

**New Jersey Science League – Biology II Exam
January 12, 2017 White TEST**

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.

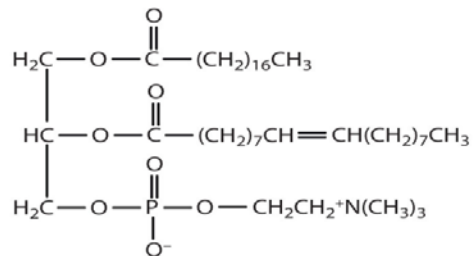
TEST INSTRUCTIONS: Choose the answer that best completes the statements or questions below and fill in the appropriate response on the form. If you change an answer, be sure to completely erase your first choice. **Corrections: #2 all full credit**

- When are experimental results considered to be statistically significant? The results are
 - likely to occur by chance alone
 - unlikely to occur by chance alone
 - influenced by sampling error
 - scientifically important
- What takes place when an ice cube cools a drink? **No answer is correct. Energy is transferred to the ice from the drink.**
 - Evaporation of water increases.
 - Molecular collisions in the drink increase.
 - Kinetic energy of water increases. **KE decreases**
 - Heat energy is transferred from the ice to the drink
- If a system absorbs energy and does an equivalent amount of work, what is the change in internal energy?
 - positive
 - negative
 - zero
 - one
- The blood usually maintains pH balance with the reaction below. Why does depressed respiration, occurring during a drug overdose, sometimes resulting in a low blood pH?

$$\text{CO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{CO}_3 \rightleftharpoons \text{H}^+ + \text{HCO}_3^-$$
 - CO₂ is retained and the reaction moves to the right placing more protons in the blood.
 - CO₂ is utilized by the cell's mitochondria
 - As less CO₂ is found in the blood more H₂CO₃ is produced
 - Carbonic acid maintains the pH of the blood at 7.35

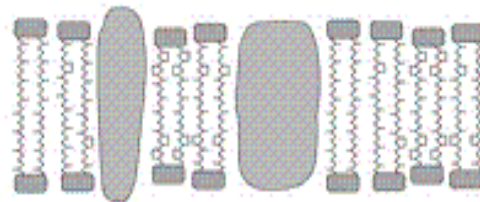
5. Where would you expect to find the following molecule?

- within the nucleoplasm
- as an enzyme in the peroxisome
- part of the motor unit of a flagella
- as part of a membrane



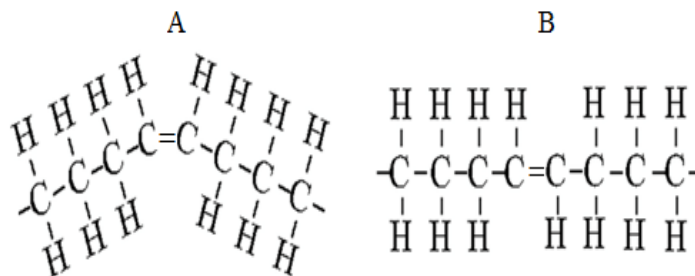
6. Below is a diagram that represents a membrane. In what cell would this type of glycerol-ether lipid monolayer probably be found?

- Archaea Bacteria
- Eubacteria
- Fungal Cells
- Plant Cells



- Vitamin A is relatively small, lipid soluble molecule that acts similar to a hormone. What would be a hypothetical characteristic of the vitamin A receptor?
 - It is ion channel receptor.
 - It is a protein kinase receptor
 - It enters with a 7-pass protein.
 - It is not located on the plasma membrane.

8. What occurs to the proteins within a one minute egg cooked for breakfast?
- Gentle cooling will reverse the denaturation.
 - High temperatures will maintain all bonds found in the proteins
 - High temperatures will break hydrogen bonds but not the covalent bonds.
 - New amino acids will form.
9. What is the structural level that occurs when four subunits associate in a fully functional molecule, for example: hemoglobin?
- primary
 - secondary
 - tertiary
 - quaternary
10. What occurs to a protein that consists of 265 amino acids, when one amino acid is replaced by another amino acid?
- This causes the tertiary structure to unfold.
 - This always alters the function of the protein.
 - This always alters the primary structure resulting in dysfunction of biological activity.
 - This alters the primary structure, sometimes the tertiary structure and may affect its biological function.
11. If cells are grown in a medium containing radioactive ^{15}N , which of the molecules would be labeled in the new cells?
- amylase only
 - proteins only
 - nucleic acids only
 - the proteins and nucleic acids
12. About 12 to 14 hours after the last meal, a healthy person's blood sugar level normally varies from 60 to 90 mg per 100 ml of blood. Although sugar levels may rise to 130 mg per 100 ml after a high carbohydrate meal, which process allows the blood level to maintain a fairly narrow range despite an uneven intake of sugar?
- adaptation
 - homeostasis
 - inheritance
 - metabolism
13. Which of the following fatty acid hydrocarbon chains below, would be an **unhealthy** food choice?

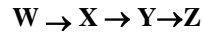


- Molecules A and B
 - Molecule A only
 - Neither A or B
 - Molecule B only
14. Which function would be impaired in an animal cell lacking oligosaccharides on the external surface of its plasma membrane?
- transporting ions against an electrochemical gradient
 - cell to cell recognition
 - maintaining fluidity of phospholipid
 - attaching to the cytoskeleton
15. In receptor-mediated endocytosis, receptor molecules initially projects to the outside of the cell. Where do the receptors end up after endocytosis?
- on the inside surface of the cell membrane
 - on the inside of a surface vesicle
 - on the outer surface of the nucleus
 - on the endoplasmic reticulum
16. Which of the following membrane activities require energy from ATP hydrolysis? **C and D are correct Key has D.**
- movement of water into the cell
 - facilitated diffusion of Cl^- ions across the membrane through a chloride channel
 - Na^+ ions moving out of a cell bathed in physiologic saline
 - movement of glucose into a bacterial cell from a medium containing a lower concentration of glucose than inside the cell

17. Zinc, an essential trace element in living organisms, is present in the active site of the enzyme carbonoxypeptidase. What is zinc's function?

- a. coenzyme derived from vitamins
- b. allosteric activator of the enzyme
- c. cofactor necessary for enzyme activity
- d. competitive inhibitor to the enzyme

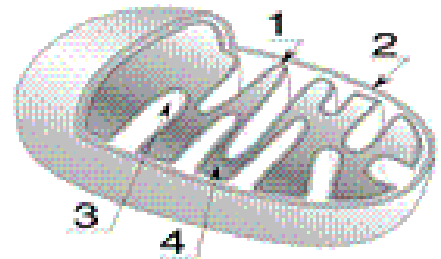
18. A series of enzymes catalyze the reaction below. Product Z binds to the enzyme that converts W to X at a position remote to the active site. What is the function of Z, with respect to the conversion of W to X?



- a. Z is a coenzyme
- b. Z is a feedback inhibitor
- c. Z is a substrate
- d. Z is a competitive inhibitor

19. In the diagram below, which labeled position indicates the matrix where the Krebs's citrus acid cycle occurs?

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

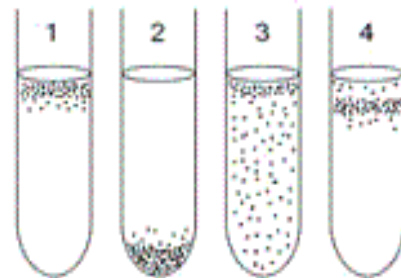


20. Why doesn't aerobic respiration take place without oxygen available?

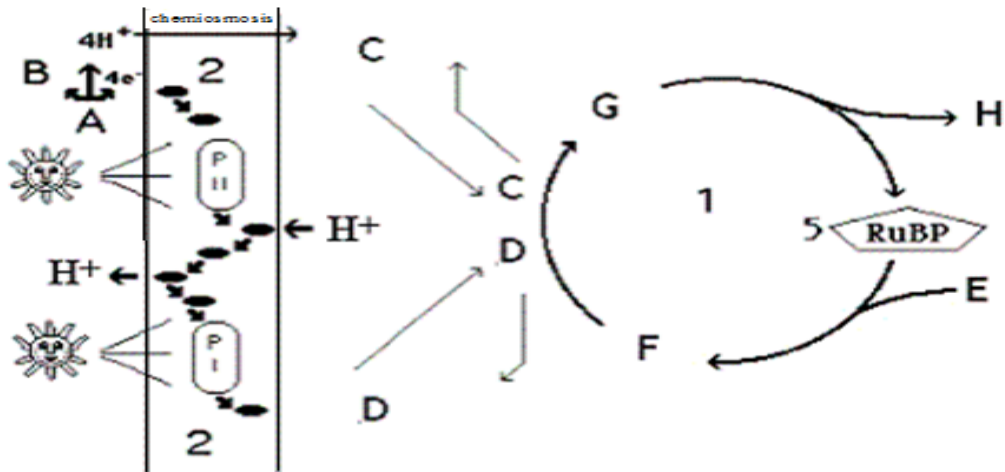
- a. Oxygen is essential for the formation of carbon dioxide during respiration.
- b. Oxygen is the terminal electron acceptor in respiration.
- c. Oxygen is necessary for the initiation of glycolysis.
- d. Oxygen is necessary for formation of alcohol and lactic acid.

21. Obligate anaerobic bacteria require an oxygen-free environment in order to grow and reproduce. Below each tube contains a different pure culture of bacteria. Which tube indicates obligate anaerobes growing?

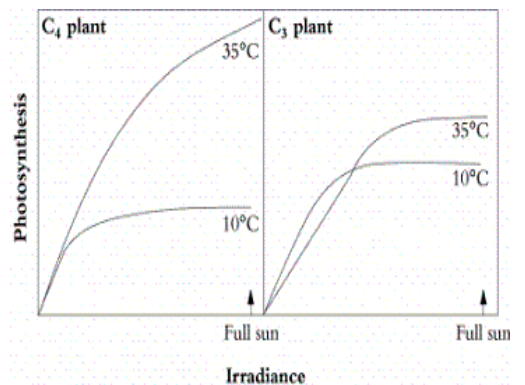
- a. 1
- b. 2
- c. 3
- d. 4



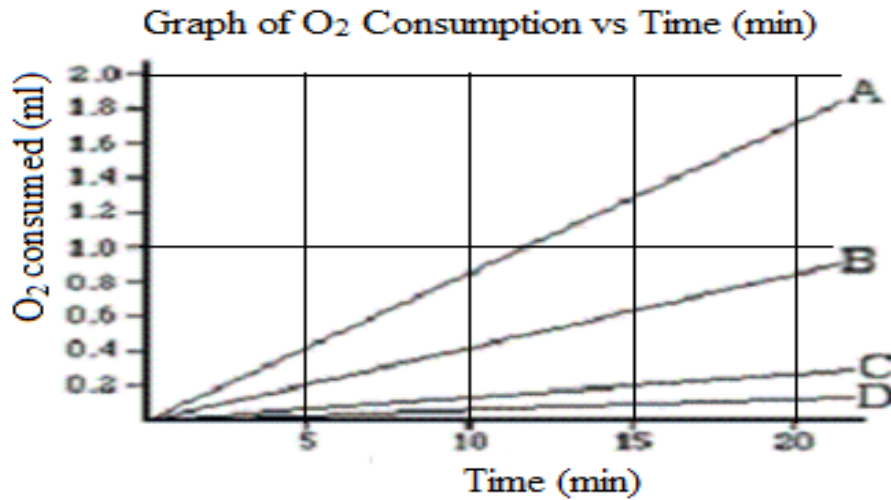
22. Use the drawing below for questions #22, 23, 24, 25. What process is shown in this diagram?



