New Jersey Science League – Biology II Exam

January 11, 2018 White TEST Corrections

SCANTRON INSTRUCTIONS: Please PRINT your **NAME**, **SCHOOL**, **AREA** and which exam you are taking onto the scan-tron. State if you are an alternate or regular member of your team.
TEST INSTRUCTIONS: Choose the answer that best completes the statements or questions below and fill in the appropriate response on the form. If you change an answer, be sure to completely erase your first choice.

1. If sample data produces a large standard deviation, what does this data indicate?
   a. Data was measured inaccurately.
   b. Data was produced by a large data sample.
   c. Data will exhibit a normal distribution.
   d. Data contains a high degree of variation.

2. When a biologist designs an experiment to test a hypothesis, what is the principle function of the controls in the experiment?
   a. to rule out alternative explanations for the results
   b. to produce the results that the biologist anticipates
   c. to produce a large amount of data, improving the statistical analysis results
   d. to allow the biologist to produce a variety of hypotheses accounting for data.

3. One nm equals 10^{-6} mm. Scanning electron microscopy provides a resolution of 10nm. If the resolution of the unaided human eye is 0.1 mm, how much is our resolution increased by this technology?
   a. 10^6 times b. 10^5 times c. 10^4 times d. 10^3 times

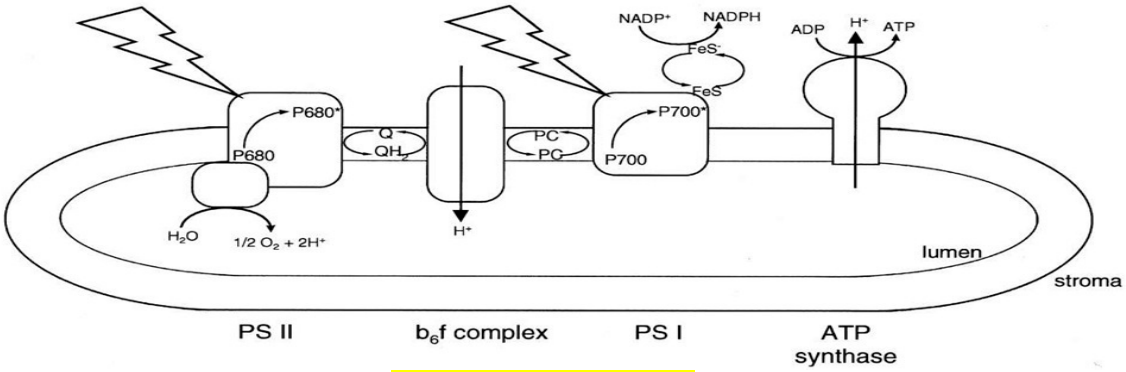
4. A coroner found a strange specimen in the hand of a murdered victim. After examining the fiber using a scanning electron microscope, it was found that the specimen was a fiber having a spiral structure consisting of a polysaccharide with spiral structure of 1-4 beta glucose molecules. Where could this sample possibly be from?
   a. cotton clothing
   b. a piece of metal piece of shrapnel
   c. an ax with a wooden handle
   d. a piece of egg from lunch

5. Examination of a patient's blood shows that a proportion of her red blood cells are swollen and some have exploded. What would you do to save her life?
   a. give mouth-to-mouth resuscitation
   b. administer of a substance that will draw excess water out of her blood
   c. administration of iron
   d. administer of a substance that will add sufficient water to her blood

6. A cell expels a vacuole in the process of exocytosis. What elements of the cytoskeleton are especially active in this process?
   a. microtubules
   b. intermediate fibers
   c. 9+2 arrangement of tubules
   d. microfilaments

7. As light passes through water various wavelengths are filtered out, beginning with longer wavelengths. At greater depths only shorter wavelengths are available for photosynthesis. If marine alga are to survive at great depths where visible light is barely present, which color must alga efficiently absorb?
   a. red b. orange c. yellow d. blue

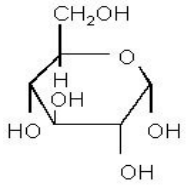
8. Which of the following best states the events of the electron transport system? All full credit



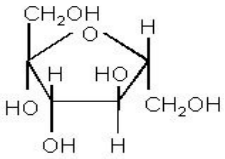
a. Hydrogen carriers are oxidized; water and ATP is formed.
b. Sugars are oxidized; hydrogen carriers are reduced.
c. Water is reduced: ATP is oxidized.
d. oxygen is oxidized; sugars and ATP are reduced.

9. What is the significance of oxygen in respiration?
a. serve as a final hydrogen acceptor
b. released as a by- product
c. activate enzymes
d. release energy resulting in ATP formation

10. Glucose is converted to fructose in glycolysis. What is the difference between the two molecules?



glucose



fructose

a. Glucose has 6 carbons, fructose has 5.
b. Glucose has 12 hydrogens, fructose has 8.
c. Glucose has 12 hydrogens, fructose has 10.
d. The atoms are arranged differently

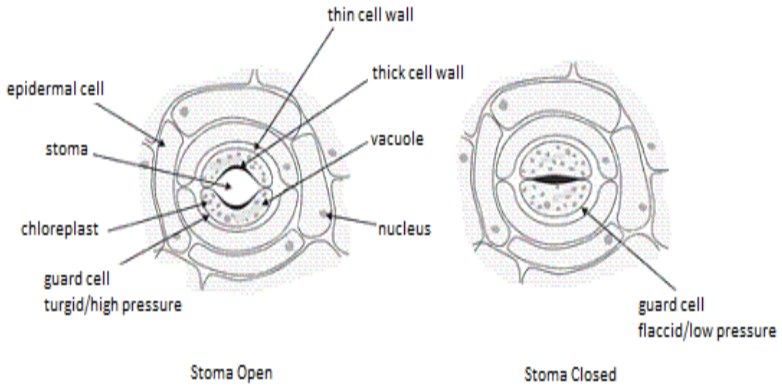
11. The atmosphere contains only, 0.03 - 0.04 % carbon dioxide. What adaptation enables plants to absorb sufficient quantities of this gas for photosynthesis?
a. An increase in the number of trichomes on the plant.
b. Chlorophyll's strong affinity for CO_2.
c. The numerous stomata located in the leaves
d. The fibrous root system picks up carbon from the soil and is oxidized.

12. In muscle creatine phosphate is used to store high energy phosphates. Creatine phosphate is produced by:
creatine + ATP $\rightarrow$ creatine phosphate + ADP. The standard free energy of this reaction, ΔG^0, = +11.7 kJ/mol. How is possible for muscle to produce creatine phosphate, if the standard free energy is unfavorable?
a. The reaction is catalyzed by a lipid.
b. The ATP concentration in the cell is high compared to the concentration of ADP.
c. The ADP concentration in the cell is high compared to the concentration of ATP.
d. The reaction is kinetically favored even though it is thermodynamically disfavored.

13. How would amphipathic molecule, such as phospholipids, align at an air-water interface?
a. hydrophobic heads in the water and hydrocarbon tails in the air.
b. hydrophobic tails in the water and polar heads in the air.
c. hydrocarbon tails in the in the air and polar heads in the water
d. amphipathic molecules are freely soluble in water and do not accumulate at the air water interface.

14. How do structural motifs, such as the α–helix , stabilize the secondary structure of a protein ?
    a. hydrophobic interactions
    b. electrostatic interactions
    c. intramolecular hydrogen bonds
    d. intermolecular hydrogen bonds

15. What is unusual about guard cells of stomata compared to other epidermal cells?
    a. They contain nuclei.
    b. They contain more chloroplasts.
    c. They lack cytoplasm
    d. They have secondary cell walls.



16. A semipermeable membrane separates two solutions, A and B. Initially, solution A contains iodine dissolved in water, and B contains starch dissolved in water. The membrane is permeable to iodine and water. Iodine is light orange when starch is absent, but blue-black when starch is present. At equilibrium, what is the expected color of solution B?
    a. colorless b. light orange c. blue-black d. unpredictable

17. How are fatty acids normally used in cellular respiration?
    a. Fatty acids are not normally respired.
    b. The liver converts them to starch which is the hydrolyzed.
    c. Fatty acids are converted to glucose and then enter glycolysis.
    d. Enzymes break fatty acids down into fragments of acetic acid forming acetyl Co-A.

18. If the underside of a leaf is coated with Vaseline, what would happen to the rate of transpiration?
    a. increase
    b. decrease
    c. no change would be evident
    d. drastically fluctuate

19. To design an experiment to yield the highest rate of photosynthesis, which set of conditions would you apply?
    a. red light, low CO_2, temperature of 0^oC
    b. blue light, high CO_2, temperature of $10\text{-}35^oC$
    c. green light, high CO_2, temperature of $10\text{-}35^oC$
    d. green light, low CO_2, temperature of 0^oC

20. Which of the following best describes the peculiarity of carbon dioxide fixation in many grasses, such as crabgrass?
    a. CO_2 is added to an activated 5C compound to form a stable 6C compound.
    b. CO_2 is added to an activated 5C compound to form an unstable 6C compound.
    c. Three CO_2 molecules are combined directly to form a 3C sugar.
    d. CO_2 is added to a 3C compound to form a 4C acid.

21. How do allosteric inhibitors interfere with the function of an enzyme?
    a. by occupying the active site
    b. by raising the temperature of the enzyme
    c. by altering the shape of the enzyme
    d. by hydrolyzing ATP, thus cutting off the energy supply

22. A woman on the show 'Survivor' has been starving for three days. Which of the following energy reserves would probably be present in the ***lowest*** concentrations in her body?
    a. carbohydrates
    b. proteins
    c. fats
    d. Both carbohydrate and proteins

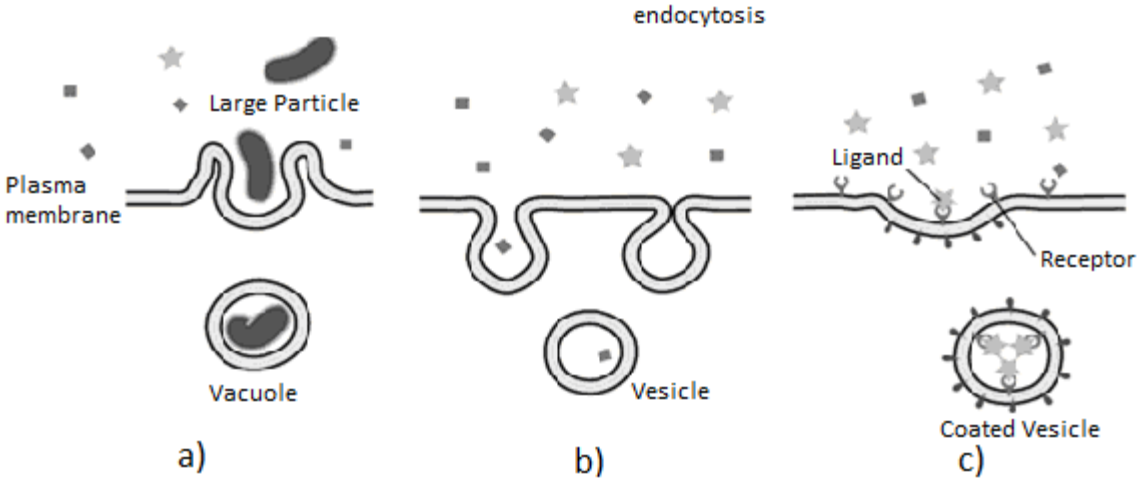
23. Hydrolysis of a protein to its component amino acid results in an increase in entropy. Why do hydrolytic enzymes such as trypsin and pepsin not require ATP as an energy source during their reactions? They are:
    a. exergonic reactions
    b. endergonic reactions
    c. anabolic reactions
    d. metabolic reactions

24. What is the region in animal cells where communication between adjacent cells are only 2 to 4 nm instead of the usual 10 to 20 nm apart, which allows molecules to pass more directly between them?
    a. gap junctions
    b. desmosomes
    c. adhering junctions
    d. plasmodesmata

25. Which of the following molecules would you expect to be least soluble in water?
    a. C_2H_5OH
    b. $H_3C\text{-}CH_3$
    c. NH_4OH
    d. CH_2NH_2COOH

26. Predict the R group of an amino acid that would be located on the surface of protein molecules found within the interior of the biological membrane?
    a. hydrophilic
    b. hydrophobic
    c. polar
    d. forming a disulfide

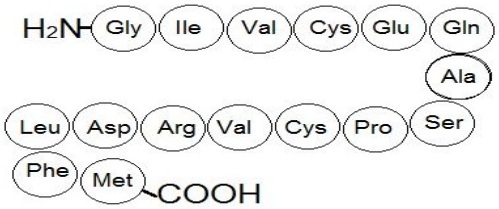
27. Pictured below are three different processes of endocytosis. Which diagram demonstrates a receptor-mediated clathrin covered vesicle formation?



    a. a
    b. b
    c. c
    d. none of these

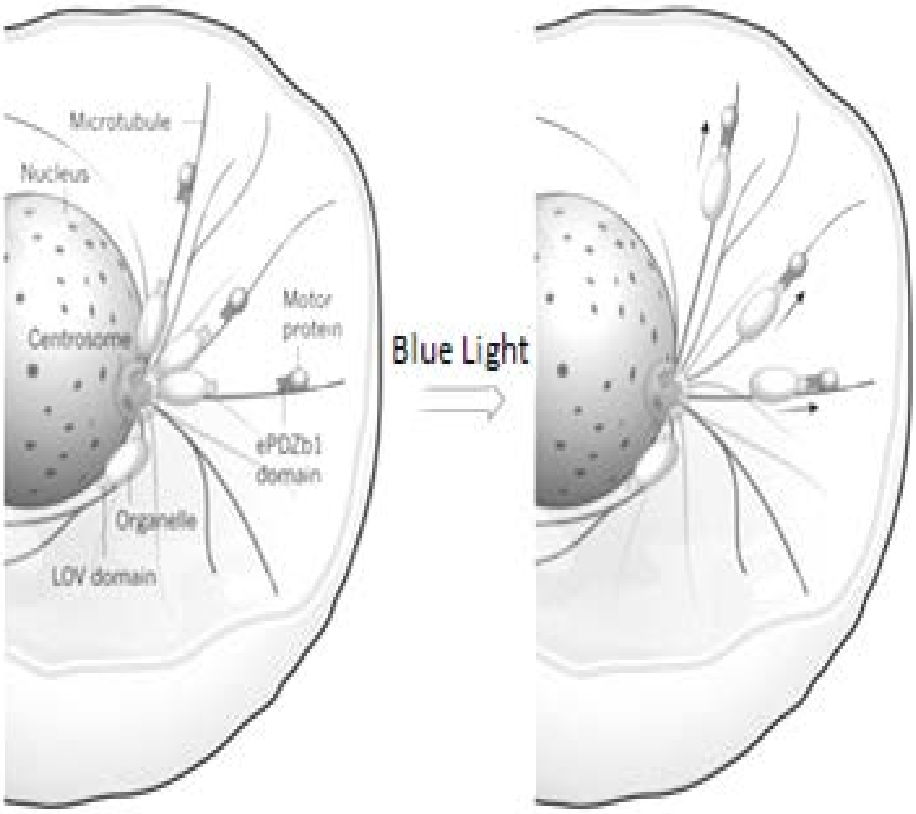
28. How many water molecules were formed from the dehydration synthesis of the molecule below?

    a. 1
    b. 2
    c. 15
    d. 17



29. The position of subcellular structures is regulated by microtubules that are part of the cell's cytoskeleton. A system developed by van Bergeijk can be used to move organelles to different positions within the cell in response to light. He fused motor proteins to ePDZb1-protein domains, and organelle-associated proteins to a modified LOV-protein domain and resulted in a new conformation when exposed to blue light. The blue light unmasking an ePDZ-binding motif results in LOV domain binding to ePDZb1. An organelle becomes tethered to the motor protein and its cellular position is altered by the motor protein's movement along microtubules. In the diagram below of this experiment, what cell process is being activated?

