionary change
  - Energy flow
  - Succession
  - Dynamic equilibrium
13. An area of bushland is destroyed in a storm. The process by which the bush vegetation will re-establish itself is called
- primary succession
  - secondary succession
  - tertiary succession
  - evolutionary succession
14. The following diagram shows a representation of a food web in an ecosystem.  
If Predator 4's population was severely decreased by disease, which of the following is LEAST likely to occur?



- Herbivore 2 will increase in number.
- Predator 1 will increase in number.
- Producer 2 will decrease in number.
- Producer 1 will increase in number.

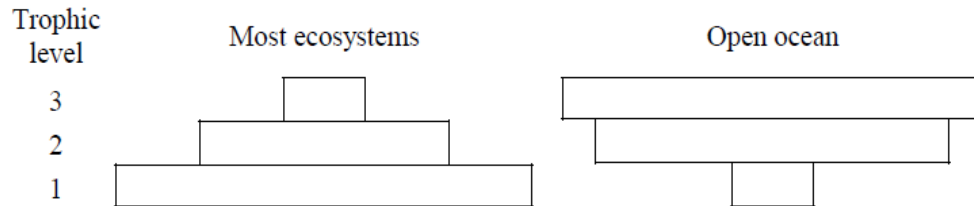
15. Compared to an ecosystem with a small variety of species, an ecosystem with a large variety of species:
- Has less natural selection
  - Has less competition between species
  - Has a greater fluctuation in the number of individuals
  - Is more stable under conditions of environmental stress
16. In some herbivorous mammals, the cellulose of plant cell walls:
- is digested by enzymes produced by symbiotic microorganisms.
  - is digested by cellulase, which is secreted by the lining of the rumen.
  - is hydrolyzed to simple molecules by large quantities of saliva.
  - cannot be digested and therefore forms the bulk of the feces.
17. Fungi may obtain their energy by which of the following methods (I to V)?
- Feeding on dead matter
  - From other organisms in a symbiotic relationship
  - From other organisms as a parasite
  - By undertaking photosynthesis
  - By undertaking aerobic respiration to produce lactic acid
- I only
  - I and II only
  - I, II, and III only
  - IV, and V only
18. The actual rate of growth of a population is the difference between the:
- number of adults and the number of newborn.
  - numbers of breeding and non-breeding individuals.
  - size last year and the size this year.
  - birth rate and death rate.
19. Mutualistic relationships between individuals of two different species benefit both species. Which of the following is an example of a mutualistic relationship?
- Natural flora living in the human gut.
  - Ticks living on a cow's legs.
  - Tapeworms in a sheep's intestines.
  - Maggots on a rabbit carcass
20. Cactus plants are adapted to the hot and dry deserts of North and South America. Which of the following characteristics would NOT help cacti to survive the extreme heat and low rainfall?
- A thick waxy cuticle
  - Stomata that are closed during the day
  - Thin leaves with a large surface area
  - Water storage tissue
21. Carbon mainly cycles between the biotic and abiotic worlds by the processes of
- respiration and transpiration.
  - transpiration and photosynthesis.
  - evaporation and photosynthesis.
  - respiration and photosynthesis.

Refer to the food web below for questions # 22, 23, 24



22. The death of a large number of worms would be predicted to cause
- an increase in the number of lizards
  - an increase in the number of snails
  - a decrease in the number of magpies
  - a decrease in the amount of grass
23. What type of organism could fill position X?
- A primary consumer
  - A carnivorous mammal
  - A herbivorous insect
  - An autotroph
24. Which of the following groups of animals would be regarded as primary consumers?
- Magpies
  - Grasses
  - Worms and lizards
  - Snails and worms
25. If we wish to manage a deer population so that a very high number of deer can be harvested, we should manage the population so that:
- the number of deer is far enough below the carrying capacity to support high birth and growth rates.
  - the deer are rare and have little contact with each other.
  - the number of deer slightly exceeds the carrying capacity so that the excess can be harvested.
  - the number of deer greatly exceeds the carrying capacity to provide a large number of excess individuals.
26. The concentration of polychlorinated biphenyls (PCB, an organochloride contaminant) in many fish populations has been declining since a ban on their production was instituted in the late 1970s. PCBs remain a potential problem, however, because they are known to biomagnify. Based on this knowledge, what type of fish is expected to be safest for human consumption (i.e., with the lowest concentration of organochlorides)?
- Slow-growing fish species.
  - Piscivorous fish species (i.e., which eat other fish).
  - Small (young) fish.
  - Fish species with high fat content.