- a. cellular respiration c. photosynthesis
 b. electron transport system d. Calvin Cycle
23. In the diagram above what is produced at letter C?
 a. ATP b. NADPH c. oxygen d. glucose
24. In the diagram above where is PGAL produced?
 a. A b. F c. C d. G
25. In the diagram above what area represents the light independent reactions?
 a. area 1 b. area 2 c. areas 1 and 2 d. area B
26. A plant is placed in a sealed greenhouse environment with a fixed supply of water, soil, and air. After a year, the plant weighs 5 kg more than at the start of the experiment. What would weigh nearly 5 kg less at the end of the experiment?
 a. the air in sealed greenhouse c. the organic matter in the soil
 b. the soil left in the pot d. the combination of the water and the soil in the pot
27. How would bromothymol dye injected into a plant cell enter an adjacent cell?
 a. by osmosis c. through plasmodesmata
 b. through the microtubule d. via the tight junction
28. After analyzing the graphs below, what conclusion can be formulated?



29. The graph below represents the data from a pea germination experiment involving germinating peas at 25°C (A), germinating peas at 10°C (B), non-germinating peas at 25°C (C), and non-germinating peas at 10°C (D). What is the rate of oxygen consumption in graph A?



- a. 0.01ml/min b. 0.09 ml/min c. 1.8ml/min d. zero
30. Houseplants adapted to indoor temperatures may die if left outdoors. What happens to the plants in a cold environment?
- a. DNA does not function c. Membranes lack adequate fluidity
b. Photosynthesis is impaired d. More oligosaccharides are needed.
31. What will occur, if an enzyme is added to a solution where its substrate and product are in equilibrium?
- a. Additional product will be formed
b. Additional reactant will be formed
c. Free energy of the system will change
d. Nothing; the reaction will remain in equilibrium
32. What part of a signal pathway does a neurotransmitter serve, when a neuron responds to a specific neurotransmitter by opening gated ion channels?
- a. receptor b. transducer c. signal molecule d. final response
33. At puberty, an adolescent female's body changes both structure and function of several organ systems. This is due to the changing concentration of estrogen and steroid hormones. How can one hormone, such as estrogen, mediate so many different effects?
- a. Estrogen production increases and diffuses more widely
b. Estrogen has specific receptors inside many kinds of cells, producing the same response to the binding.
c. Estrogen binds to specific receptors of many kinds of cells, each of which have different response to the binding
d. Sub-components of estrogen are metabolizing to change concentrations to stabilize response.
34. Why is apoptosis potentially threatening to a healthy neighboring cells?
- a. Pancreatic signal is released initiates cell death from one cell to the next.
b. Neighboring cells would activate immunological responses causing phagocytosis.
c. Released cellular energy from dying cells damages the energy budget of healthy cells.
d. Lysosomal enzymes exiting the dying cells cause damage to surrounding cells.
35. If a mutant plant cell were unable to manufacture cellulose, what could not occur?
- a. cell wall formation c. capture sunlight
b. mitotic cell division d. food storage

36. What is the **surface area to volume ratio** for 5 μm cuboidal epithelial cell?

- a. 0.75 b. 1.2 c. 2.5 d. 4.25

37. Which plant cell structure could probably have the greatest volume?

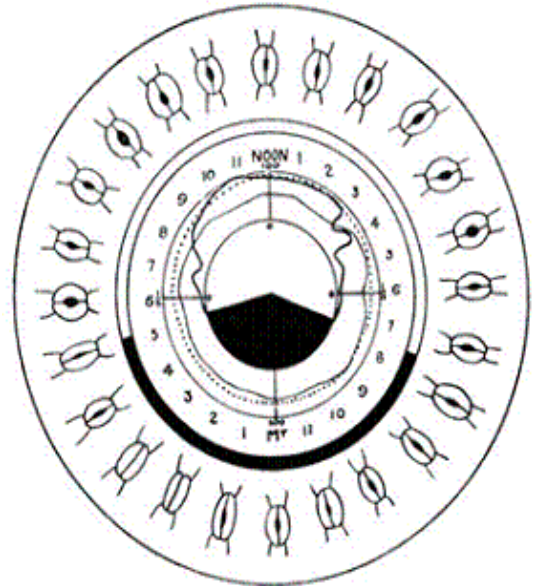
- a. chromosome b. glycosome c. ribosome d. vacuole

38. When comparing gram for gram sources of energy for cellular respiration, why are sugars not as good as fats?

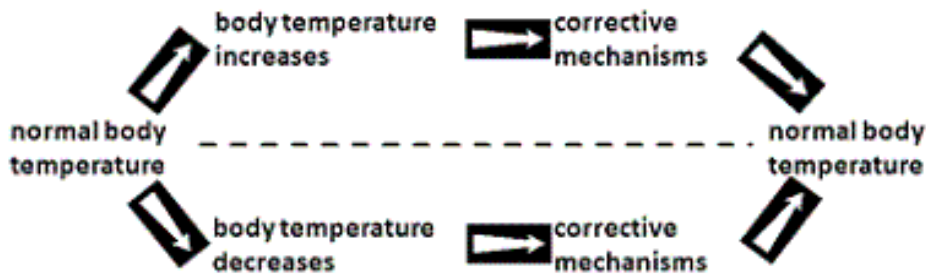
- a. Sugars usually bypass glycolysis and the Krebs cycle
 b. Sugars contain fewer hydrogen atoms and electrons
 c. Sugars contain more hydrogens than fats
 d. Fats are not as healthy as sugars

39. Below is a diagram demonstrating the effect of light intensity on a stomate in a 24 hour period. Which time of day would transpiration be reduced the most? All full credit Key has D. Not clearly distinguish between noon and midnight on drawing.

- a. Noon
 b. 9 AM
 c. 5 PM
 d. Midnight



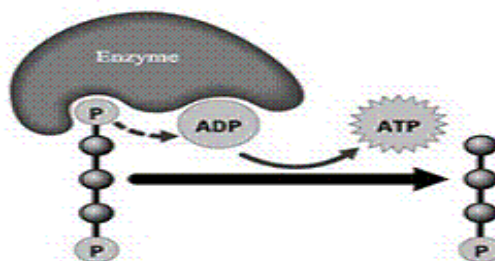
40. The hypothalamus, a thermoregulatory center, normally serves to produce metabolic responses that reverse the direction of an environmental temperature change, as shown below. What type of self-regulating system maintains a human's body temperature as exhibited in the diagram below?



- a. positive feedback c. metabolic compensation
 b. negative feedback d. hibernation response

41. What type of reaction is demonstrated below?

- a. Synthesis of an enzyme
- b. Single replacement
- c. Oxidative Phosphorylation
- d. Coupled Reaction



42. In the diagram in question # 41, what has occurred?

- a. Energy is transferred
- b. Matter is transferred
- c. Both energy and matter is transferred
- d. Neither energy nor matter is transferred

43. How many different proteins can be made from 72 amino acids?

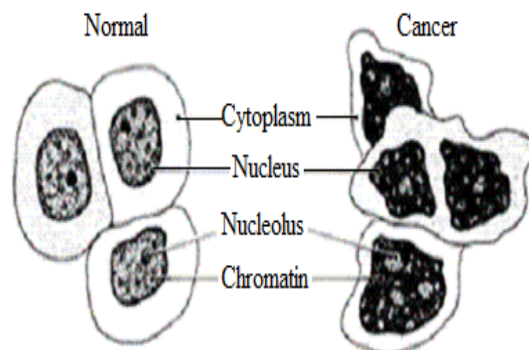
- a. 72^{20}
- b. 20×72
- c. 20^{72}
- d. 2^{72}

44. The hydrolysis of table sugar, sucrose, to glucose and fructose is exergonic. If sucrose is dissolved in water and the solution is kept overnight at room temperature, why is there no detectable hydrolysis occurring?

- a. The change in free energy of the reaction is positive.
- b. The activation energy of reaction is high.
- c. This is a condensation reaction.
- d. The free energy of the products is higher than the free energy of the reactants.

45. Analyze the diagram below. If you were a toxicologist determining if a particular chemical were a carcinogen, what cellular characteristic would you look for in your tissue sample for positive confirmation?

- a. multinucleated, multiple nucleolus and lack of cytokinesis
- b. conversion of nucleus to multiple nucleoli
- c. lack of chromosomes
- d. lack of a cell wall



46. Viruses that infect animal cells escape the host cell by a process called budding. The virus buds off from the host cell and is enveloped by a piece of host's cell membrane. Viruses that infect bacterial cells are not able to use budding but lyse the bacterial cell to escape. What best explains this difference?

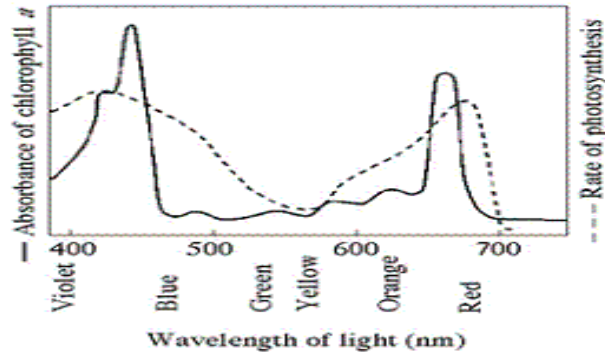
- a. Viruses that infect animal cells have more available ATP.
- b. Viruses that infect bacterial cells have more available ATP.
- c. Animal cells have more hospitable plasma membranes.
- d. Bacterial cells have plasma membranes surrounded by a cell wall.

47. Lead poisoning often causes symptoms resembling those in attention deficit disorder (ADD). What is the basis for their similarity?

- a. A deficiency of lead in the body causes ADD
- b. Lead poisoning and ADD occur in young children but not in adults.
- c. Lead may inhibit the same enzyme in the brain that is deficient in ADD individuals.
- d. The parts of the brain affected in ADD and lead poisoning are in different cerebral hemispheres.

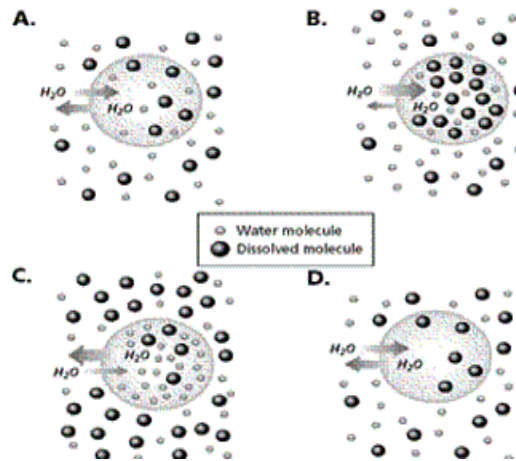
48. Which wavelength of light in the graph below is **most effective** in driving photosynthesis?

- a. 450 nm
- b. 575 nm
- c. 655 nm
- d. 730 nm



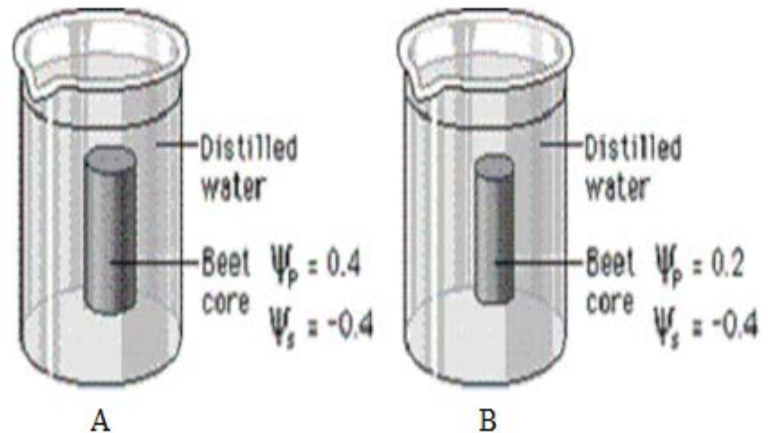
49. The diagrams below show water moving in and out of a cell. Which drawing would result in a bursting cell?