a. cell respiration
b. cell growth
c. cell division
d. cell exocytosis



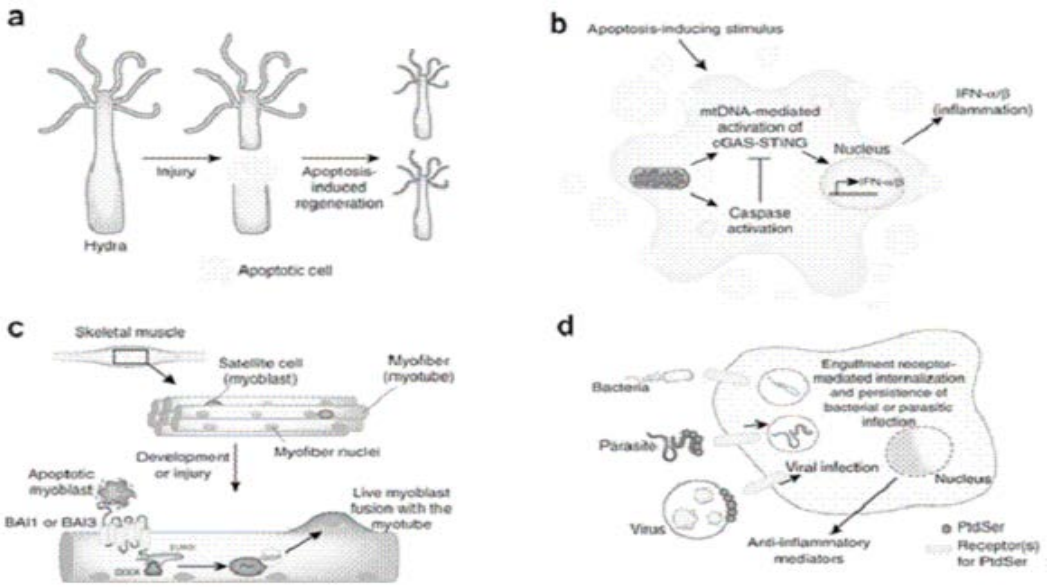
30. In the 29 diagram, what is function of the ePDZb1-LOV protein binding domain?
    a. Transduction pathway signal
    b. Secondary messengers
    c. G protein receptor
    d. Scaffolding protein signal

31. How can the four types of signals; endocrine, paracrine, autocrine and contact-dependent, be distinguished?
    a. by the distance the signals travel
    b. by the type of cell giving off the signal
    c. by the receptor shape
    d. by the desired response created

32. In cell communication, secondary messengers are propagated pathways that are initiated by G-protein-linked receptors and receptor tyrosine kinases. These secondary messengers are small, non-protein, water soluble or ions. How do these secondary messengers spread throughout the cell?
    a. osmosis
    b. facilitative transport
    c. diffusion
    d. active transport

33. Below are four flow charts of non-obvious homeostasis functions of apoptotic events. Which of these events would be involved as a normal event in the immune system? All full credit Key has B.

a. a & c
b. b & d
c. b
d. d

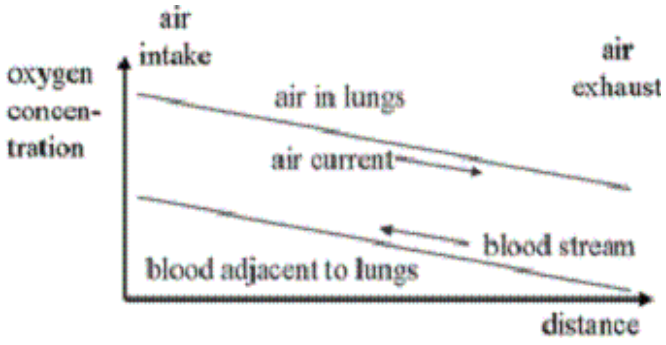


34. If you eat a dry raisin, it tastes sweeter than a fresh raisin, how does dehydration affect osmolarity of the raisin change as you dry it out?
a. increases osmolarity
b. decreases osmolarity
c. remains the same
d. depends upon temperature

35. What are the respective sizes of a virus and plant cell?
a. 3 mm, 30 mm b. 30 nm, 30 µm c. 30 µm, 30 nm d. 3 cm, 30 cm

36. The graph below illustrates oxygen exchange in a bird. How would you describe exchange of oxygen ?

a. concurrent exchange
b. parallel
c. countercurrent exchange
d. displacement



37. Which of the following statements best describes where the origin of carbon atoms that are present in a seed-eating bird?
a. Inorganic carbon atoms in the seeds were incorporated into organic molecules by the bird.
b. The carbon atoms ultimately came from the soil.
c. The carbon atoms are ultimately derived from coal.
d. The carbon atoms ultimately came from carbon dioxide incorporated into sugars through photosynthesis.

38. If cells are grown in a medium containing radioactive ^{15}N, which of these molecules will be labeled?
    a. fatty acids only
    b. nucleic acids only
    c. proteins only
    d. both proteins and nucleic acids

39. Approximately 32 different monomeric carbohydrate subunits are found in various natural polysaccharides. Proteins are composed of 20 different amino acids. DNA and RNA are each synthesized from four nucleotides. Which class of biological polymer has the greatest functional variety?
    a. polysaccharides
    b. proteins
    c. DNA
    d. RNA

40. Which of the following is a major cause of the size limits for certain types of cells?
    a. rigid cell walls that limit cell size expansion
    b. the need for a surface area of sufficient to support the cell's metabolic needs
    c. limitation on the strength and integrity of the plasma membrane as cell size increases
    d. the difference in plasma membranes between prokaryotes and eukaryotes

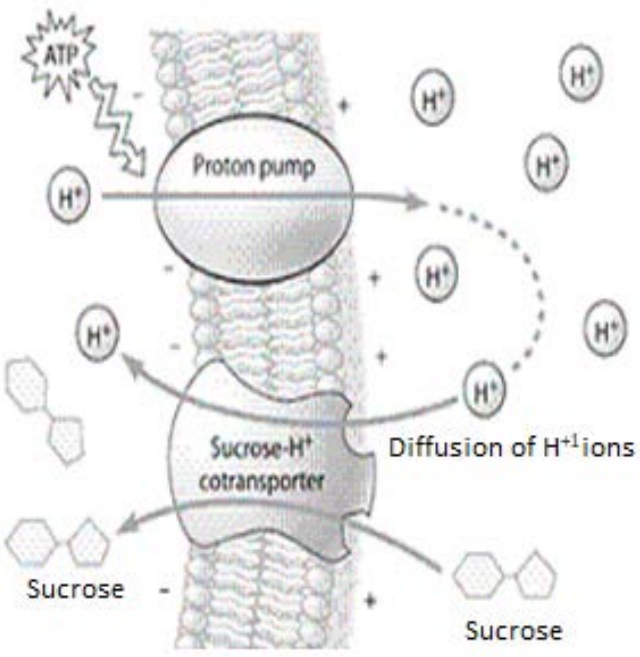
41. In a liver cell detoxifying alcohol and some other poisons, the enzymes of the peroxisome remove hydrogen from these molecules. What happens to the hydrogen?
    a. combine the hydrogen with water molecules to generate hydrogen peroxide.
    b. use the hydrogen to break down hydrogen peroxide.
    c. transfer the hydrogen to the mitochondria
    d. transfer the hydrogen to oxygen molecules to generate hydrogen peroxide

42. A biologist ground up some plant leaf cells and then centrifuged the mixture to fractionate the organelles. Organelles in one of the heavier fractions could produce ATP in the light, whereas organelles in the lighter fraction could produce ATP in the dark. What most likely be contained in the heavier and lighter fractions, respectively?
    a. mitochondria and chloroplasts
    b. chloroplasts and peroxisomes
    c. peroxisomes and mitochondria
    d. chloroplasts and mitochondria

43. What is a property of a C4 plant, not a C3 plant?
    a. Initially fix carbon dioxide in mesophyll cells as 4-carbon long compounds.
    b. Initially fix carbon dioxide in bundle sheath cells as 3-carbon long compounds
    c. Initially fix carbon dioxide in bundle sheath cells as 4-carbon long compounds.
    d. Special leaf anatomy adapted for cold and wet climates.

44. Based on the figure below, which of these experimental treatments would increase the rate of sucrose transport into the cell?

    a. decreasing extracellular sucrose concentration
    b. decreasing extracellular pH
    c. decreasing cytoplasmic pH
    d. adding an inhibitor that blocks the regeneration of ATP



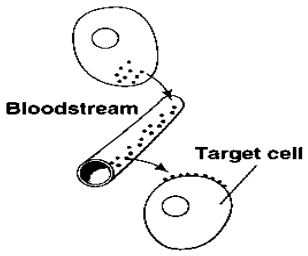
45. Five beakers were used in an osmosis experiment. Each beaker contains 50 ml of a sucrose solution of varying concentrations, as shown in the chart below. Fresh 10.0 g potato cube were placed into each beaker. After 24 hours, each potato cube was weighed again. Given the results in the table below, what is the molarity with in the potato cells?

Beaker #	1	2	3	4	5
Sucrose concentration	0.2M	0.4M	0.6M	0.8M	1.0M
Mass of potato after 24hr	13.6g	11.2g	9.8g	9.3g	8.2g

a. less than 0.2M
b. less than 0.4M and more than 0.2M
c. less than 0.6M and more than 0.4M
d. less than 1.0M and more than 0.8M

46. What type of signaling is shown below?

a. Endocrine
b. Synaptic
c. Pancrine
d. none



47. In an experiment, mitochondria are isolated and place them in buffer with a low pH, and they begin to manufacture ATP. What happens within the mitochondria?

a. The high external acid concentration causes an increase in H+ in the intermembrane space leading to increased ATP production by ATP synthetase.
b. Low pH increases the concentration of base causing mitochondria to pump out H+ to the intermembrane space leading to ATP production.
c. Low pH increases the acid concentration in the mitochondrial matrix, a condition that normally causes ATP production.
d. Low pH increases the OH^- concentration in the matrix resulting in ATP production by ATP synthetase

48. The formation of the lens from the ectoderm layer during frog embryonic development is dependent upon signals received from the underlying optic vesicle. This is an example of:

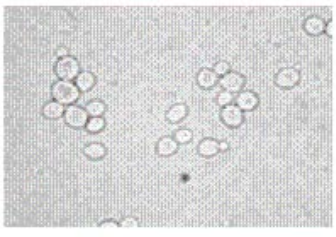
a. pattern formation
b. embryonic induction
c. polarity in the embryo
d. apical dominance

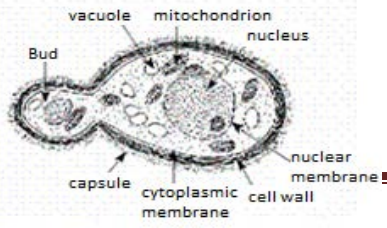
49. What is the first stage of embryonic development of a ball of undifferentiated cells?

a. blastula
b. embryo
c.gastrula
d.morula

50. Below is a photo and drawing of a cell. What label should be placed on these pictures?

a. Blood Cell
b. Bacterial Cell
c. Yeast Cell
d. Blue-green algae





NEW JERSEY SCIENCE LEAGUE

Biology II Ans Key Date: Jan 11, 2018 White Paper Test Corrections

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

BIOLOGY 11 For ADP and second year biology students. 50 Multiple Choice See topics on the web page for a complete list of topics. Question topics for eacBh test will include questions which relate to the Big Ideas I –IV listed below taken from the Advanced Placement Curriculum designed by The College Board. Questions will involve science practices such as analysis of data and evidence to support biological principles. All levels of life (molecules through ecosystems) will be explored on each exam. In addition, for each exam the identified content (e.g. osmoregulation) is linked to the excretory system. For example students should be able to answer, how does osmoregulation occur in the nephron in the excretory system.

Big Idea 1: The process of evolution drives diversity and unity of life
Big Idea 2: Biological Systems utilize free energy and molecular building blocks to grow, reproduce, and to maintain dynamic homeostasis
Big Idea 3: Living Systems store, retrieve, transmit and respond to information essential to life processes.
Big Idea 4: Biological Systems interact, and these systems and their interactions possess complex properties.

EXAM 1 January: Structure and function of Biological Molecules, Protein Folding, Bonding in Polymers, Enzymes, Coenzymes, Cofactors, Lipid and their Properties, Carbohydrates. Structure and function of Cells, Organelles and subcellular structures. Cell and tissue types, Germ layers and development. Free Energy and Gibbs Reactions, Enthalpy in Biological Systems, Biological Applications to the Laws of Thermodynamics, Endothermic/Exothermic Reactions, Coupled Reactions, Photosynthesis, Cellular Respiration, Endotherm/Exotherm in Body Temperature Regulation, Cell Types, Surface Area/Volume Ratios, Fluid Mosaic Model of the Membrane, Properties of Water, Osmoregulation, Membrane Transport, Cellular Feedback Mechanisms, Metabolic Processes and Metabolism, Communication; signaling, reception, transduction and response.

EXAM 2 February DNA and replication, RNA and Protein Production, RNA Types, Cell Cycle and Controls, Mitosis, Meiosis, Application of Mendel's Laws, Mendelian and NonMendieian Genetics, Genetic Disorders, Cancer, Genetic Engineering Techniques, Nonnuclear Inheritance, Transposons, Crossover, Gene Regulation, Apoptosis, Developmental Genes, Mutations, Biotechnology, Embryonic Development in Plants and Animals, Signaling Mechanisms, Transmission and Transduction Pathways, Polyploidy, Sex Inheritance, Mutation Effects, Viral Replication, Genetic Variation Processes, Mating Types, Behaviors and Parenting, Bacteria and Yeast Reproduction and use in Biotech, Review of Jan topics.

EXAM 3 March Evolution, Natural Selection, Artificial Selection, Mechanisms for Evolution, Hardy Weinberg Principles, Genetic Drift, Gene flow, Evidences for Evolution, Blast Genomic Analysis, Cladogram , Evolutionary Trees, Evolution of the Domains, Adaptive Radiation, Island Biogeography Theory, Speciation, Prezygotic and Postzygotic Mechanisms, Energy in Reproductive Strategies Hypothesis on Origins of Life, Virus and Bacteria types and adaptations. Review of Jan and Feb topics.

EXAM 4 April Ecosystem Energy Pyramid Structure, Food Web Alterations, Organ and System Specialization, Interactions and Coordination in Plants and Animals, Organism Responses Adaptation to Environment, Ecosystem Transformations, Components of a community, Transpiration, Population: Variation, Growth, Dynamics and Distribution, Exponential and Logistic Population Growth Models, Population Density, Limiting Factors, Species Richness, Species Diversity, Competition, Bacteria, Fungi, Symbiotic Relationships, Food Webs, Productivity, Energy Dynamics, Keystone species, Exotic and Alien Species Biogeochemical Cycles, Energy of Reproductive Strategies, Behavioral and Physiological Response to Environmental Stress, Taxis and Kinesis, Tropisms, Biological Rhythms, Behavioral Biology. Review of Jan, Feb, and March Topics

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 27th, 2018

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

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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 1ST, 2ND, 3RD, AND 4TH).

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 – Biology II Exam

February 8, 2018 White TEST Corrections

SCANTRON INSTRUCTIONS: Please PRINT your **NAME**, **SCHOOL**, **AREA** and which exam you are taking onto the scan-tron. State if you are an alternate or regular member of your team.