27. Both insects and vertebrates have hinged jaws. While the jaws serve the same general purpose, they evolved from different structures in the two groups. This is an example of:
- Punctuated evolution
  - Divergent evolution
  - Convergent evolution
  - Homologous structures
28. In most ecosystems, the biomass of a trophic level is higher than the biomass of its predators, as illustrated below by an upright pyramid of biomass. In the open ocean, however, the biomass of primary producers (microscopic algae) is often lower than the biomass of higher trophic levels (for example, zooplankton and fish), as illustrated below by an inverted pyramid of biomass. In the open ocean, how can there be enough food to support the higher trophic levels?

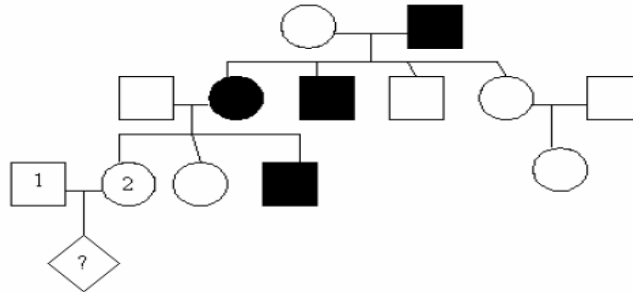


*Note: The width of the bars indicates the amount of biomass at each trophic level.*

- The microscopic primary producers are a source of food of high quality.
  - The microscopic primary producers have high rates of growth and reproduction.
  - The higher trophic levels are cold-blooded animals which do not require much food.
  - The higher trophic levels are efficient predators.
29. When you eat lettuce, you are acting as a
- Producer
  - Primary consumer
  - Secondary consumer
  - Tertiary consumer
30. When Shakespeare was alive cobs of maize (corn) grew to about 15 cm in length, whereas today they can be almost twice this size. This increase in size is because:
- of the cooler temperatures and decreased rainfall experienced at that time.
  - agricultural fields in England were small at that time and thus nutrients were limiting.
  - corn cobs were not grown to their optimal size due to high demand for corn at that time.
  - plant breeding using genetic principles and recombinant DNA technology
31. In a diploid strain of peas, flower color is determined by two alleles segregating at a single gene locus. The completely dominant allele (P) gives rise to purple flowers, while the recessive allele (p) gives rise to white flowers. What color flowers will a plant have if its genotype is Pp?
- All will be purple
  - All will be white
  - $\frac{1}{2}$  will be purple and the other  $\frac{1}{2}$  will be white
  - All will be purple with white spots

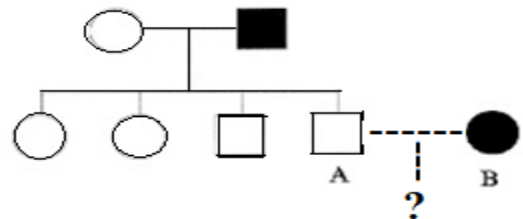
32. Feather color in budgies is determined by two different genes that affect the pigmentation of the feathers:  $Y\_B\_$  is green;  $yyB\_$  is blue; and  $yybb$  is white. Two blue budgies were paired for life. Over many years, they produced 22 offspring, five of which were white. What are the most likely genotypes for the parents?
- a.  $yyBB$  and  $yyBB$
  - b.  $yyBB$  and  $yyBb$
  - c.  $yyBb$  and  $yyBb$
  - d.  $yyBB$  and  $yybb$

33. The pedigree shown below results from a rare X-linked disease. If individual 1 and 2 have a baby, what is the likelihood that the child, noted with a ?, will have the disease?      circles represent females, squares represent males