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



50. In the diagram below, Beaker A represents the initial set up and Beaker B is after some time has elapsed. In Beaker B, what is the water potential of the distilled water and the beet core?

- a. distilled water = 0 ; beet core = 0
- b. distilled water = 0 ; beet core = -0.2
- c. distilled water = 0 ; beet core = 0.2
- d. distilled water = 0.2 ; beet core = 0.2



NEW JERSEY SCIENCE LEAGUE

Biology II Ans Key Date: Jan 12, 2017 White Paper Test Corrections

1	B	11.	D	21.	B	31.	D	41.	D
2	E (All full credit)	12.	B	22.	C	32.	C	42.	C
3	C	13.	D	23.	A	33.	C	43.	C
4	A	14.	B	24.	D	34.	D	44.	B
5	D	15.	B	25.	A	35.	A	45.	A
6	A	16.	D and C	26.	A	36.	B	46.	D
7	D	17.	C	27.	C	37.	D	47.	C
8	C	18.	B	28.	B	38.	B	48.	A
9	D	19.	D	29.	B	39.	D (all full credit)	49.	B
10	D	20.	B	30.	C	40.	B	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 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 NonMendelian 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 2017 Season

Thursday January 12, 2017 Thursday February 9, 2017

Thursday March 9, 2017 Thursday April 13, 2017

All areas and schools must complete the April exam and mail in the results by April 28th, 2017

New Jersey Science League

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What is to be mailed back to our office?

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

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

Dates 2018 Season

Thursday January 11, 2018 Thursday February 8, 2018

Thursday March 8, 2018 Thursday April 12, 2018

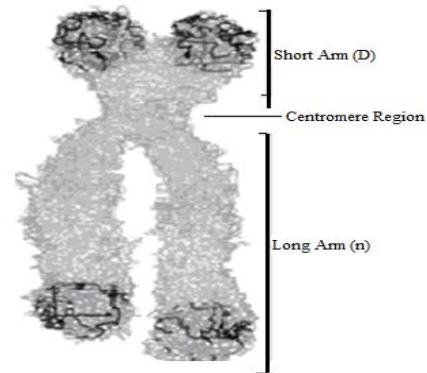
New Jersey Science League – Biology II Exam
February 9, 2017 White TEST No Corrections

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. Every nucleus in a eukaryotic organism contains the same amount of DNA. Which type of cells would have a different amount of DNA than all other nuclei within the organism?
a. muscle cells b. neurons c. fibroblasts d. gametes
2. In an organism where $2n = 12$, how many chromatids go into the first polar body?
a. 2 b. 6 c. 12 d. 24
3. In a genetics cross where a 2:1:1 ratio was expected, five sets of data were collected; each with 100 offspring. Which of these data sets would yield a higher P value in Chi-square analysis?
a. 37: 37: 36 b. 40: 30: 30 c. 45: 28: 28 d. 51: 25: 24
4. In a test cross involving two gene pairs, four phenotypes occurred in equal proportions, what is the genotype of the unknown organism?
a. AABB b. aabb c. AaBb d. AaBB
5. When children never express an abnormal phenotype unless one of the parents also expresses the phenotype, what type of allele would be expressed?
a. a sex-linked recessive allele c. an autosomal dominant allele
b. an autosomal recessive allele d. a lethal allele
6. Which of the following is a reasonable inference from the fact that certain forms of colon cancer have been found to result from defective DNA proof reading enzymes?
a. DNA replication errors cause colon cancer.
b. DNA mutations that lead to colon cancer are normally corrected in noncancer patients.
c. DNA mutations that cause colon cancer are due to exposure to ultraviolet light in affected area.
d. Environmentally induced mutations are usually limited to somatic cells only.
7. Which can be determined using RFLP analysis?
a. the order of genes on the chromosome c. the phenotype of an individual
b. the blood type of an individual d. the presence of a specific DNA fragment
8. Why is it easier to produce transgenic plants than animals using DNA technology?
a. plants have fewer genes to be added than animals
b. plants do not have introns and animals do have introns
c. genes can be inserted into plants with a DNA gun changing the plant immediately
d. genes can be inserted into single meristematic somatic cell with added plant hormones will grow an entire plant.
9. When experimental data in the results of two reciprocal crosses differ, such as a mutant gene male X normal female and normal male X mutant gene female, what type of inheritance would be expected?
a. codominance b. multiple alleles c. lethality d. sex linkage

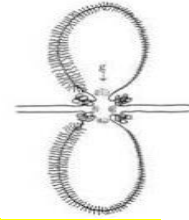
10. What is indicated in studies involving cleft palate, monozygotic twins showed a 72% concordance while dizygotic twins showed a 19% concordance?
- cleft palate only occurs in twins
 - cleft palate is inherited with no environmental effect
 - cleft palate demonstrates a genetic predisposition, but the environment of the fetus has an effect
 - cleft palate is always induced by the in utero environment
11. Which organism is RNA functioning sometimes as the inherited genetic material?
- viruses
 - bacteria
 - animals
 - plants
12. In the diagram below, what are the darkened area tips of the chromosome which are associated with the aging process ?
- exons
 - kinetochore
 - transposons
 - telomeres



13. If the percentage of A is determined to be 16% in a double stranded DNA molecule, what is the percentage of G?
- 8%
 - 34%
 - 64%
 - 84%
14. Which pairs of RNA strands would be expected to most successfully undergo molecular hybridization?
- AUGCUG & GAAUUC
 - UAGUCG & GTCGUC
 - UGCGAA & AACCCA
 - AUCAGC & UAGUCG
15. What does the discovery of Okazaki fragments suggest about DNA synthesis?
- continuous
 - discontinuous
 - semiconservative
 - 3' to 5' replication
16. Why is an RNA primer considered essential during DNA synthesis by DNA polymerase III?
- the enzyme requires a free 5' -OH group
 - the enzyme requires a free 5' -PO₄ group
 - the enzyme requires a free 3' -OH group
 - the enzyme requires a free 3' -PO₄ group
17. Which protein is associated with the nucleosome of chromatin assisting with the changing of tension during DNA supercoiling?
- acidic proteins
 - DNA polymerase
 - histones
 - nucleases

18. What occurs on lampbrush chromosome in the diagram below?

- a. intense RNA synthesis
- b. intense protein synthesis
- c. intense DNA synthesis
- d. intense nucleosome synthesis



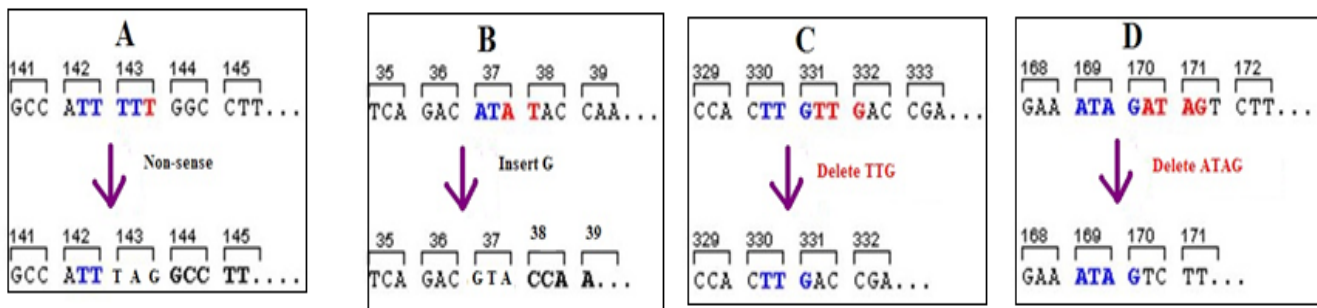
19. A female rabbit was found to be heterozygous for a sex-linked allele causing inactivation of the enzyme, phosphokinase (PK). What percentage of her cells will show PK activity?

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

20. If a child is born which is clearly male, yet a Barr body is apparent in all cells examined, what may this indicate about the child?

- a. He is afflicted with Klinefelter syndrome
- b. He is afflicted with Turner syndrome
- c. He has two Y chromosomes
- d. He doesn't have sex chromosomes

21. Which of the following examples below would result in a frame shift mutation?



- a. A and B only
- b. B, C and D only
- c. C and D only
- d. A, B, C, and D

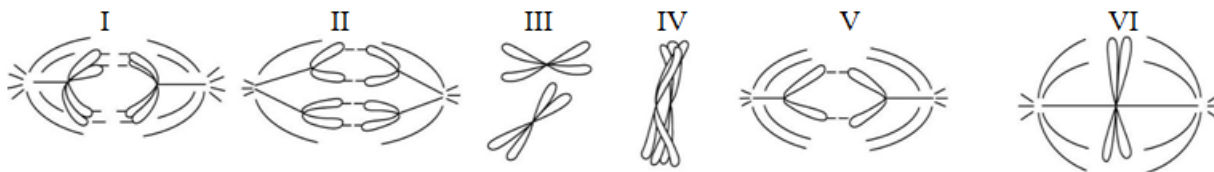
22. What is the best assay of chemicals to determine if a chemical is mutagens?

- a. Ames Test
- b. Gram Stain
- c. MRI imaging
- d. RFLP analysis

23. What is the result of independent assortment?

- a. the random nature of fertilization of ova by sperm
- b. the relatively small degree of homology shared by X and Y chromosomes
- c. the random distribution of the sister chromatids to the two daughter cells during anaphase
- d. the random and independent way in which each pair of homologous chromosomes lines up at the metaphase plate during meiosis I.

24. The diagram below shows a single pair of homologous chromosomes as they might appear during various stages of either mitosis or meiosis. Which diagram represents anaphase I of meiosis?



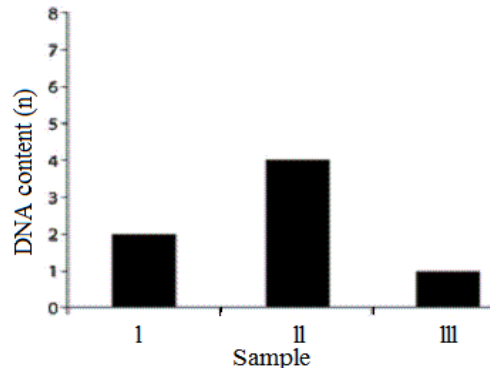
- a. I
- b. II
- c. IV
- d. V

25. Which drawing in #24 demonstrates that a crossing over is occurring?

- a. II
- b. III
- c. IV
- d. VI

26. DNA was isolated from three different cells types of an organism; a zygote, a cell in G2 of the cell cycle, and a cell arrested in G0. The relative DNA content for each cell type was determined and plotted on the graph below. Which sample might represent an animal cell in the G2 phase of the cell cycle?

- a. I
- b. II
- c. III
- d. none of the samples



27. In *Drosophila*, the bar mutant is characterized by eyes that are restricted to a narrow, vertical bar. When a bar female is mated to a wild type male, all the F1 flies are bar. However, when a bar male is mated to wild type female, 857 bar females and 905 wild type males are observed. What is the mode of inheritance of the bar mutant?

- a. dominant
- b. incomplete dominance
- c. dominant X-linked
- d. not enough data

28. Proteins can be separated based on size and/or charge using electrophoresis through a gel matrix. Migration distance through the gel serves as a phenotypic marker that could help determine an individual's genotype, as with normal hemoglobin molecules HbA and sickle cell HbS hemoglobin molecules. When these molecules are run in a gel, they migrate at different rates. Gel electrophoresis is used to screen individuals for the HbS allele. Below is a run of four couples screening. Which couple(s) is/are at risk of having a 1/4 risk of an affected child?