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

1. Why are polygenic traits difficult to study using standard genetic techniques?
   a. These traits do not show normal dominance and recessiveness.
   b. Sometimes it is difficult to determine how many sets of alleles are involved.
   c. These traits show only clear-cut alternatives and no intermediate phenotypes.
   d. Sex linkage obscures the analysis.

2. Which of the following events is a necessary precondition for a highly effective independent assortment? C is correct not d.
   a. two rounds of division
   b. chiasmata formation
   c. pairing of homologous chromosomes
   d. crossing over

3. A colorblind man and a woman with normal color vision whose father was colorblind have a son. If only, the males are considered, what is the probability they will have a colorblind son?
   a. 25% b. 50% c. 75% d. 100%

4. Why is the relative weakness of the hydrogen bond important to the structure and function of DNA?
   a. They enable mutations to occur.
   b. They prevent tangling of the DNA.
   c. They give the backbone its flexibility
   d. They enable the double helix to unwind.

5. During transcription, what special ribosomal enzyme, consisting of snRNA's and protein complexes cleaves introns forming the pre-mRNA molecule.
   a. Chromosome b. Splicesome c. Nucleosomes d. Ribosomes

6. If approximately 18% of the nucleotides in human DNA contain cytosine, what percentage contains thymine?
   a. 18% b. 32% c. 36% d. 64%

7. Which of the following would be most harmful to an organism?
   a. a mutation in an intron
   b. a mutation in a gene for a DNA repair enzyme
   c. a frameshift mutation in a recessive allele in a heterozygote
   d. an insertion of a nucleotide in a noncoding region

8. Suppose you find a mutant bacterium that makes the lactose-digesting enzymes whether or not lactose is present, what might have happened? Ans is A
   a. The gene that codes for the repressor has mutated and the repressor is no longer effective.
   b. The genes that code for the lactose- digesting enzymes have limited turnover rates
   c. The lactose in the milk has changed its composition.
   d. Lactase enzymes are out competing each other.

9. Nucleoli contain chromosomal regions, what do these regions produce? Ans is C
   a. Lipids b. hormones c. RNA d. proteins

10. Cells use “check points” to regulate the cell cycle process and prevent errors from occurring. Which of the following can result from a breakdown in the checkpoint system? Ans is D.

a. Chiasma b. cytokinesis c. meiosis d. cancer

11. In Drosophila, the forked phenotype is characterized by short bristles with split ends. The scalloped phenotype is characterized by scalloped wings at the margins and thick wing veins. Both genes are sex linked and are recessive alleles. A wild type female is mated with a scalloped forked male and produces F1 progeny of all wild type. The females of the F1 generation are to scallop forked males, generating the F2 generation shown below. What approximate percentage of the F2 progeny descended from distinguishable recombinant gametes as a result of crossing over?

F2 Progeny
230 wildtype
227 scalloped forked
12 scalloped
11 forked

a. 5% b. 10% c. 95% d. none

12. Below is given the mu (map units) for 3 recessive traits found on the X chromosome of *Drosophila*. What is the most probable gene map that can be constructed for the 3 genes?

genes	mu
forked & miniature	17
scalloped & miniature	12
scalloped & forked	5

a. scalloped----------12mu ------ miniature----------17mu----------forked
b. forked----5mu-----scalloped----------12mu----------miniature
c. Both a & b are possible
d. neither a or b are possible

13. The following are major events in the expression of a gene for insulin, which is secreted outside of certain mammalian cells. Place these events in order from earliest to latest.
    1. binding to a release factor
    2. binding to a signal recognition particle
    3. binding of transcription factors
    4. removal of introns
    5. scanning of mRNA

a. 4,2,3,1,5 b. 1,4,3,2,5 c. 5,2,1,4,3 d. 3,4,5,2,1,

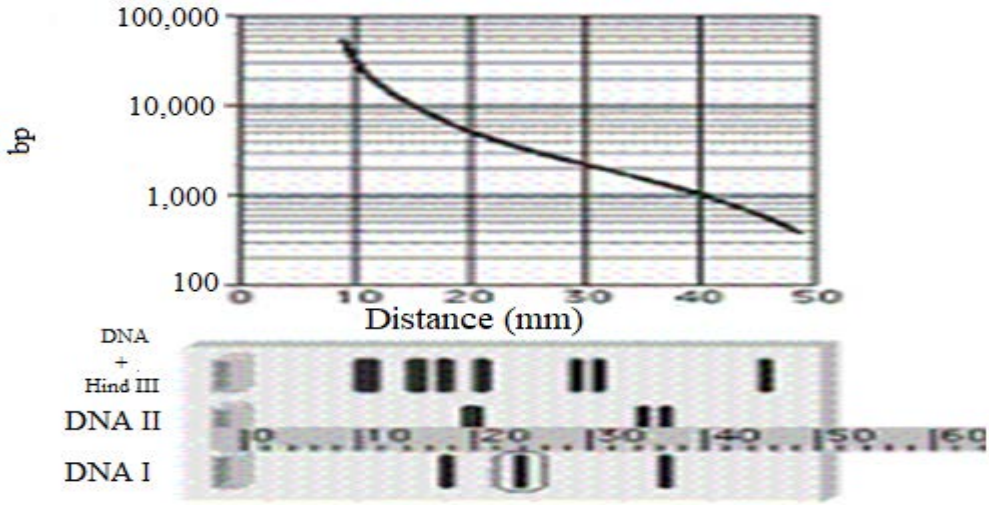
14. What did the discovery of Okazaki fragments indicate about DNA synthesis?

a. semiconservative replication occurs
b. replication is discontinuous
c. occurs 3’ to 5’ direction
d. DNA can unwind to replicate

15. The picture below demonstrates the active loops on a lampbrush chromosome. What occurs in these loops?

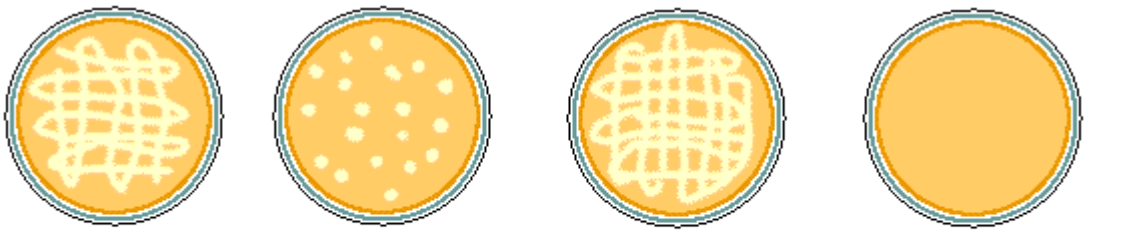
a. intense protein synthesis
b. intense DNA replication
c. intense RNA synthesis
d. intense methylation

16. Use the data below to determine how many base pairs is the fragment circled in gel below?



a. 8000 bps b. 1000 bps c. 1200 bps d. 2200 bps

17. In a molecular biology laboratory, a scientist obtained competent E. *coli* cells and used a common transformation procedure to induce the uptake of plasmid DNA with a gene for resistance to the antibiotic kanamycin. The results below were obtained. On which petri dish do only transformed cells grow?



18. From the experiment in the previous question, which of the plates is used as a control to show that nontransformed *E. coli* will not grow in the presence of kanamycin?

a. Plate I b. Plate II c. Plate III d. Plate IV

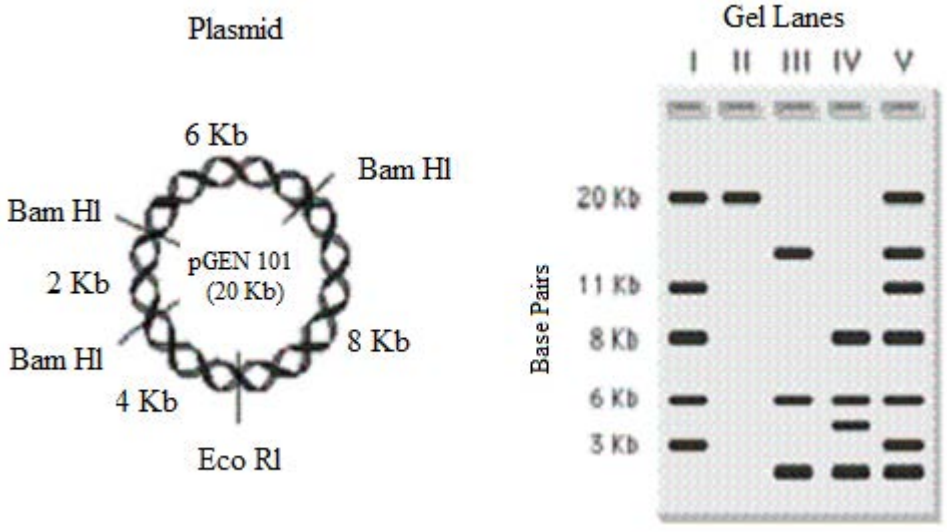
19. In eukaryotic cells, how many points of origin(s) for replication does each chromosome have?

a. one b. two c. many d. one per nucleus

20. Where does the energy directly come from for making a DNA molecule?
a. sugar
b. acytl-co A
c. release of phosphates
d. NADH

21. The structure of DNA explains which three major properties of genes?
a. contains information, directs the synthesis of protein and contained in the cell nucleus
b. contains nitrogen bases, direct the synthesis of RNA, and contained in the cell nucleus
c. replicates exactly, contained in the cell nucleus, and makes cellular proteins
d. contain information, replicates exactly, and can change by producing a mutation

22. Below is a plasmid with restriction sites for BamHI and EcoRl. Several restriction digests were done using these two enzymes either alone or in combination. Determining the number and size of the fragments produced with each enzyme. "kb" stands for kilobases, or thousands of base pairs. Which lane shows a digest with BamHl only?

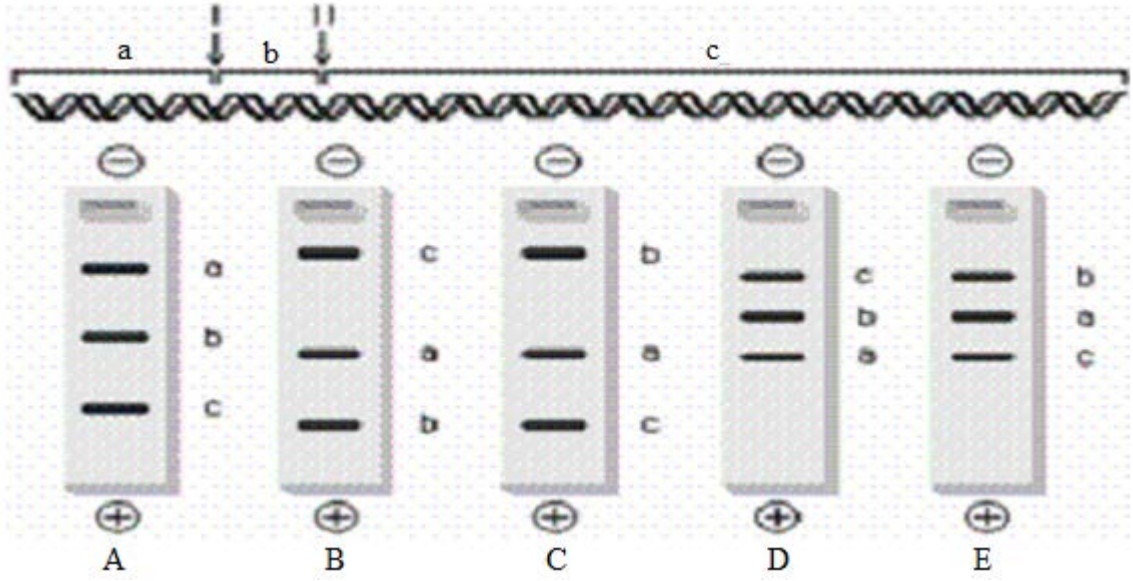


a. Lane 1
b. Lane III
c. Lane IV
d. Lane V

23. Use the data presented in the previous question, to determine which lane shows the fragments produced when the plasmid was incubated with both Eco Rl and Bam H1?

a. Lane I b. Lane III c. Lane IV d. Lane V

24. A segment of DNA below has two restriction sites—I and II. When incubated with restriction enzymes I and II, three fragments will be formed—a, b, and c. Which of the following gels produced by electrophoresis would represent the separation and identity of these fragments?



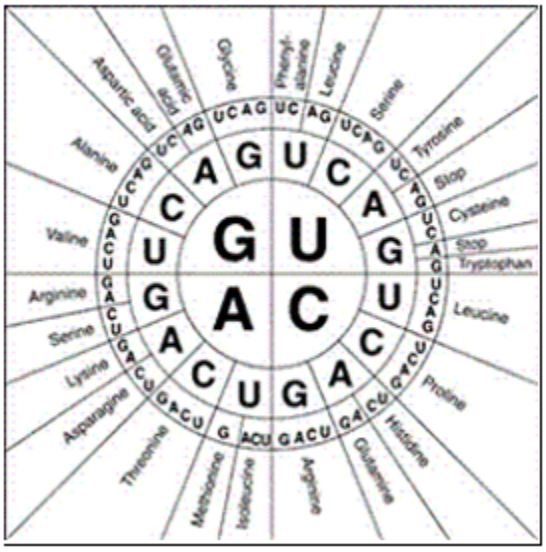
a. Gel A b. Gel B c. Gel C d. Gel D e. Gel E

25. Generally, how does a PCR increase the amount of DNA during additional cycles?
a. additively b. exponentially c. linearly d. gradually

26. In multicellular organisms, what is the process that new cells change in both form and function as they mature?
a. apoptosis b. differentiation c. mitosis or meiosis d. cyclosis

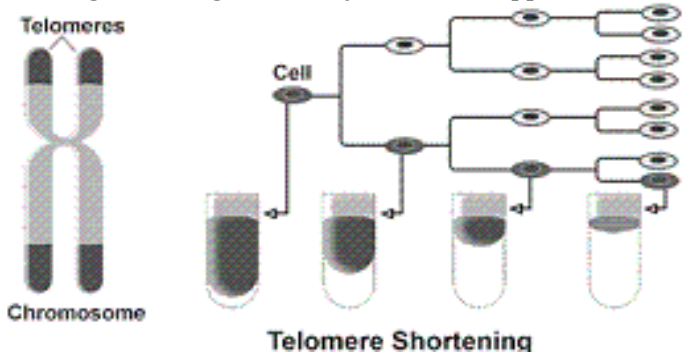
27. Degeneracy of code occurs as shown in the chart below. An example: There are 61 mRNA codons that specify an amino acid, but only 45tRNA are used. What is the best explanation for this example?

a. many codons are used, therefore tRNA does not recognize them
b. some tRNAs recognize four or more codons
c. DNA codes for all 61 tRNAs but shortly after some are destroyed by nucleases.
d. the base pairing rule between the third base of a codon and tRNA are flexible



28. Using the chart in the preceding question, how many types of tRNA can code a translation of arginine?
a. one b. two c. three d. six

29. Telomeres are tandem repetitions of nucleotide sequences; TTAGG, which shrink with cellular replication, resulting in the shortening of the telemeres and eventually causing a loss of genetic information. In the diagram below, the darken cell line goes through its cell cycles, what happens when reaching its critical Hayflick limit?