- a. 50% if it is a girl; 50% if it is a boy
  - b. 0% if it is a girl; 50% if it is a boy
  - c. 50% if it is a girl; 0% if it is a boy
  - d. 0% if it is a girl; 0% if it is a boy
34. Albinism (lack of skin pigmentation) is caused by a recessive autosomal allele. A man and a woman, both normal pigmented, have an albino child together. The couple then has a second child. What is the probability that the second child will be albino?
- a. 25%
  - b. 50%
  - c. 75%
  - d. 100%
35. Which of the following statements about Mendelian genetics is FALSE?
- a. Alternate forms of genes are called alleles.
  - b. A locus is a gene's location on its chromosome.
  - c. Only two alleles can exist for a given gene.
  - d. Individuals with the same phenotype can have different genotypes.
36. In the pedigree shown below, circles represent females, squares represent males. Colored shapes represent individuals who suffer from a genetic disease caused by a recessive allele at an autosomal locus. You would counsel the couple marked A and B that the probability that each of their children will have the disease is:

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

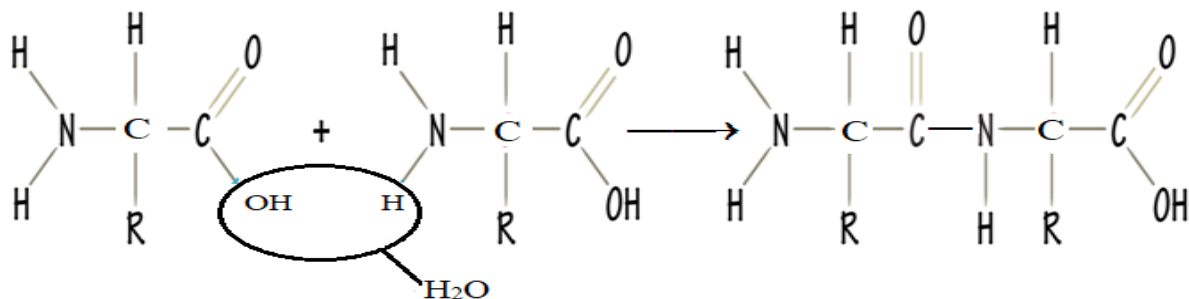


37. Which of these processes removes carbon dioxide from the atmosphere?
- a. decomposition
  - b. burning
  - c. cellular respiration
  - d. photosynthesis



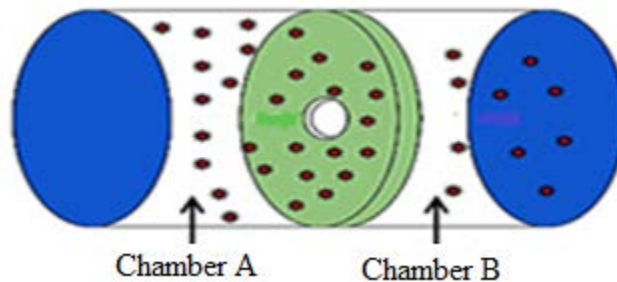
38. If an organism's somatic cells have 24 chromosomes each then the number of chromatids during mitotic division would be
- 6
  - 12
  - 24
  - 48
39. An ecologist hypothesizes that predation by a particular owl species is the major factor controlling the population of a particular rabbit species. If this hypothesis proves to be correct, which of the following population effects could be expected in this rabbit-owl relationship?
- A fall in the rabbit population should cause an increase in the owl population.
  - An increase in the incidence of disease in the rabbit population should not change the owl population.
  - An increase in the rabbits' food supply should not change the owl population.
  - An increase in the owl population should cause a fall in the rabbit population.
40. The pattern of distribution for a certain species of kelp is clumped. We will expect that the pattern of distribution for a population of snails that live on the kelp would be
- clumped
  - random
  - homogeneous
  - uniform
41. In which of the following biomes would you expect to find the highest abundance of large grazing mammals?
- Tropical rain forest
  - Chaparral
  - Temperate grassland
  - Desert
42. What type of bond is found in organic molecules such as sugars?
- Hydrogen only
  - Ionic only
  - Covalent only
  - Covalent and ionic only

Refer to the reaction below for questions # 43, 44, 45:



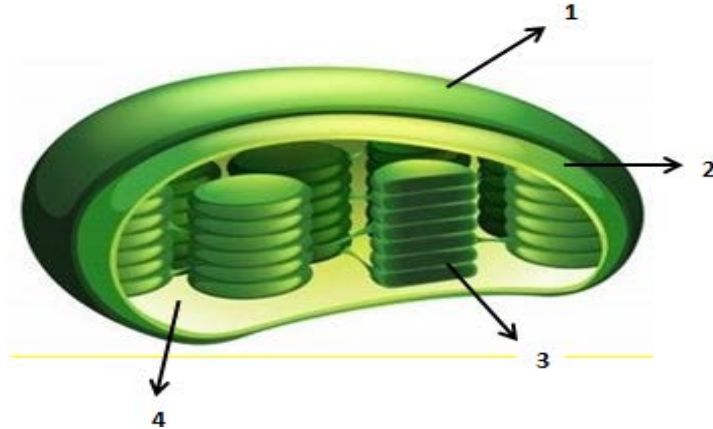
43. The chemical reaction shown above results in the joining of 2 molecules to form a larger molecule. The 2 molecules are joined to each other by the formation of a:
- Peptide bond
  - Ionic bond
  - Glycosidic bond
  - Hydrogen bond
44. The above chemical reaction is called:
- Dehydration synthesis
  - Hydrolysis
  - Denaturation
  - Phosphorylation
45. The above chemical reaction shows a step in the formation of a:
- Carbohydrate
  - Lipid
  - Protein
  - Nucleic acid

46. Water's surface tension and heat storage capacity is accounted for by its
- orbitals.
  - covalent bonds.
  - hydrogen bonds.
  - size.
47. One of the principal problems in using an electron microscope to study cells is that
- some cells are too small to be seen even with an electron microscope
  - the electron microscope has limited resolution
  - we can't slice the cells thinly enough
  - the cells can't be alive
48. An experiment is set up with two chambers that are connected by an opening through which molecules can freely pass. Chamber A contains 28% Helium gas and Chamber B contains 10% Helium gas. Which of the following will occur?



- The net movement of helium will be from Chamber A to Chamber B
  - The net movement of helium will be from Chamber B to Chamber A
  - Helium will remain concentrated in Chamber A
  - All the helium will move to Chamber B
49. In what process would microtubules and microfilaments NOT be used?
- cell division
  - cytoplasmic streaming
  - RNA synthesis
  - vesicle migrating to the cell membrane
50. Anaerobic respiration in human cells produces:
- Ethyl alcohol only
  - Ethyl alcohol and CO<sub>2</sub>
  - Lactic acid and CO<sub>2</sub>
  - Lactic acid only
51. The enzyme DNA helicase begins DNA replication by
- creating more nucleotides of DNA
  - unzipping the two strands of DNA
  - pairing complementary nitrogen bases
  - catalyzing the sugar-phosphate bonds
52. During which stage of meiosis do tetrads form?
- Prophase I
  - Prophase II
  - Anaphase I
  - Anaphase II
53. Which of the following supports the endosymbiotic theory of eukaryotic cell development?
- Mitochondria have their own DNA molecules.
  - The ribosomes of mitochondria are identical to the ribosomes in other parts of the eukaryotic cell.
  - All of the DNA in eukaryotic cells is confined to the nucleus.
  - Mitochondria are surrounded by a single membrane.

Use the following diagram for questions # 54 and 55.



54. Light dependent reactions take place in  
a. region 1                      b. region 2                      c. region 3                      d. region 4
55. The region labeled 4 is filled with  
a. stoma                          b. stroma                          c. matrix                          d. cytoplasm
56. Gel electrophoresis sorts DNA molecules on the basis of their  
a. nucleotide sequence.                      c. solubility in the gel.  
b. solubility in water.                          d. size
57. Modifications to mRNA during protein synthesis include  
a. addition of a poly-A "cap" to the molecule.  
b. addition of a poly-G "tail" to the molecule.  
c. removal of introns from the molecule.  
d. splicing introns together to form the molecule.
58. Genetic drift resulting from a disaster that drastically reduces population size is called  
a. natural selection.                          c. the bottleneck effect.  
b. gene flow.                                      d. the founder effect.
59. A rabbit population consists of animals that are either very dark on top or very light on top. When examining them closely, biologists were surprised to find no rabbit with a medium darkness, intermediate to the two extremes. This is an example of  
a. disruptive selection.                          c. stabilizing selection.  
b. directional selection.                          d. heterozygote advantage.
60. The emergence of a new plant species over a brief period of time followed by periods of little change would support which of the following theories?  
a. the gradualism model                          c. punctuated equilibrium  
b. allopatric speciation                          d. phylogenetic divergence

New Jersey Science League **Corrections: No corrections**

Biology I Answer Key **Blue Test**

Date: April 12, 2018

**Record onto the area record the # correct**

All schools and areas must finish the April exam and post mark or scan all results by April 30<sup>th</sup>.