Protein	Couple 1		Couple 2		Couple 3		Couple 4		migration
HbS	—		—	—			—	—	↓
HbA	—	—	—	—	—	—		—	

- a. couple 2
- b. couple 3
- c. couple 1 & 3
- d. couple 2 & 4

29. The blue sclera allele has 90% penetrance for producing blue sclera, 60% penetrance for fragile bones and 40% percent penetrance for deafness. If these probabilities of penetrance are independent, what percent of individuals with blue sclera allele will have deafness, blue sclera and fragile bones?

- a. 90
- b. 54
- c. 35
- d. 22

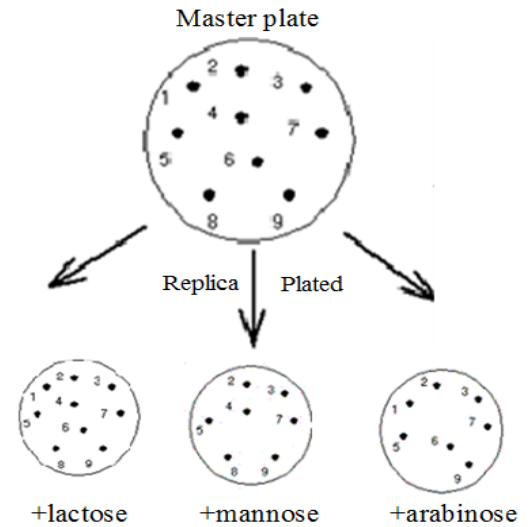
30. In tomatoes, tall plant is dominant to short plant, and smooth fruit is dominant to hairy fruits. A plant that is homozygous for both traits is crossed with a plant that is homozygous for both recessive traits. The F1 progeny are tested and crossed with the data shown below. What do the results indicate?

78 tall plants with smooth fruit	82 short plants with hairy fruit
22 tall plants with hairy fruit	18 short plants with smooth fruit

- a. Genes are located on different chromosomes
- b. Genes are linked, but do not cross over
- c. Genes are linked and show 20% recombination
- d. Genes are linked and show 40% recombination

31. The plates shown below contain different sugars as carbon sources in which bacteria can grow. Cells were first plated in the minimal media with glucose as a carbon source (master plate) and then replica plated onto plates with lactose, mannose or arabinose. Which colony(s) has the genotype lac^+ , man^+ , ara^- ?

- a. 1
- b. 9
- c. 4 & 8
- d. 5 & 6



32. Suppose that a certain enzyme is synthesized whenever the solution in which the cells are growing lack substance X. When substance X is present, the enzyme is produced only under specific environmental conditions. What type of gene regulation is this phenomenon?

- a. inducible
- b. repressible
- c. positive
- d. negative

33. Which of the following would be an example of an epigenetic change?

- a. A mutation of adenine to guanine
- b. Methylation of a cytosine
- c. Hydrogen bonding between nucleotides
- d. The binding of a transcription factor to a sequence of DNA

34. Suppose that a certain mRNA is transcribed at normal rate in the nucleus, but it is found at very low levels in the cytoplasm. Which of the following would be the possible cause?

- a. A defect in the promoter
- b. Overactive repressor in the operon
- c. A defective spliceosome
- d. A defect in poly A tail on pre-mRNA

35. Which DNA sequences forms a palindromic sequence?

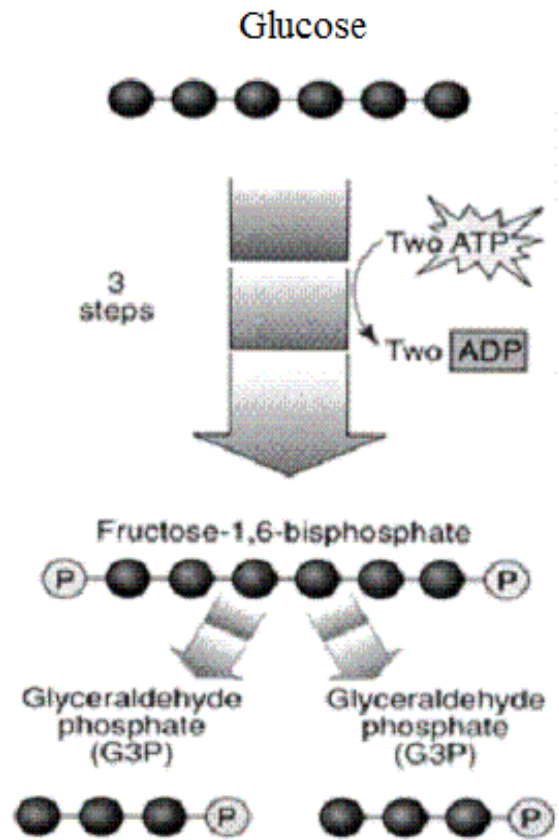
- a. GTCCCG
- b. GTACGC
- c. TACT
- d. ACGT

36. When a mouse cell and a human cell are fused, what allows the membrane proteins of the two cells to become uniformly distributed over the surface of the hybrid cell?

- a. all proteins in the membrane are peripheral
- b. all proteins are anchored within the membrane
- c. membrane proteins are the same chemical composition and asymmetrically distributed
- d. many proteins can move around within the layers

37. Where would you expect to find the following chemical process below?

- a. Glycolysis
- b. Krebs's Cycle
- c. Calvin cycle
- d. Fermentation

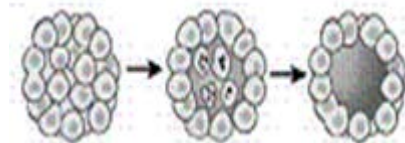


38. When you remove your sunglasses, your eyes need to adapt to light, choose the correct sequence of the following events leading to the sensory processing of a stimulus?

1. Transmission – the conduction of sensory impulse to CNS
 2. Transduction- the detection of energy by a sensory receptor
 3. Integration – the processing by receptors within the CNS
 4. Amplification – the strengthening of action potential in the sensory pathway to the brain.
- a. 1-2-3-4 b. 2-4-1-3 c. 4-3-2-1 d. 2-3-4-1

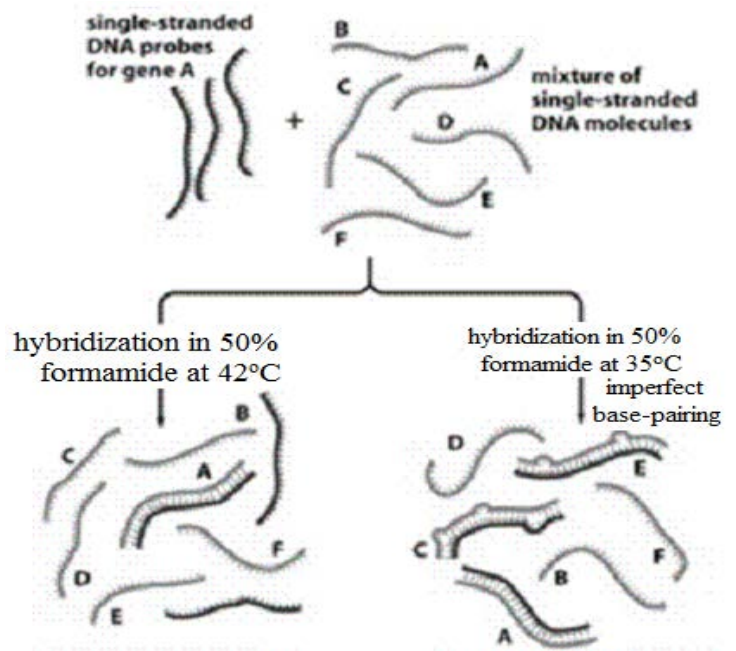
39. The formation of body cavities from the morula involves a homeostatic regulation of the cell number where by cells in excess are deleted. What is the signal process is involved?

- a. apoptosis
- b. induction
- c. transduction
- d. Amplification



40. Below is a flow chart that demonstrates methods to probe for gene A in a mixture of single-stranded DNA molecules from a bacteria clone containing a target gene. Which hybridization process in 50% formamide is the best temperature for identifying the successful recombinant DNA for commercial use?

- a. at 42 °C - strand A
- b. at 42 °C - strands B
- c. at 35 °C - strand A
- d. at 35 °C - strands A, C and E



41. Analyze the criminal case electrophoresis results shown below. What can be concluded about this run?



- a. It is the boyfriend's sample
- b. It is suspect one's sample.
- c. It is suspect two's sample
- d. A conclusion cannot be made.

42. Gene therapy is used to correct genetic deficiencies in humans; the cloned normal gene is targeted only to the tissues giving rise to the major symptoms. For instance about 50% of the cases of severe combined immunodeficiency (SCID) are caused by mutations in the gene for a subunit common to several interleukin receptors. If a SCID patient were to be treated by gene therapy, which type of cells should be targeted as host cells?

- a. Germ cells
- b. Epithelial cells
- c. Hematopoietic marrow cells
- d. Embryonic stem cells

Use the diagram below #43, 44, 45, and 46.

43. What nucleic acid structural level does b best represented?

- a. primary
- b. secondary
- c. tertiary
- d. quaternary

44. Where would a codon attach?

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

45. What region will cause a change in the overall shape of the molecule?

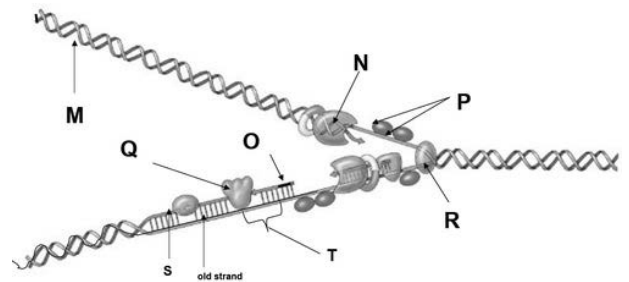
- a. 1
- b. 2
- c. 3
- d. 4

46. Where does the amino acid bind?

- a. 1-4 end on structure b
- b. 2 darken area
- c. 3' -5' end
- d. at 3 only

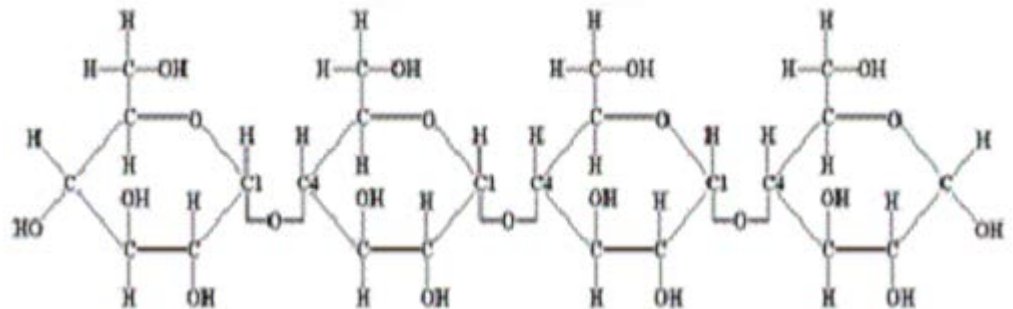
47. Examine the diagram below of DNA replication. Which corresponding letters represent the order of enzymes involved in replication: gyrase, DNA polymerase III, DNA polymerase I and ligase?

- a. PNQM
- b. RNSQ
- c. SQPN
- d. TRNM



48. How many water molecules would be formed by the hydrolysis of this tetrose?

- a. one
- b. two
- c. three
- d. four



49. When light strikes chlorophyll molecules they lose electrons. What occurs next?

- a. glucose is produced
- b. carbon is fixed
- c. makes ATP
- d. splits water

50. Photosynthesis has a positive ΔG equal to 686 kilocalories. What does the positive ΔG indicate?

- a. exergonic
- b. endergonic
- c. at equilibrium
- d. cannot occur at any temperature.