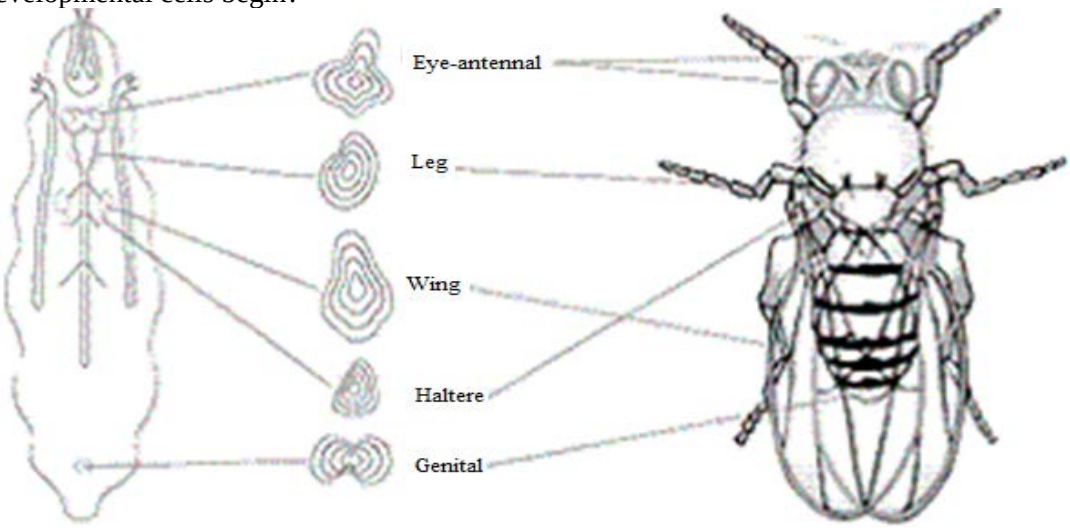


a. telomerase extends the telomeres
b. the cell repairs itself
c. the cell undergoes senescence
d. the cell undergoes many more cell cycles

30. What type of prokaryotic genetic transfer is occurring below?

a. binary fission b. conjugation c. transduction d. transformation

31. As shown in the diagram below, during development of the fruit fly, the segments of the adult body, including head, thoracic, and eight abdominal segments are derived from specialized cells. Where does this type of developmental cells begin?



a. ventral cells
b. neural crest
c. polytene cells
d. imaginal discs

32. Studies indicate acid reflux from the stomach, may cause esophageal cancer. An oncologist thinks that a lack of cell to cell recognition is a contributing factor to this cancer. The oncologist research will focus the studies on
    a. destruction of oligosaccharides on the e-face of the cell membranes in the esophagus
    b. loss of an electrochemical gradient for ion transport in the cells of the stomach
    c. homeostasis of membrane fluidity in all cells
    d. detached cytoskeleton from cell membranes

33. What are two characteristics of intracellular receptors that regulate gene transcription?
    a. Lipid soluble signal and extracellular binding site
    b. an extracellular binding site and an active transcription domain
    c. a DNA binding site and a transcription activating domain
    d. signal by a lipid soluble molecule and a DNA binding site

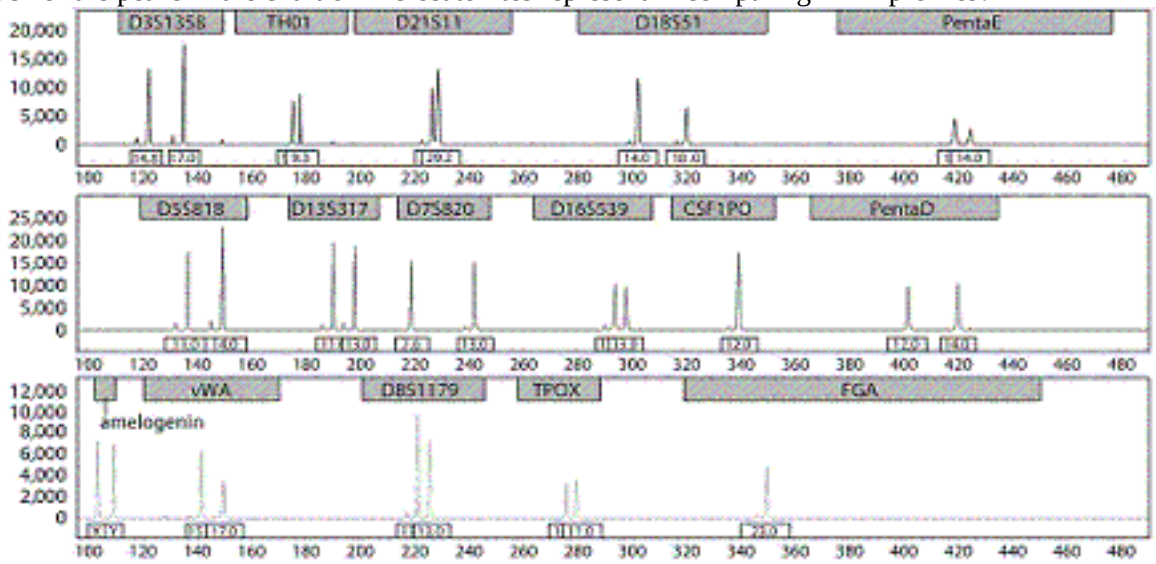
34. How often are the genes that regulate a stem cell activated?
    a. once b. only twice c. up to 10 times d. never

35. Of the choices below, what important molecular step is necessary for the expression of a phenotype?
    a. replication of Okazaki fragment
    b. binding of mRNA to a ribosomes
    c. splicing events which remove introns
    d. proofreading activity of DNA Pol III

36. Which of the following accurately represents a difference between a prokaryote and eukaryote ribosomes?
    a. Prokaryotes have 1 subunit while eukaryotes have 2 subunits
    b. In eukaryotes ribosomes are attached to the ER while prokaryotes are free ribosomes
    c. The sediment rate of prokaryotes is 70S while eukaryotes are 80S
    d. In prokaryotes the small subunit is on top and on the bottom in eukaryotes functioning differently

37. Which type of cell would you expect to find genetic material is included in a single circular molecule devoid of histone proteins?
    a. virus b. bacteria c. fungi d. yeast

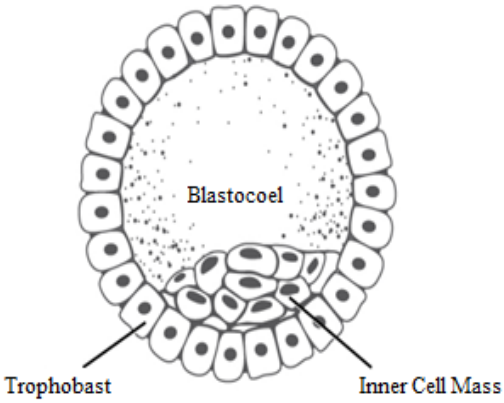
38. What does each of the peaks in the chart of microsatellites represent in comparing DNA profiles?



    a. the expression of a foreign gene in a transgenic plant.
    b. a DNA fingerprint.
    c. a locus where two genomes diverge.
    d. a test for one short tandem repeat.

39. Examine the diagram of the blastula below, which part will differentiate and become the embryo?

a. Blastocoel
b. Trophoblast
c. Inner cell mass
d. none of these



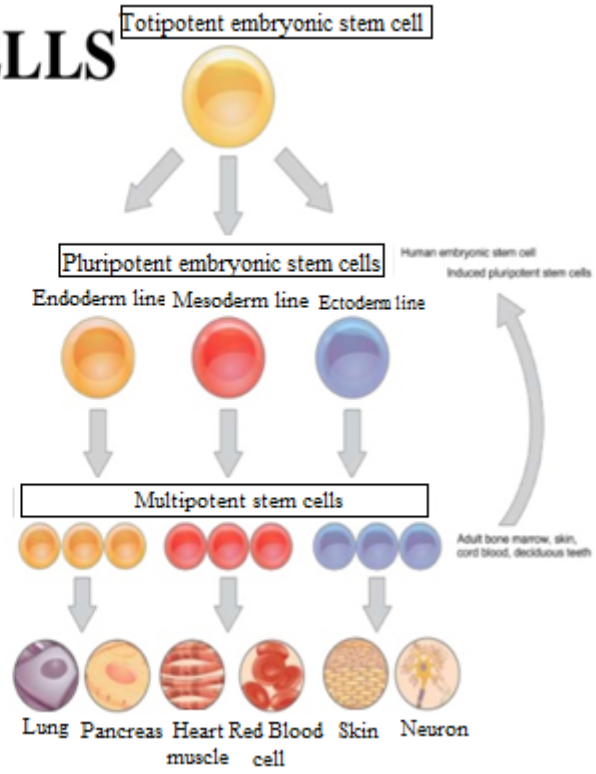
40. Viruses with RNA genomes have higher rates of mutations than viruses with DNA genomes. What would best explain this difference?
    a. DNA viruses go through the lysogenic cycle more often than RNA viruses.
    b. RNA viruses go through the lytic cycle faster that DNA viruses.
    c. DNA viruses lack replication error- checking mechanisms.
    d. RNA viruses lack replication error- checking mechanisms.

41. Why do prokaryotic cells have difficulty expressing eukaryotic genes?
    a. Prokaryotic cells cannot transcribe introns because they don't have them
    b. The ribosomes of prokaryotes are not large enough to hold long chains of eukaryotic cells
    c. The genetic code differs in prokaryotes due to substitute uracil for adenine.
    d. The signals that control gene expression are different. so a prokaryotic promoter region must be added to the vector

42. The Wall Street Journal reported on January 5, 2018, Bill Gates, Richard Branson and Cargill, Inc. is investing in developing clean meat (ground beef) that could make livestock obsolete. The biotechnology that may be used is a stem cell nuclear transfer technique. Which stem cell line would best fit this scenario for production of red meat? Use the chart below to determine your answer.

TYPES OF STEM CELLS

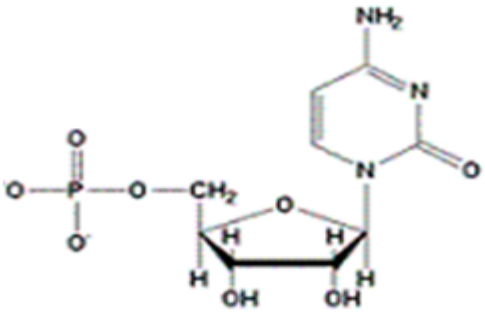
Type of stem cell	What it can be	Examples
Totipotent cells	Each cell can develop into a new individual	Cells of embryo of 1-3 days
Pluripotent cells	Each cell can form any cell type (over 200)	Cells of blastocyst 5-14 days
Multipotent cells	Cells differentiate and can form a number of tissue types.	Fetal tissue, cord blood, adult cells



a. all embryonic cells b. totipotent c. pluripotent d. multipotent

43. According to the diagram above stem cells in a human blastocyst and in umbilical cord blood may be cultured and controlled to
   a. produce human clones
   b. grow tissues and organs for transplantation
   c. function as an egg for in vitro fertilization
   d. function as antibodies against Ebola

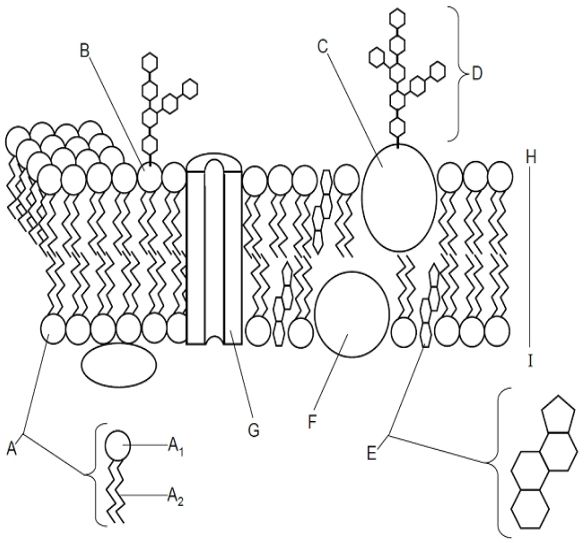
44. What type of molecule is shown below?



Guanosine Monophosphate (GMP)

   a. carbohydrate
   b. nucleic acid
   c. protein
   d. lipid

45. Answer the next 5 questions using the diagram below:



Which best represents an amphipathic molecule
a. A
b. A_1
c. A_2
d. E

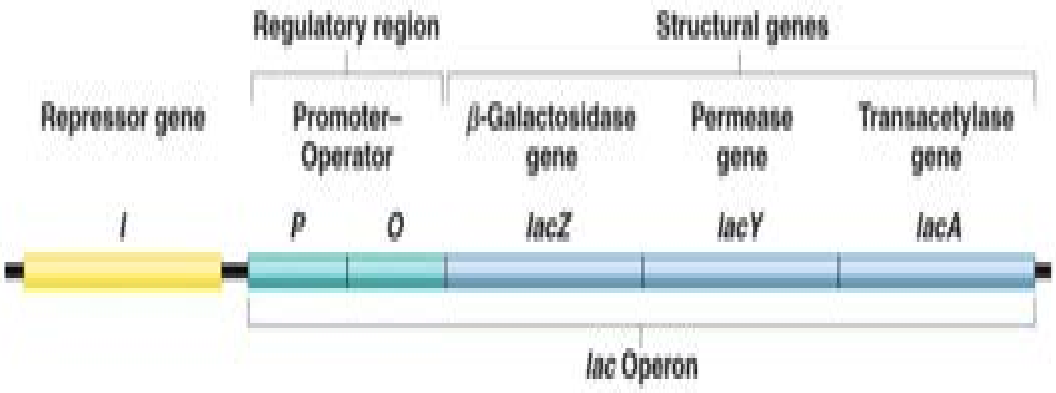
46. Which structure is phospholipid hydrophilic?
a. A
b. A_1
c. A_2
d. G

47. Which would be used for cell recognition?
a. A
b. D
c. E
d. H

48. Which structure represents a glycoprotein?
a. A
b. B
c. C
d. E

49. Which structure is an aquaporin?
a. B
b. F
c. G
d. H

50. The *lac* operon is shown below. What does a mutation affecting the promoter of *lac* Z have on the expression of *lac* y and *lac* A? The mutation would



a. increase transcription of *lac* Y and *lac* A
b. decrease transcription of *lac* Y and *lac* A
c. produce lactase
d. not effect to *lac* Y and *lac* A

NEW JERSEY SCIENCE LEAGUE **Corrections**

Biology II Ans Key Date: Feb 8, 2018 **White Paper Test**

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

BIOLOGY 11 For ADP and second year biology students. 50 Multiple Choice See topics on the web page for a complete list of topics. Question topics for eacBh test will include questions which relate to the Big Ideas I –IV listed below taken from the Advanced Placement Curriculum designed by The College Board. Questions will involve science practices such as analysis of data and evidence to support biological principles. All levels of life (molecules through ecosystems) will be explored on each exam. In addition, for each exam the identified content (e.g. osmoregulation) is linked to the excretory system. For example students should be able to answer, how does osmoregulation occur in the nephron in the excretory system.

Big Idea 1: The process of evolution drives diversity and unity of life
Big Idea 2: Biological Systems utilize free energy and molecular building blocks to grow, reproduce, and to maintain dynamic homeostasis
Big Idea 3: Living Systems store, retrieve, transmit and respond to information essential to life processes.
Big Idea 4: Biological Systems interact, and these systems and their interactions possess complex properties.

EXAM 1 January: Structure and function of Biological Molecules, Protein Folding, Bonding in Polymers, Enzymes, Coenzymes, Cofactors, Lipid and their Properties, Carbohydrates. Structure and function of Cells, Organelles and subcellular structures. Cell and tissue types, Germ layers and development. Free Energy and Gibbs Reactions, Enthalpy in Biological Systems, Biological Applications to the Laws of Thermodynamics, Endothermic/Exothermic Reactions, Coupled Reactions, Photosynthesis, Cellular Respiration, Endotherm/Exotherm in Body Temperature Regulation, Cell Types, Surface Area/Volume Ratios, Fluid Mosaic Model of the Membrane, Properties of Water, Osmoregulation, Membrane Transport, Cellular Feedback Mechanisms, Metabolic Processes and Metabolism, Communication; signaling, reception, transduction and response.