1	C	16	A	31	A	46	C
2	B	17	C	32	C	47	D
3	D	18	D	33	B	48	A
4	A	19	A	34	A	49	C
5	B	20	C	35	C	50	D
6	A	21	D	36	C	51	B
7	B	22	C	37	D	52	A
8	A	23	B	38	D	53	A
9	B	24	D	39	D	54	C
10	C	25	A	40	A	55	B
11	D	26	C	41	C	56	D
12	C	27	C	42	C	57	C
13	B	28	B	43	A	58	C
14	B	29	B	44	A	59	A
15	D	30	D	45	C	60	C

**BIOLOGY I** : No AP or second year students in this category. 60 multiple choice questions per exam.

**JANUARY EXAM** – Scientific Method, Microscope parts and functions, Carbon Compounds and basic chemistry including the chemistry of water and pH, Chemical Reactions, Enzymes, Cell structure and function, Levels of Cellular Organization, Organelles, Prokaryotic and Eukaryotic, Cell membrane structure and function, Cellular and Intracellular transport, Tonicity, Homeostasis, Cellular Energy Flow, Photosynthesis and Respiration, Cellular Division- Mitosis, Cell Regulation.

**FEBRUARY EXAM** - Structure and function of nucleic acids, experiments identifying DNA as the hereditary molecule, DNA replication, roles of DNA and RNA, protein synthesis, viral DNA, Meiosis, chromosomal analysis (pedigree, karyotyping), Mendelian genetics, one and two factor crosses, incomplete dominance, codominance, pleiotropy, polygenic inheritance, sex-linked disorders, mutations and causes, human genetic diseases including chromosomal analysis, Variation of Traits, Genetic engineering, Gene regulation and expression, Plus review of the Jan exams

**MARCH EXAM** - Evidence for evolution: historical thought/experimental theories of evolution..... Biogenesis/Abiogenesis, Comparative anatomy and comparative embryology, Fossil record, Hardy Weinberg, Natural Selection, Speciation and its causes, Taxonomy: Cladograms and Phylogenetic Trees, Genetic change in a population, Patterns and causes of Evolution, Coacervate formation, Miller/Urey experiment. Molecular evidence (nucleotide sequence analysis, amino acid sequence analysis), Plus review of the Jan and Feb exams.

**APRIL EXAM** - Evidence of diversity, Adaptation of organism to the environment, Types of biomes, Limiting factors in Biomes, Population density and dispersal patterns, Carrying capacity of a population, Exponential Growth, Boom-and-bust growth cycles, Interactions of autotrophs and heterotrophs, Flow of energy through an ecosystem, Symbiosis, Food cycles and webs, Cycles of Matter, Ecological succession, Ecosystem models of energy flow, Ecological experimentation and analysis, Factors affecting biodiversity in a population, Human Influence on ecosystems, Plus review of Jan, Feb, and March exams.

Dates for 2018 Season

**Thursday April 12, 2018**

All schools and areas must finish the April exam and post mark or scan all results by April 30<sup>th</sup>.

No area may take the April exam during the first week of April or the first week of May

New Jersey Science League

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What is to be mailed back to our office?

**PLEASE RETURN THE AREA RECORD AND ALL TEAM MEMBER SCANTRONS (ALL STUDENTS PLACING 1<sup>ST</sup>, 2<sup>ND</sup>, 3<sup>RD</sup>, AND 4<sup>TH</sup>).**

If you return scantrons of alternates, then label them as ALTERNATES.

Dates 2019 Season

Thursday January 10, 2019 Thursday February 14, 2019

Thursday March 14, 2019 Thursday April 11, 2019