NEW JERSEY SCIENCE LEAGUE

Biology II Ans Key Date: Feb 9, 2017 White Paper Test Corrections: None

1	D	11.	A	21.	D	31.	C	41.	B
2	C	12.	D	22.	A	32.	B	42.	C
3	D	13.	B	23.	D	33.	B	43.	C
4	C	14.	D	24.	A	34.	D	44.	B
5	C	15.	B	25.	C	35.	D	45.	C
6	B	16.	C	26.	B	36.	D	46.	C
7	D	17.	C	27.	C	37.	A	47.	B
8	D	18.	A	28.	A	38.	B	48.	C
9	D	19.	C	29.	D	39.	A	49.	D
10	C	20.	A	30.	C	40.	A	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 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 NonMendelian 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, Evidence 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 2017 Season

Thursday January 12, 2017 Thursday February 9, 2017

Thursday March 9, 2017 Thursday April 13, 2017

All areas and schools must complete the April exam and mail in the results by April 28th, 2017

New Jersey Science League

PO Box 65 Stewartsville, NJ 08886-0065

phone # 908-213-8923 fax # 908-213-9391 email: newjssl@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 2018 Season

Thursday January 11, 2018 Thursday February 8, 2018

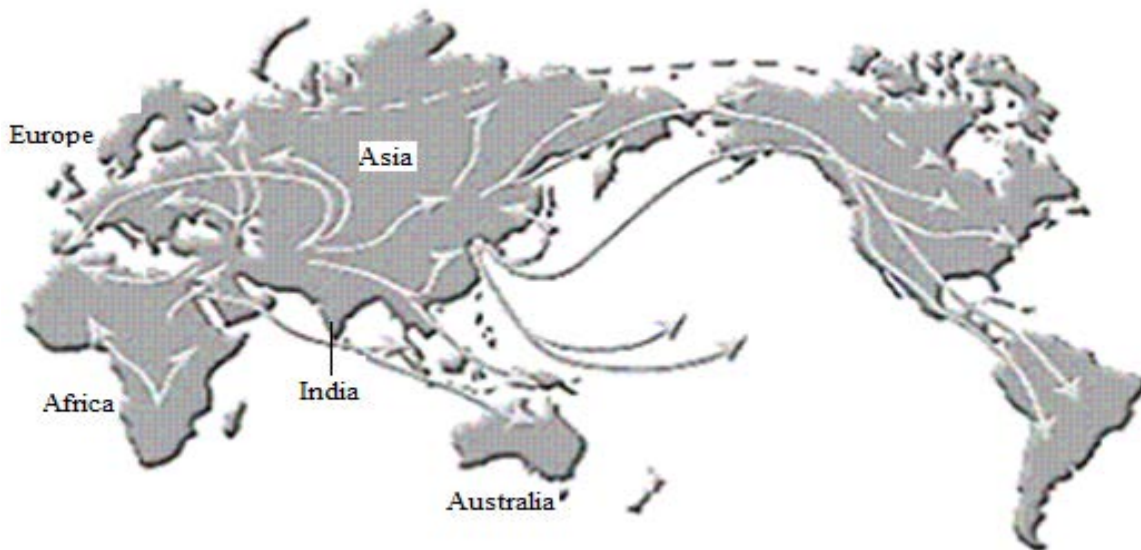
Thursday March 8, 2018 Thursday April 12, 2018

New Jersey Science League – Biology II Exam
March 9, 2017 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. Which of the following statements best supports the claim that organisms are linked by lines of descent from a common ancestor?
 - a. All organisms have the capacity to grow and interbreed with other organisms.
 - b. All organisms utilize oxygen for energy and have a mitochondria found in free-living prokaryotes.
 - c. All organisms share a genetic code that allows one organism to express a gene different from another organism.
 - d. Different species have specific traits and adaptations to allow survival in their environment.
2. The greyhound dog was originally used to hunt the fastest of game, such as, fox and deer. Early Egyptians breeders would only breed the dogs with the fastest speed for many generations. Gradually the greyhounds were running up to 64 km/h and still do today. What type of artificial selection does this best exemplify?
 - a. disruptive
 - b. directional
 - c. stabilizing
 - d. punctuated
3. Mitochondrial DNA (mtDNA) is passed down directly from mother to child and changes in the DNA accumulate slowly compared to other types of DNA. The unique characteristics of mtDNA provide clues about evolutionary history. Analysis of mtDNA from people around the world has revealed many clues about ancient migration patterns as shown below on the map. From where did humans originate?

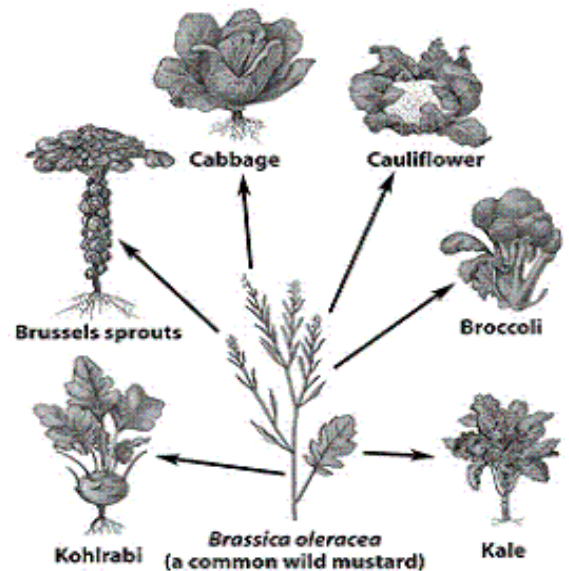


- a. Africa
 - b. Asia
 - c. Europe
 - d. India
4. Which of the following organisms would be considered to be most fit?
 - a. A young female bear with 5 baby cubs and three of her cubs are competing to mate with her.
 - b. An old male bear who has two offspring, each having two offspring
 - c. An adolescent female bear that has 3 mature males competing to mate with her.
 - d. A young male bear with 3 offspring that just killed another bear.

5. A specific gene contains of 2285 base pairs and codes for a protein that is 660 amino acids is length. Researchers found this protein in both the protozoan, *Amoeba proteus* and a canine known as the bloodhound, but it is not found in the dalmatian. How would an evolutionary biologist explain these findings?
- The gene is clearly conserved, so the data for the dalmatian must be an error.
 - The gene was on possessed only by the bloodhound, but was later acquired by the Amoeba through transformation.
 - The amoeba was a swallowed by a bloodhound and passed the gene to its offspring
 - The gene is conserved but has recently been lost in the Dalmatian
6. Insects first evolved 479 million years ago, while flying insects evolved 409 million years ago. Birds evolved from dinosaurs around 160 million years ago. Both organisms' recent ancestors did not have wings, and must have developed independently from each other and have a different morphology. Genetic analysis confirms their independent development of wings. What can you conclude about the functional similarity of wings in insects and birds?
- Convergent evolution produces analogous structures
 - Divergent evolution produces homologous structures
 - Wings can only develop from one recent ancestor
 - Wing are a direct result of adaptive radiation
7. A biology student used a computer program to simulate a large population of insects. The program specifies that no mutations occur, there is no natural selection or gene flow and mating is random. After several generations, what will happen to the population?
- The population will have evolved, but not yet formed new species.
 - The population will become smaller due to lack of genetic variation.
 - The population will get larger since there are no selective pressures.
 - The original population will be replaced by later generations and will have nearly the same gene frequencies
8. In a similar experiment, the medium in which the bacteria were grown contained both glucose and citrate. Normally, bacteria cannot use citrate for energy. After over 30,000 generations, one population increased dramatically in density, because a mutation enabled it to use citrate. Millions of mutations had occurred in the previous populations. Which of the following statements is a logical hypothesis based on these observations?
- Mutations are always beneficial for bacterial populations.
 - Natural selection limits the rate of the mutational process.
 - Several mutations are necessary to create a new, useful allele.
 - The evolution of new adaptive trait may rely on rare combinations or sequences of mutational events.
9. What has occurred if two populations of a species of ants were separated by a river, and eventually diverge into separate species?
- allopatric speciation
 - directional selection
 - natural selection
 - sympatric selection

10. Fragments of a meteorite that fell to Earth approximately one hundred million years after the Earth formed, were found to contain more than 80 amino acids. Which statements prove that the meteorite is not contaminated from organisms that exist on earth?
- Portions of amino acids found in the meteorite were similar to those produced in the Miller-Urey experiment, which demonstrates organic molecules can be synthesized from inorganic precursors.
 - The amino acids were present in equal amounts of D and L isomers of amino acids, but Earth's organisms can only make and use L isomers.
 - Only 20 amino acids make up proteins in organisms.
 - Molecules exposed to extreme temperatures undergo chemical changes
11. Rather than using antibiotics to eliminate pathogenic bacteria, instead Russian scientist discovered and is now using bacteriophages, which is a cheaper method. How is it that bacteriophages can be used to eliminate pathogenic bacteria from human wounds without causing similar destruction in the human tissues?
- Some bacteriophages can infect human cells, but do not damage the tissue.
 - All bacteriophages can infect human cells, but do not damage the tissue.
 - Bacteriophages are incapable of attaching to the cell's surface, because human cells lack the appropriate receptors.
 - Bacteriophages are capable of attaching to and entering human cells, but the capsids are never assembled correctly for release.
12. Which vegetable is most likely to be produced from wild mustard, *Brassica oleracea*, by continued artificial selection for stems and flowers?

- Brussels sprouts
- Kohlrabi
- Broccoli
- Cabbage

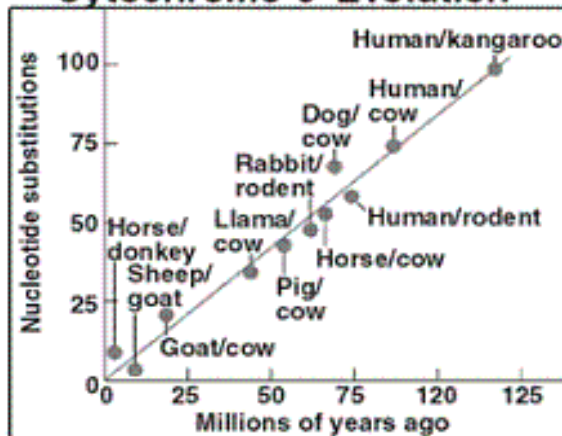


13. In an observed population of tree swallows, 40 individuals showed the dominant trait of smaller gonads in nonbreeding season, adapting them for long flights, while 10 individuals lacked this trait. What is the frequency of the allele in changing gonad size? **C is correct not D.**
- 0.36
 - 0.40
 - 0.54
 - 0.80
14. How does gametic isolation prevent the reproduction between two species?
- The offspring become infertile in the first generation cross.
 - Males and female of the different species refuse to interact.
 - Males of one species mate in spring while the females prefer to mate in the fall.
 - The sperm of one species cannot chemically interact with eggs of another species.

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

16. When the time since each pair of organisms presumably diverged is plotted against the number of nucleotide differences, what does the resultant straight line suggest about the cytochrome c gene?

Cytochrome c Evolution



- It has changed little over time.
- The cytochrome c gene is evolving at a constant rate.
- It changes at an accelerating pace.
- The number of nucleotide sequences in this gene continues to increase.

17. Which of the following best describes natural selection?
- Chance of variations in traits
 - The differential survival and reproduction of individuals
 - The immutability of species
 - The process that leads individuals to resemble their parents

18. Several populations of copepods are sampled for variations at the G locus. After examining the data below, which of these populations shows a heterozygote deficiency?