EXAM 2 February DNA and replication, RNA and Protein Production, RNA Types, Cell Cycle and Controls, Mitosis, Meiosis, Application of Mendel's Laws, Mendelian and NonMendieian Genetics, Genetic Disorders, Cancer, Genetic Engineering Techniques, Nonnuclear Inheritance, Transposons, Crossover, Gene Regulation, Apoptosis, Developmental Genes, Mutations, Biotechnology, Embryonic Development in Plants and Animals, Signaling Mechanisms, Transmission and Transduction Pathways, Polyploidy, Sex Inheritance, Mutation Effects, Viral Replication, Genetic Variation Processes, Mating Types, Behaviors and Parenting, Bacteria and Yeast Reproduction and use in Biotech, Review of Jan topics.

EXAM 3 March Evolution, Natural Selection, Artificial Selection, Mechanisms for Evolution, Hardy Weinberg Principles, Genetic Drift, Gene flow, Evidences for Evolution, Blast Genomic Analysis, Cladogram , Evolutionary Trees, Evolution of the Domains, Adaptive Radiation, Island Biogeography Theory, Speciation, Prezygotic and Postzygotic Mechanisms, Energy in Reproductive Strategies Hypothesis on Origins of Life, Virus and Bacteria types and adaptations. Review of Jan and Feb topics.

EXAM 4 April Ecosystem Energy Pyramid Structure, Food Web Alterations, Organ and System Specialization, Interactions and Coordination in Plants and Animals, Organism Responses Adaptation to Environment, Ecosystem Transformations, Components of a community, Transpiration, Population: Variation, Growth, Dynamics and Distribution, Exponential and Logistic Population Growth Models, Population Density, Limiting Factors, Species Richness, Species Diversity, Competition, Bacteria, Fungi, Symbiotic Relationships, Food Webs, Productivity, Energy Dynamics, Keystone species, Exotic and Alien Species Biogeochemical Cycles, Energy of Reproductive Strategies, Behavioral and Physiological Response to Environmental Stress, Taxis and Kinesis, Tropisms, Biological Rhythms, Behavioral Biology. Review of Jan, Feb, and March Topics

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 27th, 2018

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

New Jersey Science League
PO Box 65 Stewartsville, NJ 08886-0065
Phone # 908-213-8923 fax # 908-213-9391 email: newjsl@ptd.net
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 1ST, 2ND, 3RD, AND 4TH).

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 – Biology II Exam **White Exam**

March 8, 2018 **Corrections:**

SCANTRON INSTRUCTIONS: Please PRINT your **NAME**, **SCHOOL**, **AREA** and which exam you are taking onto the scan-tron. State if you are an alternate or regular member of your team.

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

1. Which comparative study would provide the **best** data on the early evolution of fungi and plants?
   a. ribosomal RNA
   b. mitochondrial DNA
   c. amino acid sequence of chlorophyll
   d. morphology of specimens

2. In the Northeast, a new bacteria strain appears to have become resistant to an antibiotic that was introduced within the past two years. What has occurred to his population of bacteria?
   a. divergent evolution b. adaptive radiation c. directional selection d. disruptive selection

3. A species of deer fly is widely distributed over northeastern states but are grouped in five separate regions. Five visibly different varieties of deer fly are found, one variety in each of the five regions. Which mechanism could account for the development of a distinct variety of deer fly within each of the five regions?
   a. deer flies began to reproduce asexually
   b. isolation occurred, which led to the development of a unique gene pool of deer flies in each region
   c. homeostasis has occurred
   d. mitosis and crossing over naturally occurring in a population

4. Two species of frogs occasionally mate but their offspring do not complete development. What type of barrier isolates these gene pools from producing mature frogs?
   a. gamete isolation
   b. prezygotic barrier
   c. reduced hybrid viability
   d. reduced hybrid fertility

5. What is greatest source of genetic variation in plant and animal populations?
   a. mutations
   b. sexual recombination and crossing over
   c. polymorphism
   d. recessive masking of an allele in heterozygotes

6. The eyes of humans and octopuses have strikingly similar forms and functions but arose from completely different evolutionary paths. What is a logical explanation for this observation?
   a. acquired traits
   b. convergent evolution
   c. divergent evolution
   d. homologous structures

7. In a certain population, the allele causing sickle cell anemia has an allele frequency of 0.2. If the population is in genetic equilibrium for this allele, what fraction of the population would be carriers for the allele?
   a. 0.16 b. 0.32 c. 0.40 d. 0.80

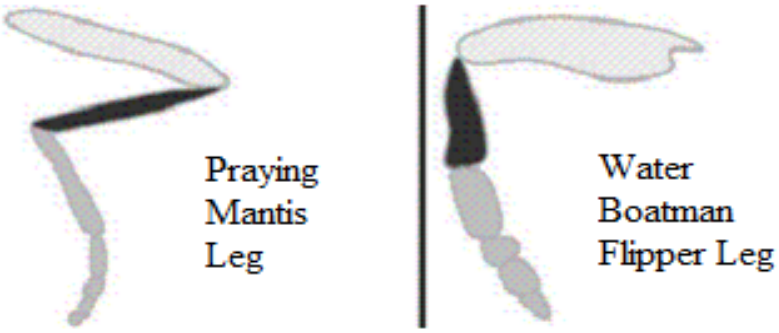
8. Stanley Miller constructed an apparatus in which he placed inorganic substances found in earth's primitive atmosphere in a flask and exposed them to an electrical charge. The data that Miller collected over time is listed below. What conclusion can he claim from his data?

Hours	Ammonia	Amino Acids	Methane	Hydrogen	Water Vapor
0	35	0	42	47.9	37.9
25	34	7	39.2	44	33.9
50	28	10.3	35.5	40	34
75	20.1	21.8	29.6	29	28.3
100	18.2	32.2	28.7	25.2	27.2
125	15.1	33.4	22.3	20.1	20.1
150	10.9	33.8	17.	18.2	18.2
175	1	34	2.3	9.3	9.3

a. Lightening created the electrical charge in the primitive earth for this reaction.
b. An electrical charge produced all these inorganic compounds.
c. In primitive earth, hydrogen was available to produce water.
d. Primitive earth gases such as ammonia, methane, hydrogen and water vapor can produce amino acids in the presence of an electrical charge.

9. Which of the following would be **least** likely to form a fossil?
a. crab b. virus c. tree d. oyster

10. What do the legs of these living insects represent in the diagram below?

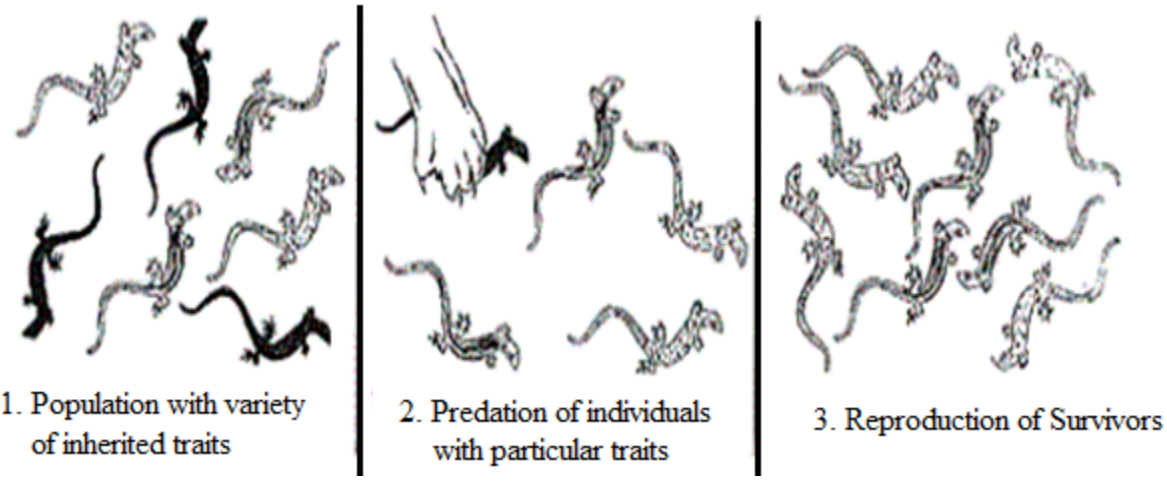


a. vestigial structures
b. analogous structures
c. homologous structures
d. extinct structures

11. The extraordinarily large tail feathers of the male peacock present an evolutionary conundrum. The tail reduces the individual bird's chance of survival because it is so large and decreases maneuverability away from predators. However, the trait has been passed on through many generations. What is a possible advantage of the large tail feathers?
a. Humans value the tail and use it for dressing styles through the centuries.
b. The tail is a beneficial mutation to attract predators.
c. The tail is a favorable sexual trait and females select males with larger, more beautiful tails.
d. The tail is a vestigial organ from previous ancestors showing relatedness.

12. In which of these scenarios is speciation **most** likely to occur?
    a. Two previously separate populations of squirrels merge to form one.
    b. A population of ants outcompetes its closest rival for resources.
    c. An antelope within a large herd is born with a beneficial mutation.
    d. A group of individual birds become isolated on an island and adapt to new environment.

13. Analyze the sequential diagrams below and identify which type of selection has occurred over time.



    a. artificial selection
    b. disruptive selection
    c. directional selection
    d. stabilizing selection

14. The following are major events in the evolution of life on early Earth. Place these events in a chronological order, from what happen first to last.
    1. Evolution of prokaryotes
    2. Evolution of eukaryotes
    3. Formation of simple and complex organic molecules
    4. Plasma membrane
    5. Metabolism and genes functioned

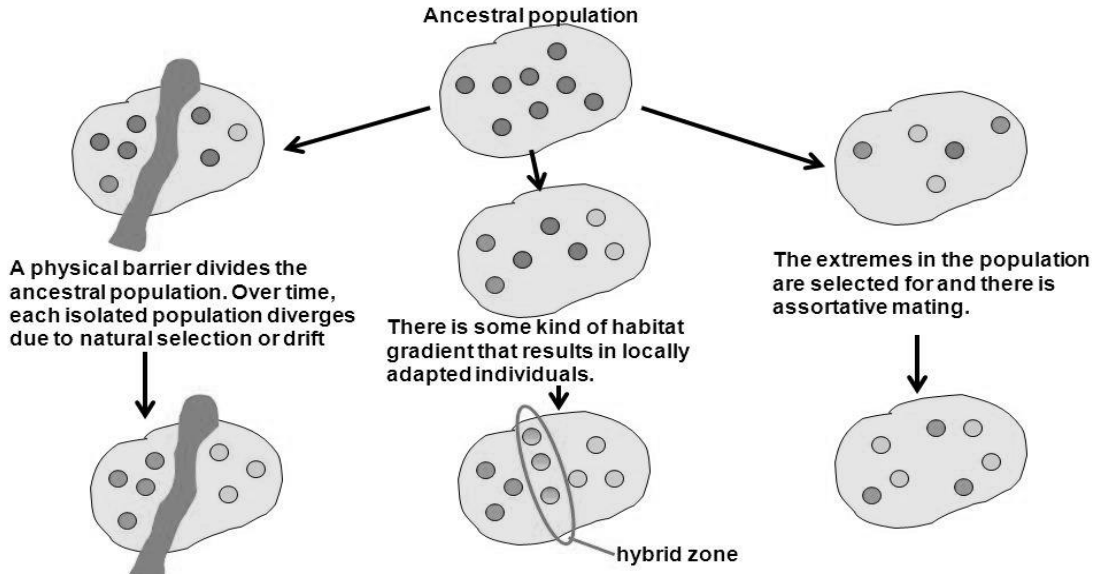
    a. 5,4,3,1,2 b. 3,1,4,5,2 c. 3,5,4,2,1 d. 3,4,5,1,2

15. White wool is dependent upon a dominant allele *B*; while *b* is the recessive allele for black wool. A sample of 900 Rambouillet breeding sheep on an Idaho farm consisted of 891 white sheep and 9 black sheep. What is the phenotypic frequency of the white sheep?
    Hardy-Weinberg Equations
    $p^2 + 2pq + q^2 = 1$
    $p + q = 1$
    p = frequency of dominant allele in a population
    q = frequency of the recessive allele in a population

    a. 0.1 b. $\sqrt{9/900}$ c. 0.9 d. 1.0

16. Aquatic species take dissolved oxygen from water. Terrestrial animals evolved in such a way that their respiratory surfaces are inside the body, because they are not in constant contact with water. In evolutionary history, in order for animals to make the move from water to land, how did they solve the problem of gas exchange?
    a. keeping the respiratory surfaces moist
    b. keeping capillaries near the center of the body
    c. keeping the respiratory surface thick
    d. keeping the level of oxygen high by panting

17 Analyze the diagram below. Which letter **best** represents parapatric speciation?



a. A b. B c. C d. A and C

18. Shown below is the genotypic frequency in two different populations for a particular gene with two different alleles. What are the allele frequencies of A and a in populations I and II?

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

$p + q = 1$

Populations	*AA*	*Aa*	*aa*
I	0.09	0.42	0.49
II	0.20	0.20	0.60

a. A= 0.7; a= 0.3 b. A= 0.3; a= 0.7 c. A= 0.4; a= 0.6 d. A= 0.6; a= 0.4

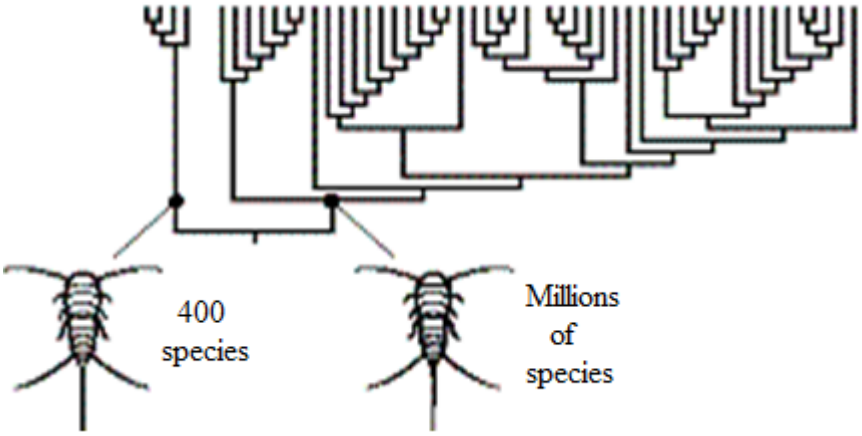
19. In the problem above, which population is near Hardy-Weinberg Equilibrium?

a. *I* b. *II* c. Both d. Neither I or II

20. In question 17, what does population II indicate? Should say question #18 not 17. No change in answer. Question can still be answered.

a. stabilizing selection
b. disruptive selection
c. directional selection
d. artificial selection

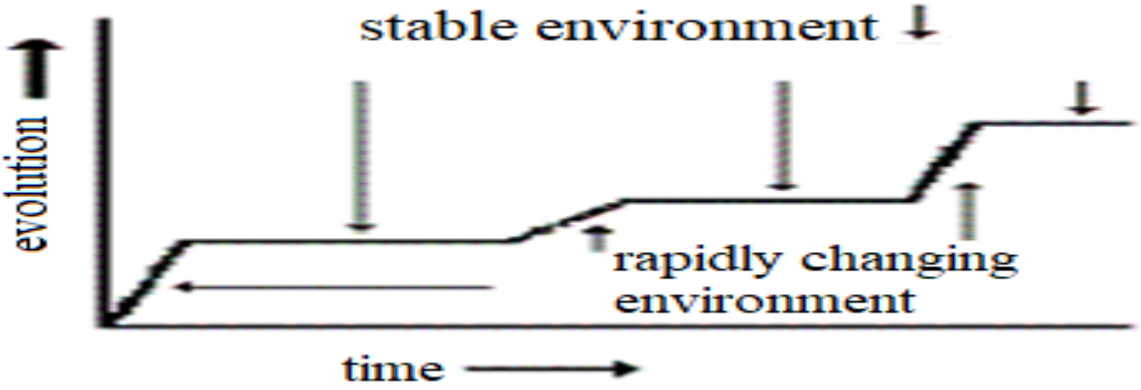
21. Examine the clade below. This lineage split into two about 300 million years ago. One lineage gave rise to millions of extant species looking a lot like the ancient insect species. The environment presented the lineage with opportunities for specialization, isolation and a release from competing with other insects.



What is another factor that is necessary for this type of adaptive radiation to occur?

a. genetic variation was available in the population
b. no niches available
c. populations were small
d. reproduction was asexual

22. What does the graph below indicate about the timing and fossil record?



a. Evolution occurs gradually.
b. Evolution occurs constantly.
c. Evolution is predictable.
d. Evolution occurs in short periods of change and long periods of stability.

23. Some genes that encode proteins that are essential to the survival of the organism are highly conserved sequences used for studying ancestral lines. Which of the following is an example of one of these proteins?

a. myosin from muscle fibers
b. melanin from the skin
c. cytochrome c in the mitochondria
d. amylase from the salivary gland

24. Why are methanogens, of the domain Archaea, considered to be similar to the earliest cells?
    a. They use nucleotides that are no longer on earth.
    b. They resemble the nuclei found in algal cells.
    c. Their genetic material is composed of RNA rather than DNA.
    d. Their metabolic pathways utilize compounds that are hypothesized to exist on early earth.

25. A college student examines geographic variation of a widely distributed species. Where would the student expect to see the **least** morphological variation and greatest gene flow occurring within the species?
    a. island archipelagos
    b. environmentally homogeneous regions
    c. mountainous areas
    d. environmentally heterogeneous regions

26. What molecule, that was found in early protobionts and is still in existence today, is capable of information storage, direction of protein synthesis, and replication?
    a. DNA b. RNA c. ATP d. protein

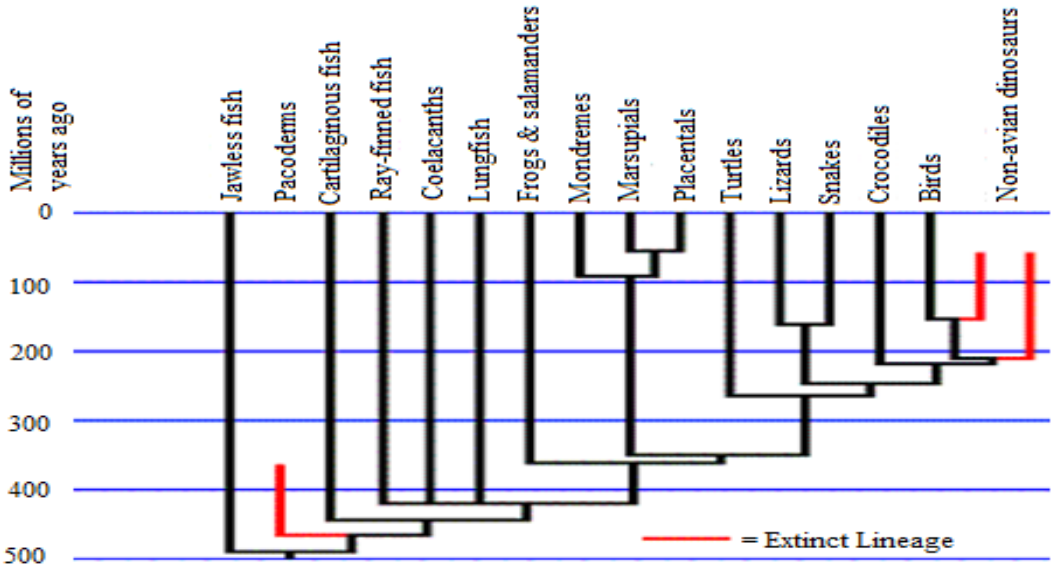
27. According to the Endosymbiont Hypothesis and nucleic acid analysis, where did the chloroplast originate from?
    a. ameboid predator
    b. aerobic bacteria
    c. cyanobacterium
    d. spirochete

28. What occurs when gene flow is reduced and geographic distance is increased?
    a. allopatric speciation
    b. coevolution occurs
    c. mutations occur
    d. extinction occurs

29. *Bradybaeana* snails, shown below, with spiral shells that turn in opposite directions are unable to mate. What type of prezygotic mechanism occurs in these snails?

    a. behavioral isolation
    b. hybrid breakdown
    c. gamete isolation
    d. mechanical isolation

30. *Tiktaalik* was a species that arose as an intermediate between fish and 4 legged animals. According to the tree phylogeny below, determine in mya (million years ago) the probable placement of this organism.



a. 95 mya b. 375 mya c. 410 mya d. 480 mya

31. A cricket has a diploid genome of 1.2 billion base pairs and the mutation rate is one per 100 million base pair. The sample population consists of 200,000 crickets. On average, how many new mutations will occur in an individual cricket?
a. 0.0002 b. 1.2 c. 12 d. 2.4 million

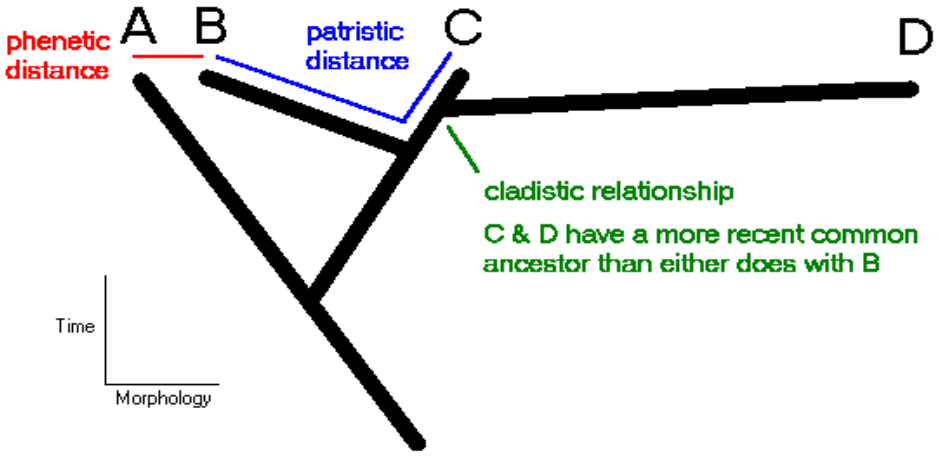
32. Originally, a pond had a variety of long-finned fish and short-finned fish. A disease leads to the death of a disproportionate number of long-finned fish to the point where relative frequency of the two forms has drastically shifted. What occurred in this population?
a. stabilizing selection
b. disruptive selection
c. gene flow
d. bottleneck effect

33. How is fitness of an organism measured?
a. by its longevity
b. by the number of offspring it produces
c. by its success as a predator
d. by the variety of habitats it can occupy

34. A dung beetle engaged in mating behavior has thereby forfeited time foraging for food. The loss of food vs. mating is what type of cost to the individual beetle?
a. breeding b. energy c. territory d. opportunity

35. There are many different groups of unicellular eukaryotes in the now defunct Kingdom Protista. Select the **best** method of comparison that could be used to distinguish the groups of protists.
a. embryonic stage analysis
b. fossil
c. comparative anatomy
d. genomic or molecular analysis

36. Examine the diagram of the Cretaceous age below. Dinosaurs and birds have the most recent common ancestor in the Cretaceous Period. The adaptations associated with the evolution of bird's flight are the most morphologically distinctive. If dinosaurs are represented by C, which letter would be the **best** position for birds on the tree?



a. A b. B c. C d. D

37. Biochemical analysis of respiratory protein cytochrome C contains between 100 and 104 amino acids. The chart below shows how many amino acid differences exist between two species. Which two organisms seem to be **least** related to each other?

	Turtle A	Man B	Tuna C	Chicken D	Moth E	Monkey F	Dog G
Turtle A							
Man B	19						
Tuna C	27	31					
Chicken D	8	18	26				
Moth E	33	36	41	31			
Monkey F	18	1	32	17	35		
Dog G	13	13	29	14	28	12	

a. man and tuna
b. tuna and moth
c. monkey and moth
d. man and monkey

38. Which of the following is **most** conducive for parallel phenotypic evolution?
a. The sudden appearance of a new structure.
b. The conservation of important developmental genes.
c. The capacity of organisms to use info to predict future conditions.
d. Genomic equivalence.

39. Nylon was first made in 1935. In 1975, a bacterium, *Arthrobacter K172*, was discovered with the ability to digest and live off not nylon itself but also off the chemical wastes from its manufacturing. These by-product chemicals had not existed before. This bacterium had evolved several enzymes, one being 6-aminohexanoic acid hydrolase, later renamed nylonase. In was found that this protein was similar to a common enzyme found in many bacteria, but there was a slight change in two amino acids causing a small change towards the end of the amino acid sequence. The new nylonase was now capable of binding to the nylon's chemical waste byproducts. How did this *Arthrobacter K172* evolve?

a. by a frame shift mutation
b. by a nonsense mutation
c. by competition with other bacteria
d. by practicing swimming to the food source

40. Which can evolve?
a. a pair of hummingbirds who visit bird feeders
b. a solitary bull elephant in the forest near Madras, India
c. a family of birds who nest in the woods
d. all hummingbirds restricted to an island 1000 miles from the mainland

41. Which of the following is **not** associated with a lipid coacervate or a proteinoid microsphere?
a. nucleus
b. carry out chemical reactions
c. ability to grow
d. an outer boundary

42. The hypothesis that chloroplasts and mitochondria were originally prokaryotic organisms living within eukaryotic hosts is supported by the fact that mitochondria and chloroplasts:
I. possess circular DNA.
II. possess capability for protein synthesis.
III. possess a bilipid layer membrane.
IV. possess characteristic ribosomes of prokaryotes.

a. I and IV only b. I and III only c. I and II and III only d. I, II , III, and IV

43. A research oncologist discovers the addition of a new hydrophobic drug to a culture of cancer cells results in increased transcription of a specific gene. Which type of receptor is **most** likely activated?
a. an ion-linked channel
b. an intracellular receptor
c. an enzyme linked receptor
d. a G-protein linked receptor

44. Isomerase normally produces galactose in a pregnant mammal. A deficiency of this substance will affect normal milk production from mammary glands because..
a. glucose cannot be converted to galactose.
b. galactose cannot be converted into lactose.
c. galactose cannot pass across the membranes in the mammary glands.
d. galactose is not an isomer of glucose.

45. Five rabbits were fed food containing a radioactive marker for oxygen in glucose. After the rabbits metabolized the glucose, where would the radioactive oxygen be found?
a. H_2O
b. CO_2
c. O_2
d. ATP

46. The sequence of eight amino acids from four different ß-hemoglobin's are in the chart below. One of these proteins is normal, the others are mutant alleles. Which of the sequences is normal?

	Positions							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Hb #1	Val	His	Lue	Thr	Pro	Ser	Arg	Lys
Hb #2	Val	Try	Lue	Thr	Pro	Glu	Glu	Lys
Hb #3	Val	His	Ile	Thr	Pro	Glu	Glu	Lys
Hb #4	Val	His	Lue	Thr	Pro	Glu	Glu	Lys

a. Hb #1 b. Hb #2 c. Hb #3 d. Hb #4

47. Which of the following will decrease the genetic variation in a gene pool?
a. diploidy
b. mutations
c. recombinant DNA
d. selection

48. When two dogs meet, they carry out a 'high-dog, low-dog' ritual in which they take turns holding their heads above each other until one dog is declared dominant. The **most** important reason for this agonistic behavior is to..
a. recognize kin.
b. demonstrate cooperative behavior.
c. attract a mate.
d. establish dominance without injury.

49. Homeobox or Hox genes are master regulatory genes that control the expression of the placement of anatomical structures. Their role in evolution have enabled new species to arise because these genes are responsible for..
a. apoptosis.
b. egg polarity.
c. maternal behaviors.
d. pattern formation.

50. Many viruses evolve new strains easily. Viruses with RNA genomes have higher rates of mutations than viruses with DNA genomes. What would **best** explain this difference?
a. DNA viruses go through the lysogenic cycle more often than RNA viruses.
b. RNA viruses go through the lytic cycle faster that DNA viruses.
c. DNA viruses lack replication error-checking mechanisms.
d. RNA viruses lack replication error-checking mechanisms.

NEW JERSEY SCIENCE LEAGUE Corrections:

Biology II Ans Key Date: March 8, 2018 **White Paper Test**

Deadline: All March exam results must be post marked by March 16th or scan the record sheet and email to newjsl@ptd.net or the scores will not count.

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

BIOLOGY 11 For ADP and second year biology students. 50 Multiple Choice See topics on the web page for a complete list of topics. Question topics for each test will include questions which relate to the Big Ideas I –IV listed below taken from the Advanced Placement Curriculum designed by The College Board. Questions will involve science practices such as analysis of data and evidence to support biological principles. All levels of life (molecules through ecosystems) will be explored on each exam. In addition, for each exam the identified content (e.g. osmoregulation) is linked to the excretory system. For example students should be able to answer, how does osmoregulation occur in the nephron in the excretory system.

Big Idea 1: The process of evolution drives diversity and unity of life
Big Idea 2: Biological Systems utilize free energy and molecular building blocks to grow, reproduce, and to maintain dynamic homeostasis
Big Idea 3: Living Systems store, retrieve, transmit and respond to information essential to life processes.
Big Idea 4: Biological Systems interact, and these systems and their interactions possess complex properties.

EXAM 1 January: Structure and function of Biological Molecules, Protein Folding, Bonding in Polymers, Enzymes, Coenzymes, Cofactors, Lipid and their Properties, Carbohydrates. Structure and function of Cells, Organelles and subcellular structures. Cell and tissue types, Germ layers and development. Free Energy and Gibbs Reactions, Enthalpy in Biological Systems, Biological Applications to the Laws of Thermodynamics, Endothermic/Exothermic Reactions, Coupled Reactions, Photosynthesis, Cellular Respiration, Endotherm/Exotherm in Body Temperature Regulation, Cell Types, Surface Area/Volume Ratios, Fluid Mosaic Model of the Membrane, Properties of Water, Osmoregulation, Membrane Transport, Cellular Feedback Mechanisms, Metabolic Processes and Metabolism, Communication; signaling, reception, transduction and response.

EXAM 2 February DNA and replication, RNA and Protein Production, RNA Types, Cell Cycle and Controls, Mitosis, Meiosis, Application of Mendel's Laws, Mendelian and NonMendieian Genetics, Genetic Disorders, Cancer, Genetic Engineering Techniques, Nonnuclear Inheritance, Transposons, Crossover, Gene Regulation, Apoptosis, Developmental Genes, Mutations, Biotechnology, Embryonic Development in Plants and Animals, Signaling Mechanisms, Transmission and Transduction Pathways, Polyploidy, Sex Inheritance, Mutation Effects, Viral Replication, Genetic Variation Processes, Mating Types, Behaviors and Parenting, Bacteria and Yeast Reproduction and use in Biotech, Review of Jan topics.

EXAM 3 March Evolution, Natural Selection, Artificial Selection, Mechanisms for Evolution, Hardy Weinberg Principles, Genetic Drift, Gene flow, Evidences for Evolution, Blast Genomic Analysis, Cladogram , Evolutionary Trees, Evolution of the Domains, Adaptive Radiation, Island Biogeography Theory, Speciation, Prezygotic and Postzygotic Mechanisms, Energy in Reproductive Strategies Hypothesis on Origins of Life, Virus and Bacteria types and adaptations. Review of Jan and Feb topics.