Population	GG	Gg	gg
A	30%	60%	10%
B	62%	36%	2%
C	35%	30%	35%

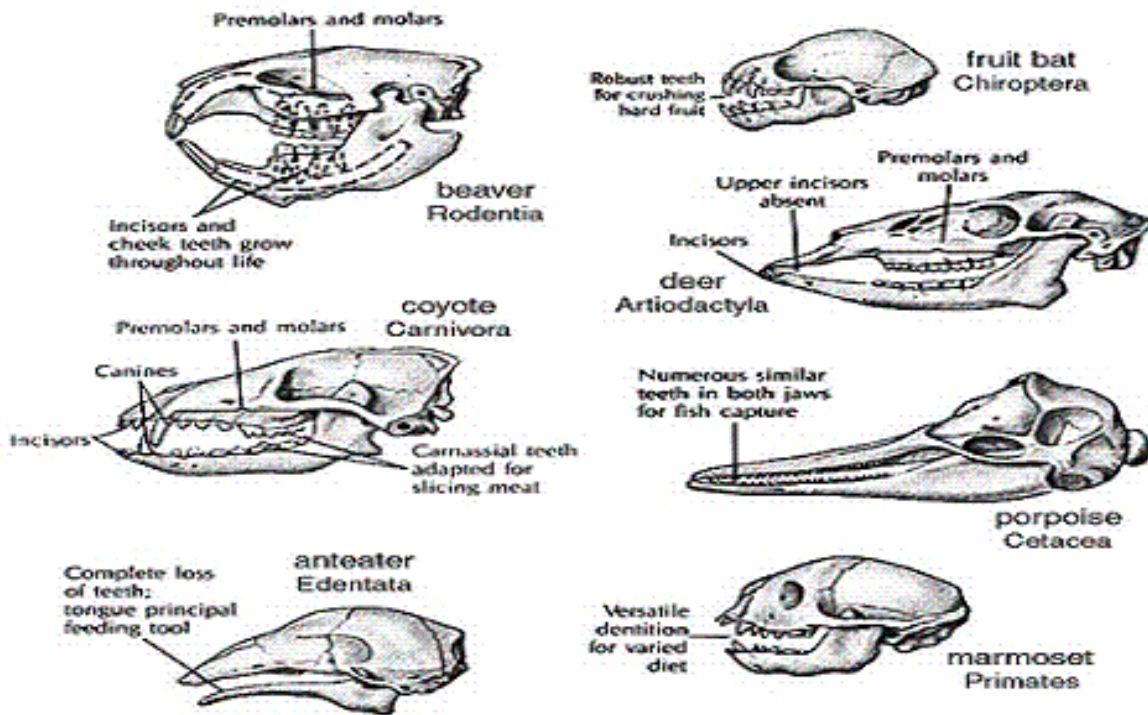
- A
- B
- C
- None of these

19. Which of the following is a plausible explanation for the typically slow rates of evolution over the long term?
- Mutation rates are high.
 - Most populations have no genetic variation.
 - Natural selection is typically stabilizing.
 - Genetic drift counters the effects of selection, particularly in large populations.

20. The sizes of horns in males of a particular beetle have a distribution with the highest frequencies are around 15 millimeters and 30 millimeters and very few in between. Based on these observations, which of the following modes of selection is operating on these beetle horns?
- stabilizing selection
 - directional selection
 - disruptive selection
 - natural selection

21. DNA sequences taken from various snail species have shown that the rates of nonsynonymous substitutions and synonymous substitutions are roughly the same. What can be inferred from this pattern?
- Most amino acid changes are neutral.
 - Strong directional selection is acting on this gene.
 - Strong stabilizing selection is acting on this gene.
 - Transversions are more common than transitions of the genes.
22. Which of the following conditions would be most conducive to the evolution of sexual reproduction and recombination?
- Large population size
 - Steady temperatures
 - The elimination of natural pathogens
 - A rapidly changing stressful environment
23. Which of the following would lead to the conclusion that sea squirts are more closely related to vertebrates than scientist had previously thought?
- Data from a CT scan
 - Discovery of behavior similarities of both
 - Findings that larvae have notochords
 - Choices a and b only
24. Suppose that mice and humans differ by 20 substitutions in their globin genes, and rats and mice differ by 5 substitutions. Other evidence indicates that the ancestor to mice and humans lived 80 million years ago. Assuming the molecular clock is operating, how many millions of years ago did rats and mice split from each other?
- 5
 - 10
 - 20
 - 80
25. According to the *morphological species concept*, organisms are classified in the same species if they appear identical by anatomical criteria. Which of the following observations of a new species would pose the greatest challenge of this method of classifying species?
- Lack of sexual reproduction in a population
 - Populations separated by geographic barriers
 - Populations that cannot be bred in the lab
 - Sexual dimorphism

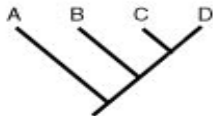
26. In the diagram below, how did the various mammals become so varied?



- long jaws evolved to compete with other males to win more mates
 - specialized teeth evolved to manage specific diets for specialized niches within their environment allowing species survival
 - with Hox genes increased the size of their jaw to scare other animals from eating their offspring
 - mental capacity increased and evolve to manage living in their new environment
27. Which of following is the most likely sequence of events in allopatric speciation?
 1. genetic divergence 2. geographic barrier 3. reproductive isolation
- 1, 2, 3
 - 2, 3, 1
 - 3, 1, 2
 - 3, 2, 1
28. Despite overlapping ranges, the western spotted skunk and the eastern skunk do not interbreed, because the western species breeds in the fall and the eastern species breed in late winter. What type of isolation has occurred?
- postzygotic
 - chemical
 - mechanical
 - temporal
29. Which group of prokaryotes was responsible for converting Earth's early atmosphere from anaerobic to aerobic?
- Actinobacteria
 - Cyanobacteria
 - Halophiles
 - Spirochetes
30. How did photosynthetic euglenoids obtain their chloroplasts, that are surrounded by three membranes?
- primary endosymbiosis
 - secondary endosymbiosis retaining the chloroplast from green alga.
 - secondary endosymbiosis retaining the chloroplast from an amoeba
 - secondary endosymbiosis retaining the chloroplast in the lysosome of the cell.

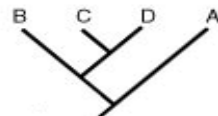
31. Two different species of ciliate are placed in a solution with an unknown solute concentration. Ciliate A has a contractile vacuole that expels water at a rate of 5 times per minute; Ciliate B expels water 12 times per minute. Which is a reasonable conclusion based on these observations?
- Ciliate A has a greater internal solute concentration than Ciliate B
 - Ciliate B has a greater internal solute concentration than Ciliate A
 - The solution has a greater solute concentration than Ciliate A
 - The solution has a greater solute concentration than Ciliate B
32. Nonvascular plants have never evolved as large as vascular plants. What do they lack?
- a photosynthetic mechanism
 - an efficient mode of respiration
 - a mechanism for nutrient absorption
 - an efficient system for conducting water and minerals
33. Many bacteria obtain resistance to an antibiotic, ampicillin, by carrying a plasmid that contains a gene that confers resistance to the ampicillin. The plasmid is passed on to other bacteria through conjugation and can be passed to their offspring during binary fission. If bacteria already resistant to ampicillin were not exposed to ampicillin, predict which of following would be the effect over several generations?
- The plasmid containing the gene for ampicillin resistance would eventually disappear from the population.
 - The transmission of the plasmid conferring ampicillin resistance would decrease but would not disappear from the population.
 - Transmission of the plasmid containing the ampicillin resistance would increase as those bacteria as those without the plasmid would die.
 - The gene for ampicillin would eventually mutate to confer resistance to a new antibiotic.
34. In an experiment, young male chicks of one species are exposed only to songs of a different species. As adults when exposed to their own species or other birds, they do not sing any songs. Which hypotheses best explains this observation?
- Birds can sing only songs of their own species.
 - Birds are unable to learn songs of another species
 - Bird learn to sing the specific song of their species during a critical developmental stage
 - Birds cannot learn to sing songs unless it is practiced.
35. Which of the following pairs of organisms are most closely related?
- Canis lupus* and *Canis latrans*
 - Canis latrans* and *Lutra lutra*
 - Lutra lutra* and *Canis lupus*
 - Mustela lutra* and *Lutra lutra*
36. Which of the following best explains the role of variation in natural selection?
- Variation is not necessary for evolution but increases the speed at which evolution occurs.
 - Variation impedes natural selection but is an inevitable consequence of sexual reproduction.
 - Variation results in new species regardless of the selective pressures present.
 - Environmental pressures applied to populations of genetically different individuals may result in divergent evolution.
37. What are evolutionary innovations which are used to classify organisms and create a cladogram?
- mutations
 - environmental habitat
 - morphological similarities
 - adaptive radiation

38. Of the cladograms shown below, which one shows a different evolutionary history from the others?



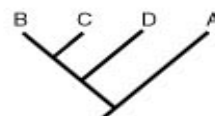
A.

a. A.



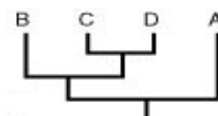
B.

b. B.



C.

c. C.



D.

d. D.

39. Where is the energy of organic molecules stored that can be used by a cell?

- a. within the atomic nucleus only
- b. within proton-electron interactions
- c. within hydrophobic interactions
- d. within carbohydrates and lipids

40. A gram of glucose contains about 8 kcal of energy, but when completely drained of energy by a cell yields only about 4 kcal of energy for the cell's use. Why is there such a difference?

- a. 4 kcal difference is passed to the next higher trophic level
- b. A total of 4 kcal is harvested before glucose reaches the cell for use.
- c. The 4 kcal is lost in the form of metabolic heat.
- d. Some of the missing energy is captured by forming bonds found in long fatty acid chains

41. Each fall, arctic hares molt their dark-colored fur and replace it with white fur. The process is reversed in the spring, when the darker color returns. Moving the animals to a climate where there is no snow and is warmer does not prevent the color change. What conclusion can be drawn from these observations?

- a. The color change is triggered by the white background.
- b. The color change is precipitated by changes in temperature.
- c. The changes are controlled by genetic factors.
- d. The changes are triggered by photoperiod reduction in the change of seasons.

42. If a compound that prevented DNA binding by to any repressors happened to enter the cell, what would be the results?

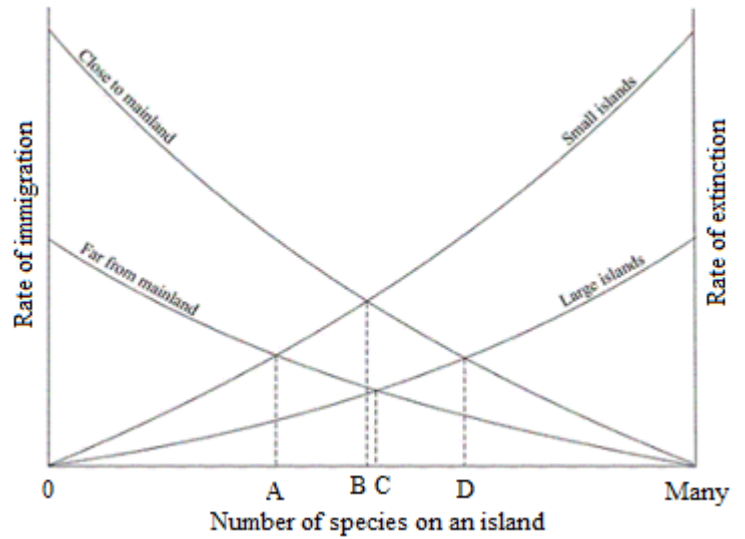
- a. The cell would die.
- b. The cell would grow uncontrollably
- c. The cell would divide uncontrollably
- d. The cell would secrete substances uncontrollably

43. Occasionally, 'living fossils' such as the coelacanth are found. These organisms appear to be little changed from their ancestors preserved in rock strata many millions of years ago. Such organisms often occur in ocean deep and in soil and desert environments that change less over time. What does this indicate about evolution?