EXAM 4 April Ecosystem Energy Pyramid Structure, Food Web Alterations, Organ and System Specialization, Interactions and Coordination in Plants and Animals, Organism Responses Adaptation to Environment, Ecosystem Transformations, Components of a community, Transpiration, Population: Variation, Growth, Dynamics and Distribution, Exponential and Logistic Population Growth Models, Population Density, Limiting Factors, Species Richness, Species Diversity, Competition, Bacteria, Fungi, Symbiotic Relationships, Food Webs, Productivity, Energy Dynamics, Keystone species, Exotic and Alien Species Biogeochemical Cycles, Energy of Reproductive Strategies, Behavioral and Physiological Response to Environmental Stress, Taxis and Kinesis, Tropisms, Biological Rhythms, Behavioral Biology. Review of Jan, Feb, and March Topics

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 27th, 2018

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

New Jersey Science League
PO Box 65 Stewartsville, NJ 08886-0065
Phone # 908-213-8923 fax # 908-213-9391 email: newjsl@ptd.net
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 1ST, 2ND, 3RD, AND 4TH).

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 – Biology II Exam

April 12, 2018 White TEST Corrections:

SCANTRON INSTRUCTIONS: Please PRINT your **NAME**, **SCHOOL**, **AREA** and which exam you are taking onto the scan-tron. State if you are an alternate or regular member of your team.
TEST INSTRUCTIONS: Choose the answer that best completes the statements or questions below and fill in the appropriate response on the form. If you change an answer, be sure to completely erase your first choice.

1. In which of the following animals would you expect circannual rhythms to be most pronounced?
   a. Humans living at the equator
   b. Humming birds that live in relatively constant environments
   c. Bears that hibernate in the winter
   d Fruit flies whose life span is usually shorter than a month

2. In diploid organisms, what percentage of the total possible offering alleles does a parent share with their offspring? Not a clear explanation. B and C are taken as correct.
   a. 0% b. 25% c. 50% d. 75%

3. What method would a biologist use to determine the effect of a single gene on a particular behavior?
   a. gene tagging experiment
   b. cloning experiment
   c. gene knockout experiment
   d. trial and error series experiment

4. Based on the following life table, during what time interval is survivorship least? C is correct not A

Age (years)	0	1	2	3	4
Number alive	800	770	550	123	75

   a. 0-1 years b. 1-2 years c. 2-3 years d. 3-4 years

5. Certain birds follow swarms of foraging army ants and prey upon the insects and invertebrates that the ants flush out. What is the relationship between the birds and the ants?
   a. amensalism b. commensalism c. competition d. parasitism

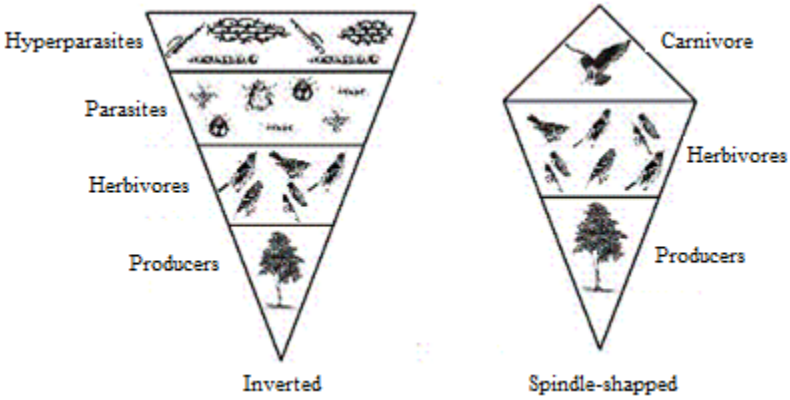
6. If a species of plant that is trampled by an animal eventually evolves sharp spines that prevent trampling, how has the plant's association with these flowers changed?
   a. amensalism to competition
   b. amensalism to commensalism
   c. commensalism to competition
   d. parasitism to competition

7. If the dry biomass of the primary producers of an ecosystem is 1000g per square meter and the efficiency of transfer between trophic levels is 20%, what dry biomass weight in grams would be expected at the secondary carnivore level?
   a. 200 grams b. 40 grams c. 20 grams d. 8 grams

8. Which choice below describes the genus expected to have the greatest proportion of rare species?
   a. a genus with 30 species living in the temperate zone
   b. a genus with 30 species living in the tropical zone
   c. a genus with 10 species living in the temperate zone
   d. a genus with 10 species living in the tropical zone

9. What type of pyramids are represented below?

a. energy
b. mass
c. numbers
d. territory



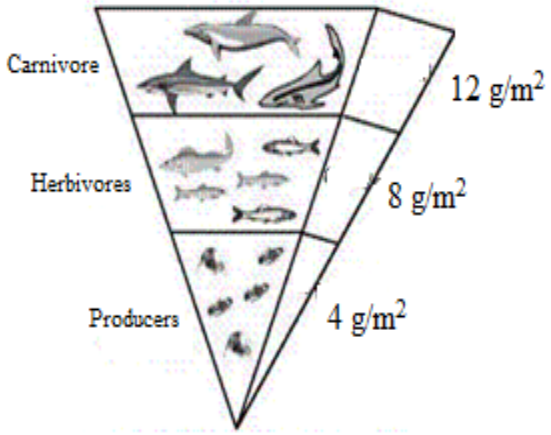
10. The toothed whale usually have a large number of conical shaped teeth, but no flattened molars like those found in humans. What does this suggest about the eating habits of toothed whales?
    a. they carefully chew their food into pulp before swallowing.
    b. they rip or tear their food and probably swallow it in whole chunks
    c. are herbivores and feed mostly on easily digested algae
    d. strain large volumes of water through their teeth and filter out small fish

11. Lizards cannot metabolically produce enough heat to maintain continuous elevated body temperatures, but they are able to hold their body temperatures somewhat constant by appropriately positioning themselves in the environment. What type of thermoregulatory capabilities do lizards have?
    a. Endothermic, behavioral poikilotherm
    b. Endothermic, physiological homeotherm
    c. Exothermic, behavioral poikilotherm
    d. Exothermic, behavioral homeotherm

12. Although, evaporative cooling is an effective way to increase heat loss, but carries important physiological drawbacks when panting or sweating? What are these drawbacks?
    a. increased water uptake causing bloating
    b. increases use of ATP and substantial loss of water
    c. stimulates the release of pyrogens leading to a fever
    d. accelerating the rate of fat deposition

13. Why is asexual reproduction a good strategy found in stable environments?
    a. gametogenesis is most efficient under these conditions
    b. animal cells tend to be more totipotent under stable conditions
    c. parthenogenesis can produce a large amount of genetic diversity
    d. offspring are genetically identical to their parents and are pre-adapted for the environment

14. What conditions allow the dry mass of the producers in the pyramid below to be so low?



a. Unicellular phytoplankton don't weigh much providing less nutrition in the food chain
b. Unicellular phytoplankton populations multiply rapidly and are eaten by large herbivores
c. Zooplankton, which are herbivores, divide rapidly and are eaten by other phytoplankton
d. Unicellular phytoplankton multiply rapidly and are cropped by the zooplankton which support larger herbivores.

15. A plant in the dark uses 0.02 ml of O_2 per minute. The same plant in sunlight releases 0.14 ml O_2 per minute. What is the best estimate of its rate of gross primary production of O_2 per minute?
a. 0.02 b. 0.12 c. 0.14 d. 0.16

16. In some animal societies, such as honeybees, a single female mates with several males. What type of relationship exists between the female and males?
a. monogamous b. polyandry c. polygyny d. polygenetic

17. Mule deer live and feed in predominately open areas in the mountains of western North America, where there is slightly less food available than on the forest edge, However the risk of predation by mountain lions near the forest edge is greater than in open fields where they feed. What is the cost-benefit compromise made by the mule deer?
a. predator prey compromise
b. optimal foraging mode
c. natural selection
d. associative learning

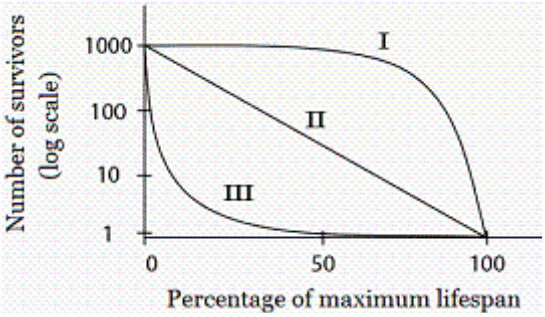
18. If young zebra finches are raised by foster parents of another species, the Bengalese finch, they will court female Bengalese finches instead of females within their own species. What has caused the resulting behavior?
a. conditioning b. habituation c. imprinting d. reinforcement

19. Which of the following describes an intimate ecological association in which an organism benefits from living on or within a host, but generally has a negative effect of the host?
a. commensalism b. parasitism c. mutualism d. saprophytic

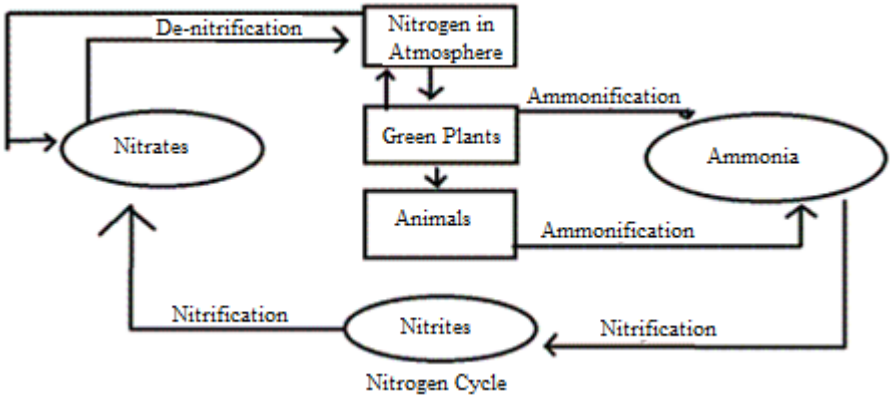
20. What is the unique family of genes in animals that plays an important role in the development of embryos, and controls the expression of other genes influencing animal morphology?
a. FOX2 b. Hox c. Mads-box d. α and β globbins

21. A sea turtle lays approximately 100 eggs at a time, yet on average only one of eggs will survive to adult hood. Which type of survivorship curve shown below represents a sea turtle population?

a. I
b. II
c. III
d. none of these



22. The Earth's nitrogen reservoir in the atmosphere is about 78% N_2. How is this inorganic gas (N_2) brought into biological nitrogen cycle? All full credit key gives C

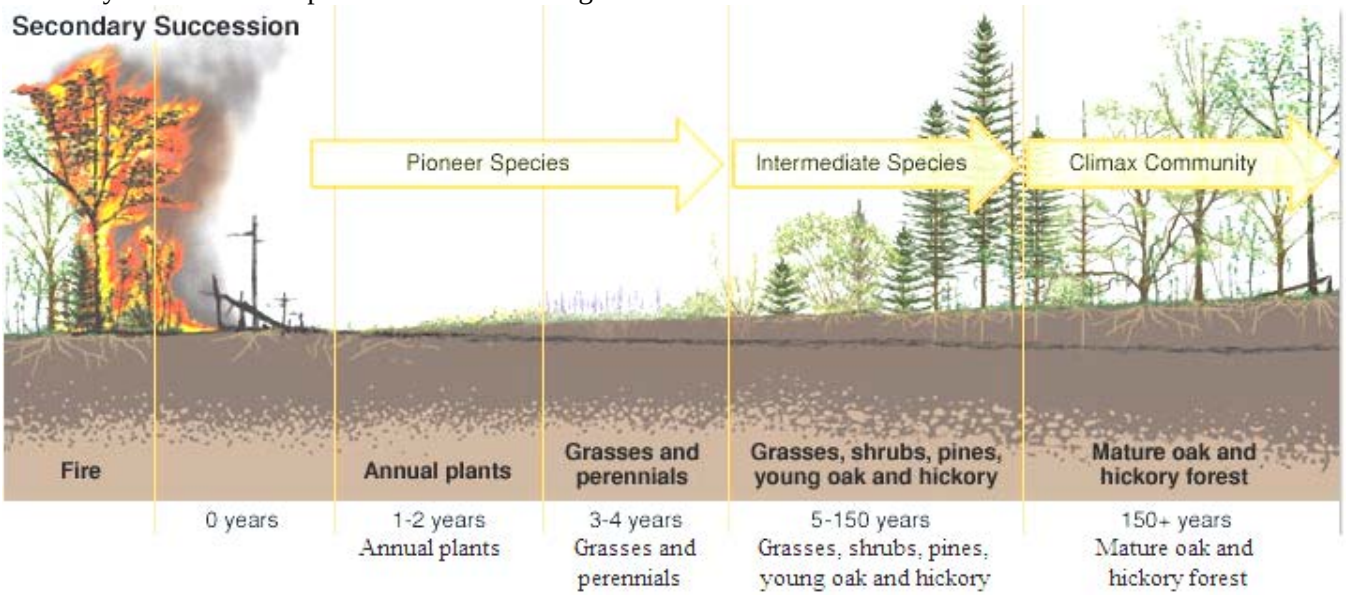


Nitrogen Cycle

a. Through the same plant-based process that fixes carbon from the atmosphere.
b. Nitrogen is converted to nitrates by the roots of legumes.
c. Nitrogen is converted to ammonia by animals or bacteria in the soil and root of legumes.
d. The process of de-nitrification is performed by various types of soil bacteria.

23. Over the last fifty years, an abrupt decrease in average temperature on an island has resulted in a gradual change from wind-blown forests of short conifers to open fields containing permafrost and few trees. Which of the following transitions in the biome is occurring?
a. Tundra to taiga
b. Taiga to tundra
c. Tundra to grasslands
d. Taiga to coniferous forest

24. A fire ignites a 400 year old primary forest consisting of mostly beech and maple trees. How will the pace of the secondary succession compare to the initial ecological succession in the area?