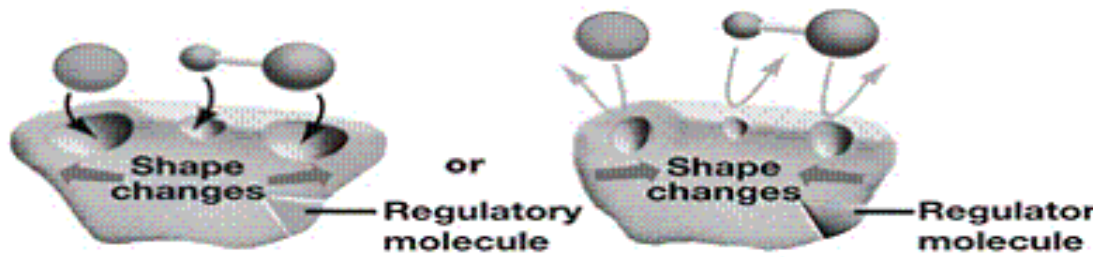
- a. Although gene mutations are common, there may be little selection among individuals already well adapted to a uniform environment.
- b. By chance these organism's mutations are all in alleles that do not affect morphology
- c. The Hardy-Weinberg equilibrium prevents organisms from evolving very fast
- d. This organism has extensive inbreeding.

44 Analyze the graph below on Island Biogeography theory. Where would the most species diversity be located?

- a. small island, far from the mainland
- b. small island, close to mainland
- c. large island, far from mainland
- d. large island, close to mainland



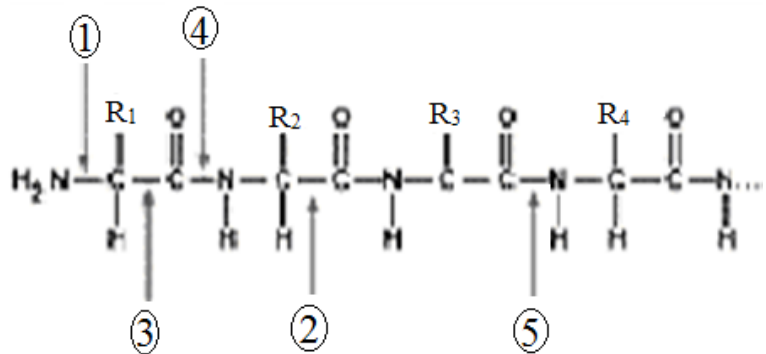
45. Which kind of enzymatic interaction is shown below?



- a. Feedback inhibition
- b. Competitive inhibition
- c. Noncompetitive inhibition
- d. Allosteric regulation

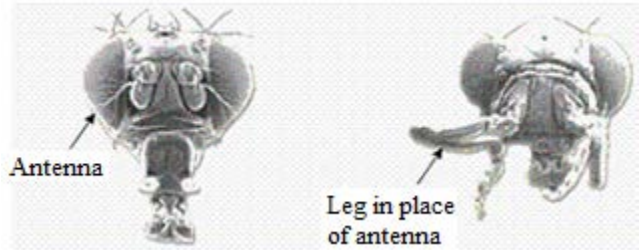
46. Where is the peptide bond(s) located in the molecule below?

- a. 1 only
- b. 1 and 2
- c. 2 and 3
- d. 4 and 5



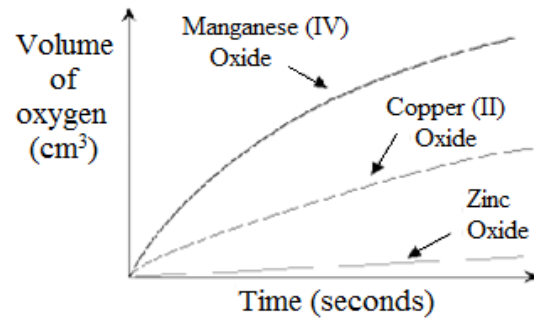
47. Ed Lewis at Caltech, discovered many transformations were caused by homeotic transformations using Hox genes, as shown below of antennapedia. What general principle did his work on these transformations confirm?

- a. Eyes can grow legs that will function.
- b. Every cell of an organism carries, within its DNA all of the information necessary to build the entire organism.
- c. Flies can use legs to see; therefore other structures can get multiple functions.
- d. Legs can be transplanted into an eye socket.



48. Below is a graph that demonstrates the use of different catalysts to decompose hydrogen peroxide into water and oxygen. Which catalyst is most effective?

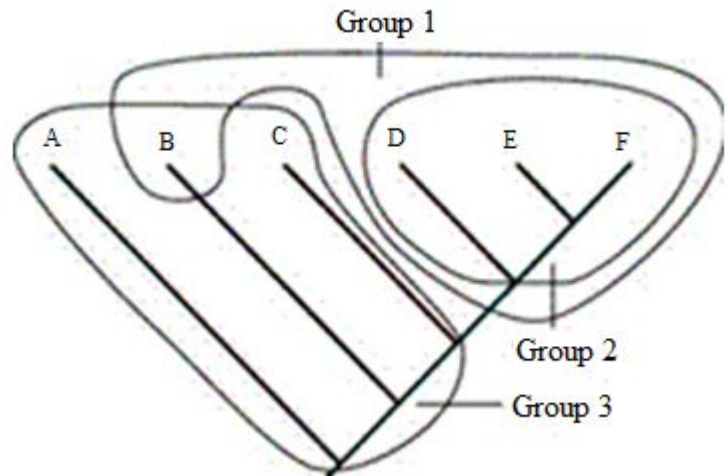
- a. Copper II oxide
- b. Manganese IV oxide
- c. Zinc Oxide
- d. All are equally effective



49. Three taxonomic groups are circled on the cladogram below. Which group is paraphyletic?

Correct answer is letter C not B.

- a. Group 1
- b. Group 2
- c. Group 3
- d. None of these



50. In the diagram in question 49, which group represents a polyphyletic taxonomic group?

- a. Group 1
- b. Group 2
- c. Group 3
- d. None are shown

NEW JERSEY SCIENCE LEAGUE

Biology II Ans Key Date: March 9, 2017 White Paper Test

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

BIOLOGY II 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 NonMendelian 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 2017 Season

Thursday March 9, 2017 Thursday April 13, 2017

All areas and schools must complete the April exam and mail in the results by April 28th, 2017

New Jersey Science League

PO Box 65 Stewartsville, NJ 08886-0065

phone # 908-213-8923 fax # 908-213-9391 email: newjssl@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 2018 Season

Thursday January 11, 2018 Thursday February 8, 2018

Thursday March 8, 2018 Thursday April 12, 2018

New Jersey Science League – Biology II Exam **Corrections**
April, 2017 White TEST

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. Terrestrial vascular plants have special adaptations that allow them to conserve water but still allow gas exchange. Which structure and its response allows this to occur?
 - a. The Casparian strip in the root controls the influx of water into the plant cortex by channeling the water from between the cells into cells.
 - b. Seed's abscisic acid prevents the uptake of water prior to germination.
 - c. Apical meristems produce cells that increase in length prior to the formation of an impermeable cell wall.
 - d. Guard cells of the leaf respond to changes in turgor by opening and closing stomata.

2. If a test tube filled with the proper nutrients were inoculated with bacteria, what type of growth may occur?
 - a. Explosive growth
 - b. Exponential growth
 - c. Linear growth
 - d. Zero growth

3. In organisms, there are at least three enzymes, peroxidase, superoxide dismutase and catalase, which are highly reactive to oxygen radicals. How is it that oxygen, an extremely toxic gas, can cause severe damage to biological systems, yet most organisms need it for survival?
 - a. Aerobic organisms neutralize the effects of free oxygen.
 - b. Oxygen is completely consumed in the mitochondria and no residual oxygen remains to damage cells.
 - c. The lungs limit the amount of oxygen that can enter into the tissues and regulate cell damage.
 - d. Toxicity of any substance is reduced by the blood.

4. A box containing a population of caterpillars has remained stable for three days when provided a fixed amount of their preferred food. On day four the amount of food doubled from this point and the population counts were taken. Expectations were the population would increase to a new carrying capacity; however the size of the population did not increase. What is the best explanation for this?
 - a. Caterpillars are voracious eaters and require more than a doubling of the food supply.
 - b. The rate of population is limited by the mass of the organism, which is related to the mass of the food supplied.
 - c. Something other than food is limiting the population size.
 - d. Caterpillars just increase their size rather than their number.

5. Which of the following organisms can feed at more than one trophic level?
 - a. omnivores only
 - b. omnivores and decomposers only
 - c. secondary consumers only
 - d. producers, omnivores, decomposers

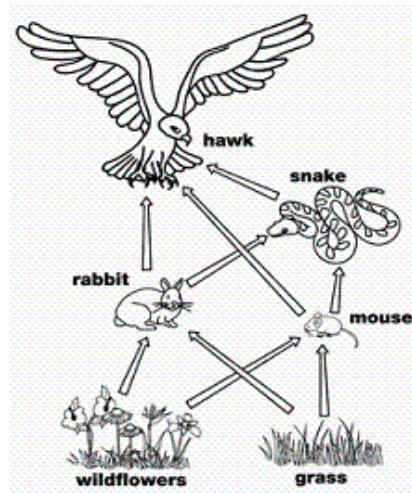
6. The Earth's largest nitrogen reservoir is in the atmosphere. How is this inorganic gas brought into the biological nitrogen cycle?
 - a. Through the same cycle in a plant that fixes carbon in the atmosphere.
 - b. Nitrogen is converted into nitrates by the roots of legumes.
 - c. Nitrogen is converted to ammonia by bacteria in the soil and roots of legumes
 - d. Denitrification is performed by various types of soil bacteria.

7. If birds that feed on insects are placed near a supply of both dark moths and yellow jackets, the moth rapidly disappear, while the population of yellow jackets remains unchanged. What kind of ecological mechanism does this suggest for the yellow jackets?
- a. camouflage
 - b. exploitive competition
 - c. protective mimicry
 - d. warning coloration
8. If nuthatches feed primarily upon insects found on the bark of trees and on pine nuts, then where would you expect these birds to make their nests?
- a. in pine forests
 - b. in tropical regions
 - c. in polar regions
 - d. adjacent to pine forests

9. Analyze the diagram of a food web below.

If we weighed all the organisms on each level of this food web, which would be the heaviest?

- a. grass and wildflowers
- b. grasshoppers and mice
- c. hawks and snakes
- d. all levels would weigh the same



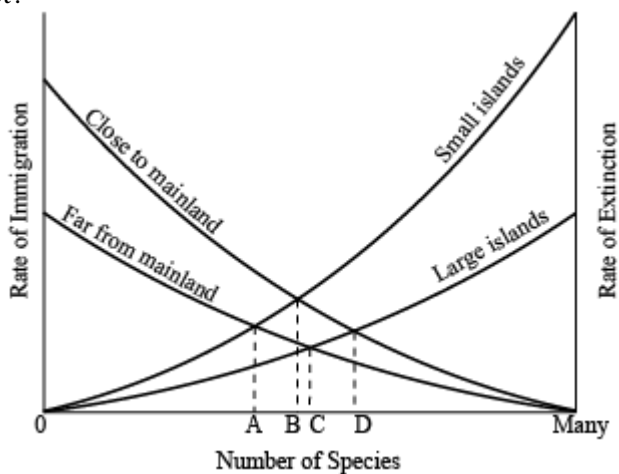
which

10. Which of the following correctly compares the energy requirements of a rat and snake of equal body mass living at room temperature?
- a. The rat requires more energy because it is an endotherm
 - b. The snake would require more energy because it is a carnivore.
 - c. The snake would require more energy because it lacks both fur and subcutaneous fat.
 - d. The snake and the rat have the same caloric energy requirement.
11. In comparison with the numbers of grasshoppers or deer, there are not a lot of mountain lions. Why are large and fierce animals rare in an ecosystem?
- a. Such animals do not tolerate other members like them
 - b. During evolution, most fierce animals have been killed off by others.
 - c. Food chains are only 10% to 20% efficient at each step; top carnivores are physically limited in how long they can roam for food.
 - d. Only a few such animals are permitted by succession in the biome.