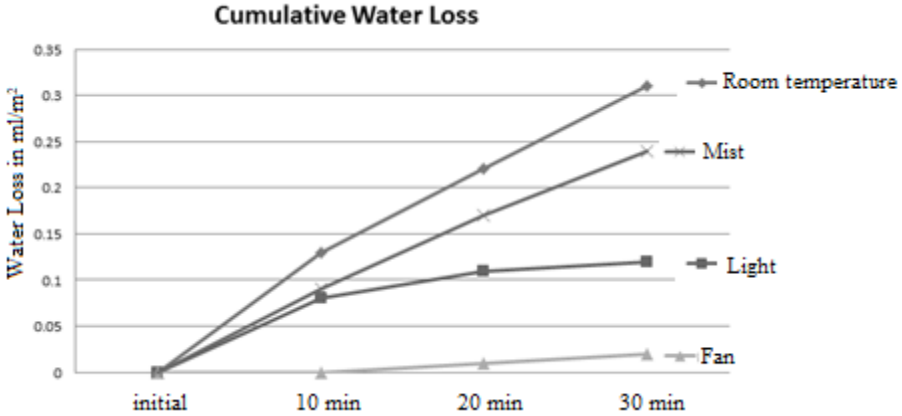


a. Growth of the secondary community will be faster than the initial succession
b. Growth of the secondary community will be slower than the initial succession
c. Growth of the secondary community will be about the same as the initial succession
d. Growth of the secondary community will depend upon the lichens to absorb carbon

25. Sentry meerkats stand on alert to detect predators and bark. They continue barking even after they spot a predator thus warning fellow meerkats to hide despite bringing attention to themselves. What type of social behavior is exemplified?

a. agonistic behavior
b. altruistic behavior
c. dominant hierarchy
d. territoriality

26. In comparison to room temperature, which variable is most efficient in <u>increasing</u> the rate of transpiration, as shown in the graph?



a. > Light
b. >mist
c. >wind
d. >rainfall

27. Many infected animals with parasitic microsporidians are induced to develop huge cells known as xenomes, which are full of spores. Since the cells develop so large, what problem must be addressed?
    a. The xenomes must obtain mitochondria to survive
    b. The xenomas must keep spores for escaping to prevent infecting other organisms
    c. The parasite must endow the xenomas in some way to overcome the surface area to volume ratio
    d. The xenoma will develop a cell wall of chitin or else they will lyse

28. In a hypothetical situation, the gene for sex pilus construction and for tetracycline resistance are located on the same plasmid in a certain bacterium. If a bacterium conjugates involving a copy of this plasmid, what would be the results?
    a. The rapid spread of tetracycline resistance to other bacteria in the habitat.
    b. The bacteria would have a diploid genome.
    c. There would be a loss of the tetracycline resistance in the bacteria.
    d. Transduction would occur in all future generations

29. Several tomato plants are growing in a small garden plot. If soil water potential were to drop significantly on a hot summer afternoon, which of the following would most likely happen?
    a. Stomatal apertures would decrease
    b. Transpiration would increase
    c. The uptake of CO_2 would be enhanced
    d. The leaves will become turgid

30. What would have to happen to the H5N1 avian(bird) flu virus to cause a human pandemic?
    a. to spread to primates, such a chimps
    b. develop into a virus with a different host range
    c. be capable of bird-to-human-human transmission
    d. become more pathogenic

31. Why must multicellular animals have cells surrounded by interstitial fluids?
    a. the membranes crystallize in fluids
    b. the aqueous fluids are needed for the cellular exchange of nutrients, gases and wastes
    c. the cells need to be protected from dissolved N_2 from the blood
    d. the fluids prevent water loss due to osmosis

32. A fungus caused the chestnut tree blight that occurred early in the 20th century. The fungus lived on the trees and was spread by a number of agents - wind, rain, insects, and birds. The fungus killed the trees over a period of time. Which of the following describes the nature of the spreading agents and the relationship of the fungus to the chestnut tree?
    a. biotic; mutualism
    b. biotic; predation
    c. abiotic and biotic; parasitism
    d. abiotic and biotic; competition

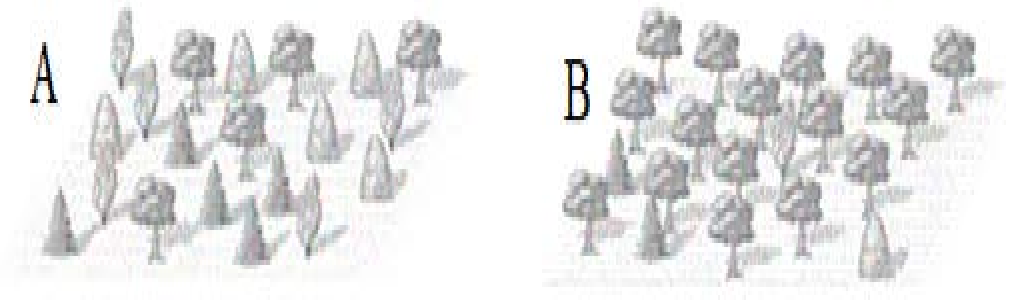
33. In a rocky intertidal of the Northwest Pacific, the starfish (*Pisaster ochraceus*) is an efficient predator of the mussel, (*Mytilus californicus*). The mussel is able to compete for resources successfully and reproduces rapidly. Predation by the starfish keeps the mussel population at moderate levels, allowing other macro-invertebrates to persist in the environment. The decline of starfish population will inadvertently increase the mussel population, resulting in a decline in the numbers of macro- invertebrates. Use the table below to determine where the starfish should be placed in this community.

impact ⇑	Keystone species	Dominant species
	Rare species	Common species
Abundance ⇒		

a. Keystone b. Common c. Dominant d. Rare

34. Exotic species of organisms have been accidentally and intentionally introduced into well-established native fresh water ecosystems in recent years and have undergone explosive growth. Which of the following best describes a possible reason for such a population explosion?
    a. They found many unoccupied niches
    b. New mutations made them more successful in the new niche
    c. They have many enemies in the new niche
    d. They can't coexist with the native species occupying the same niche

35. Of the two diagrams below which diagram demonstrates species richness?

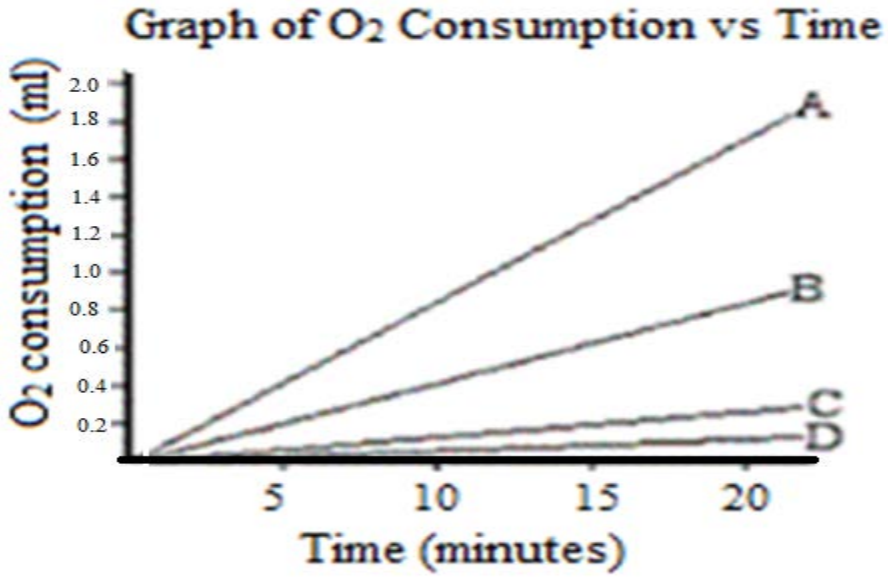


a. A b. B c. Both diagrams d. Not evident

36. In the diagrams for #35 which community has a more even distribution of relative abundance?
    a. A b. B c. not evident

37. A certain bacteria gather at the ends of green algae. How do these bacteria respire?
    a. aerobes
    b. anaerobes
    c. facultative anaerobes
    d. chemoautotrophs

38. The graph below represents data from four respirometers in a pea germination experiment involving (A) germinating peas at 20°C, (B) germinating peas at 10°C, (C) nongerminating peas at 20°C, and (D) nongerminating peas at 10°C. Respirometer C contains glass beads to adjust the effects of air pressure readings during oxygen consumption data collection. What statement is supported by the date graphed below?



a. The rate of oxygen consumed in germinating peas at 10°C at 10 minutes is 0.4 ml O_2/minute.
b. The amount of oxygen consumed by A is twice the amount of oxygen consumed by B at the end of the experiment.
c. The rate of oxygen consumed is higher for nongerminating peas at 10°C than at 20°C
d. The rate of oxygen consumed is the same in germinating and nongerminating peas from 0 to 5 minutes.

39. Researchers discover a new protein in humans that function in the production of the nuclear envelope. Bioinformatic analysis indicates that *Saccharomyces cerevisiae* has this homologous protein. What would their next thought be?
    a. The scientist cannot use their present data because it does not relate directly to humans
    b. The scientist cannot correlate the bioinformatic analysis to human data.
    c. The scientist can study the function of the protein using *S. cerevisiae* as a model for their experiments.
    d. The scientist can assume all eukaryotes use the protein

40. Dr. Foteini Hassiotou announced that she had found cells in breast milk that were from the three initial germ layers and are pluripotent with the capability to develop into any of the 200 human cell types. What type of cells were found in the breast milk?
    a. Embryonic cells
    b. Embryonic stem cells
    c. Adult stem cells
    d. Multipotent cells

41. Beta amylase is an enzyme that breaks down polysaccharides into its components, but is not produced by humans. Beta amylase is most effective in digesting which chemical below?
    a. glycogen b. glucose c. cellulose d. starch

42. Which of the following is a consequence of biological magnification? Choices do not deal with biological magnification. All full credit. No answer is correct.
    a. The biomass of producers in an ecosystem is generally lower than the biomass of primary consumers.
    b. The biomass of producers in an ecosystem is generally higher than the biomass of primary consumers.
    c. The amount of biomass in the producer level of an ecosystem decreases if the producer turnover time increases.
    d. Only a small portion of the energy captured by producers is transferred to consumers.

43. In an experiment, five marked pill bugs were placed on the dry side of a choice chamber and five marked pill bugs on the wet side. They collected data as to the number on each side every 30 seconds for 10 minutes. After 6 minutes, eight pill bugs were continually on the wet side. After 10 minutes, eight pill bugs were in the wet side but since they were marked, observations showed that they were not exactly the same pill bugs. They appeared to randomly move into the wet area, spending more time in the area. What type of behavior is exhibited by the pill bugs?

    a. positive taxis toward moist areas
    b. negative taxis towards dry areas
    c. kinesis only
    d. both taxis and kinesis

44. A farmer is trying to decide which of two fields to grow zucchini and other types of squash. One field is in the shade for half a day and the other is in full sun all day. In the chart below are July yields for each field. What can be concluded?

Vegetables	Shady Field	Sunny field
Zucchini	240 kg	400 kg
Acorn squash	70 kg	100 kg
Butternut Squash	190 kg	290 kg

    a. The shady field has the best yields
    b. The sunny field has the best yields
    c. No conclusion can be determined
    d. Both fields could be used because there isn't significant difference.

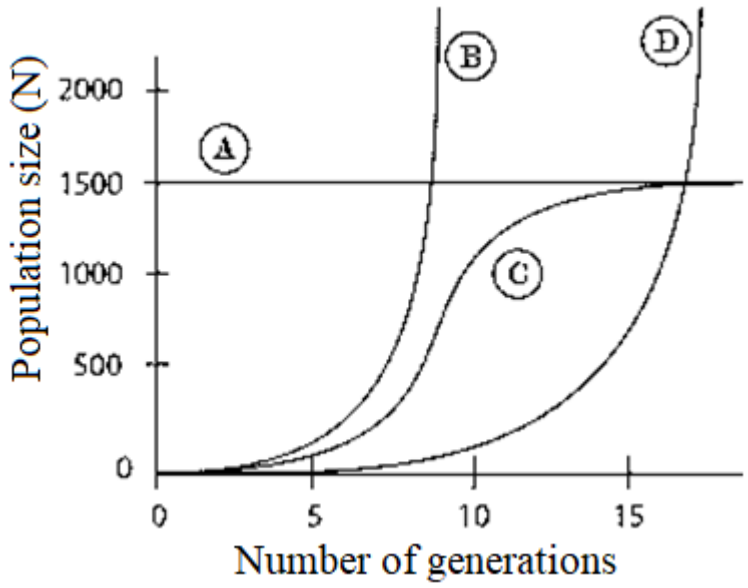
45. Bacteria are able to communicate using signaling molecules released into the environment. Each bacteria cell is able to sense the number of bacteria or cell density from the accumulation of signaling molecules. There are several different classes of signals in which side chains in the molecule vary slightly giving different information. Evidence has shown that mixed populations of bacteria in biofilms can communicate. Quorum sensing plays an important role in

    a. Spatial Diffusion
    b. Population explosion
    c. Interspecies cross talk
    d. Bacterial languages

46. What is the result of a successful adaptation from a genetic variation ?
    a. a longer life span
    b. competition advantage in finding food
    c. greater reproductive success
    d. imprinting behaviors from other species

Matching

Use the graph below to answer questions 47 through 50.



47. Which line represents a carrying capacity at zero growth?
48. Which line represents a population having longest lag phase?
49. Which line represents a population entering log phase quicker?
50. Which line represents obtaining a stable population?

NEW JERSEY SCIENCE LEAGUE Corrections

Biology II Ans Key Date: April 12, 2018 White Paper Test

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

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

BIOLOGY 11 For AP and second year biology students. 50 Multiple Choice

Question topics for each test will include questions which relate to the Big Ideas I –IV listed below taken from the Advanced Placement Curriculum designed by The College Board. Questions will involve science practices such as analysis of data and evidence to support biological principles. All levels of life (molecules through ecosystems) will be explored on each exam. In addition, for each exam the identified content (e.g. osmoregulation) is linked to the excretory system. For example students should be able to answer, how does osmoregulation occur in the nephron in the excretory system.

Big Idea 1: The process of evolution drives diversity and unity of life

Big Idea 2: Biological Systems utilize free energy and molecular building blocks to grow, reproduce, and to maintain dynamic homeostasis

Big Idea 3: Living Systems store, retrieve, transmit and respond to information essential to life processes.

Big Idea 4: Biological Systems interact, and these systems and their interactions possess complex properties.

EXAM 1 January: Structure and function of Biological Molecules, Protein Folding, Bonding in Polymers, Enzymes, Coenzymes, Cofactors, Lipid and their Properties, Carbohydrates. Structure and function of Cells, Organelles and subcellular structures. Cell and tissue types, Germ layers and development. Free Energy and Gibbs Reactions, Enthalpy in Biological Systems, Biological Applications to the Laws of Thermodynamics, Endothermic/Exothermic Reactions, Coupled Reactions, Photosynthesis, Cellular Respiration, Endotherm/Exotherm in Body Temperature Regulation, Cell Types, Surface Area/Volume Ratios, Fluid Mosaic Model of the Membrane, Properties of Water, Osmoregulation, Membrane Transport, Cellular Feedback Mechanisms, Metabolic Processes and Metabolism, Communication; signaling, reception, transduction and response.

EXAM 2 February DNA and replication, RNA and Protein Production, RNA Types, Cell Cycle and Controls, Mitosis, Meiosis, Application of Mendel's Laws, Mendelian and NonMendieian Genetics, Genetic Disorders, Cancer, Genetic Engineering Techniques, Nonnuclear Inheritance, Transposons, Crossover, Gene Regulation, Apoptosis, Developmental Genes, Mutations, Biotechnology, Embryonic Development in Plants and Animals, Signaling Mechanisms, Transmission and Transduction Pathways, Polyploidy, Sex Inheritance, Mutation Effects, Viral Replication, Genetic Variation Processes, Mating Types, Behaviors and Parenting, Bacteria and Yeast Reproduction and use in Biotech, Review of Jan topics.

EXAM 3 March Evolution, Natural Selection, Artificial Selection, Mechanisms for Evolution, Hardy Weinberg Principles, Genetic Drift, Gene flow, Evidences for Evolution, Blast Genomic Analysis, Cladogram , Evolutionary Trees, Evolution of the Domains, Adaptive Radiation, Island Biogeography Theory, Speciation, Prezygotic and Postzygotic Mechanisms, Energy in Reproductive Strategies Hypothesis on Origins of Life, Virus and Bacteria types and adaptations. Review of Jan and Feb topics.

EXAM 4 April Ecosystem Energy Pyramid Structure, Food Web Alterations, Organ and System Specialization, Interactions and Coordination in Plants and Animals, Organism Responses Adaptation to Environment, Ecosystem Transformations, Components of a community, Transpiration, Population: Variation, Growth, Dynamics and Distribution, Exponential and Logistic Population Growth Models, Population Density, Limiting Factors, Species Richness, Species Diversity, Competition, Bacteria, Fungi, Symbiotic Relationships, Food Webs, Productivity, Energy Dynamics, Keystone species, Exotic and Alien Species Biogeochemical Cycles, Energy of Reproductive Strategies, Behavioral and Physiological Response to Environmental Stress, Taxis and Kinesis, Tropisms, Biological Rhythms, Behavioral Biology. Review of Jan, Feb, and March Topics

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 30th.

No area may take the April exam during the first week of April.

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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 1ST, 2ND, 3RD, AND 4TH).

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