12. Zoologist extracted the chemical that the Japanese beetle uses to attract a mate, and use it in a trap to reduce the beetle population. What substance are they using?
- hormone
 - pesticide
 - pheromone
 - enzyme
13. If two individuals each have an endocrine gland producing the same amount of hormone, and both have the same threshold response to levels of the hormone, but one individual weighs twice the other. What effect would this have of the speed of hormone action?
- The heavier individual would respond sooner and faster.
 - The heavier individual would respond later or slower.
 - The lighter individual would respond slowly.
 - Both would respond in the same time.
14. The same hormone has considerably different effects in different species. The hormone thyroxin in humans stimulates metabolism, but in frogs it induces metamorphosis tadpole to adult frog. What does this data indicate?
- The target tissues have evolved different responses.
 - The organisms have absolutely no evolutionary relationship.
 - Metamorphosis is caused by a change in body metabolism.
 - The origin of the hormone makes a difference in the hormone's effect on target tissues.
15. What is the water potential of a plant cell bathed in pure water until there is no net movement into or out of the cell?
Data: $\Psi_{\text{water}} = 0$ and $\Psi_{\text{s Cell}} = -1$ MPa
- 0
 - +1
 - 1
 - +2
16. *Vibrio fischeri* is a species of bioluminescent marine bacteria. When grown in liquid culture, the bacteria produce light only when they have a high population density. It has been observed that whenever bacteria from a luminescing culture seeded a new culture, they would produce a light at low population densities for a short time and then stop producing light until the colony grew a high density. These bacteria undergo quorum sensing by concentrations of secreted chemical concentrations in their local environment. Which is a reasonable mechanism for the changes in bioluminescence with bacteria density?
- Low-density bacteria cultures contain an inhibitor of bioluminescence whose concentration increases as their population grows.
 - Bacterial metabolism releases excited electrons that emit photons in solution that become increasing visible with increasing number of bacteria.
 - The bacteria carried bioluminescence particles with them during the transfer process to the new culture that are either diluted or inactivated by exposure to a new low-density population.
 - Light is produced only when bacteria make contact with other bacteria.
17. Sunlight that passes through the atmosphere is absorbed, and is reradiated back as longer wavelength heat waves becoming trapped by the atmospheric gases. What process does this cause?
- global warming
 - greenhouse effect
 - carbon cycle
 - energy cycle to drive life energy chains
18. In nature, salmon smell the unique odors of soil and trees along their home stream when young ones leave and return to mate. Salmon fish hatcheries add a harmless perfume, morpholine, to a stream when they release the young. When the fish mature, the hatchery biologist attracts them back to the home stream by using morpholine. What behavior is the hatchery biologist relying upon?
- insight learning
 - imprinting
 - thigmotropism
 - trial and error

19. Farmers sprayed leechi trees to suppress populations of scale insects. This also killed the population of predatory lacewings that controlled the numbers of scale insects. Quickly the spraying did not work and the damage to the leechi from the scales was greater than before the spraying had occurred. Why are there fewer predatory lacewings existing in the trees?
- Both insects are r-selected
 - Both insects are K-selected and resistant was a matter of chance
 - The predatory lacewings was r-selected and was more susceptible to the spray
 - The scale insects were r-selected and the high number of offspring included a resistant strain, while the predator was K-selected and will take longer to produce a resistant variety.

20. Analyze the graph below demonstrating E.O. Wilson's Island biogeography or spatial heterogeneity. What does he predict?

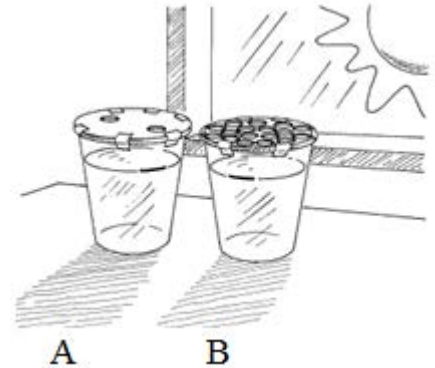


- Uniform environments are richer than patchy environments.
 - The equilibrium point is high for smaller island distant from the mainland.
 - Space is unlimited and community richness can increase indefinitely.
 - Equilibrium is reached when the rate of immigrations matches the rate of species extinction.
21. If North America grassland became a great deal warmer and drier over 100 years, what would probably happen in accord to punctuated equilibrium?
- The grassland organisms would gradually be replaced by migrating pineland organism.
 - The grassland organisms would gradually be replaced by other grassland organisms.
 - The grassland organisms would rapidly evolve into desert organisms.
 - Nothing would happen
22. If a seedling is placed in a light-proofed box and strongly illuminated from below the shoot will grow downward. What evidence does this observation provide?
- positive gravitropism is a stronger influence on shoot growth than positive phototropism
 - positive phototropism is a stronger influence on shoot growth than negative gravitropism
 - negative gravitropism is a stronger influence on shoot growth than positive phototropism
 - negative phototropism is a stronger influence on shoot growth than positive gravitropism

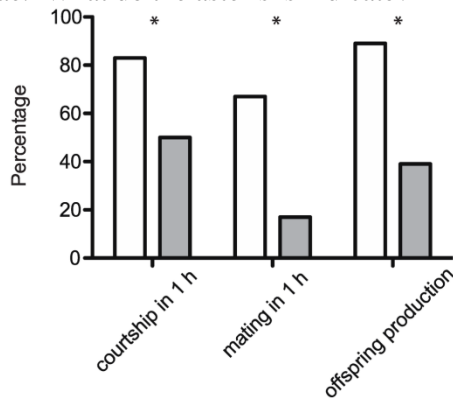
23. As sewage accumulates and overpopulated species populate a body of water, decomposers populations increase. The decomposers use up water's dissolved oxygen in breaking down organic wastes. What are the consequences of these occurrences?
- aerobic conditions increase
 - most of the fishes will die
 - minerals and nutrients decrease
 - waters clear up

24. In the diagram below, the experiment models the number of stomata found in a leaf. With time the water level in B decreases faster. Which cup would best represent plants found in a desert?

- A only
- B only
- Both A and B
- Neither A or B



25. Insect antenna has been found to have an olfactory function. In Sweden, Santosh Revidi found that in *Drosophila suzukii* 4 day old female's secretions of cyclic hexane play a role in sexual communication to mediate sexual behaviors in males. In further experiments, males were antennectomized (removal of antenna) and observed mating for one hour in the morning. Afterwards the mating couples and offspring were kept together for two weeks. Data results are found in the graph below. The lighter bars represent males with antennae and the darker bars represent males without antennae. What do the asterisks indicate?

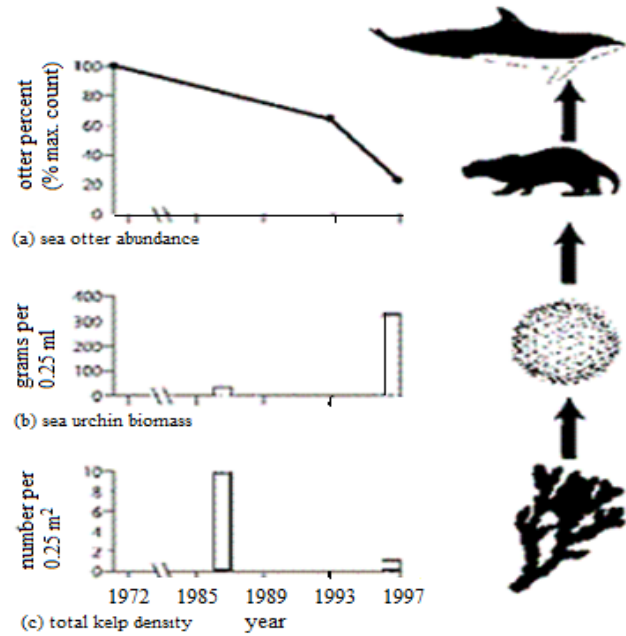


- decreased reproductive output from antennectomized males
 - increased successful mating occurs from antennectomized males than from males with antenna intact.
 - decrease in courtship and mating rates with reduced reproductive output from antennectomized males
 - the data proved that antenna did not act as a receptor in mating behavior.
26. A certain species of bacteria reproduces every half hour under suitable conditions. Starting with two bacteria, how long would it take to obtain a population of approximately 1000 individuals?
- 2.5 hours
 - 4.5 hours
 - 7.5 hours
 - 9.5 hours

27. When genes of poor adaptive value are linked to genes of high adaptive value, natural selection may not affect the gene frequencies. When would the gene frequency most likely change?
- When crossing over supply new combinations.
 - When DNA replicates to begin mitosis.
 - When nondisjunction of the chromosomes occurs.
 - When vegetative reproduction takes place.

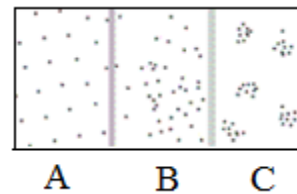
28. Examine the figure below of the data collected. Which organism is the keystone species?

- kelp
- sea urchin
- sea otters



29. Which diagram below demonstrates population distribution of herds of elephants on the African plains?

- A
- B
- C
- all of these



30. Which would be a disadvantage associated with a species living in a group?

- protection against predation
- locating resources due to communication
- increased breeding
- division of labor creating specialist in the group

31. Male and female hyenas possess two anal glands that open into the rectum. The hyena straddles long stalks of grass, as the stems pass underneath, the rectum is inverted and a strong smelling whitish substance is deposited on the stems in a circular pattern. The action is called pasting. What is the purpose of this behavior?
- for attracting a females
 - for marking territory
 - for scaring predators
 - for demonstrate dominance
32. Sea anemones contain venom that is used to sting and paralyze their prey. The clown fish contains an enzyme in their scales that makes them immune to the venom. This allows clownfish to live freely in the ocean along with sea anemone without being harmed. As described here, what type of relationship does this exemplify ?
- mutualism
 - commensalism
 - predator-prey
 - parasitic
33. If a species, such as the golden wing warbler is facing extinction. What probably would be the most significant effect upon its gain in numbers for future generations while living in their natural environment?
- eliminating its prey
 - rearing the birds in zoos
 - providing supplemental food
 - increasing its habitat
34. The process of fermentation takes place in the rumen and the reticulum. Fermentation is when microorganisms convert carbohydrates into volatile fatty acids and gases. This process allows the cow to convert cellulose fiber into energy. Of gases produced within the rumen during fermentation (500–1500 liters per day, 20–40% consist of methane and carbon dioxide. Production of fermentation gases represents a considerable energy loss. Certain fermentation modifiers, such as ionophores, improve energy efficiency of ruminants by reducing those gas energy losses. Which type of bacteria is commonly found within the rumen of cattle produce these fermentation gases?
- methanogens
 - extreme halophiles
 - facultative aerobes
 - extreme acidophiles
35. How do lichens obtain their energy?
- from parasitizing other plants
 - by decaying organic matter
 - through photosynthesis
 - from minerals in the soil
36. A rabbit use sugars from a plant to make energy for itself when it runs away from a hawk. Which of the following represents how energy is transformed in this pathway?
- chemical → kinetic → heat
 - heat → kinetic → chemical
 - light → chemical → mechanical
 - light → potential → mechanical
37. If a population of a particular species exists without controls, what type of graph would be displayed demonstrating growth?
- an arithmetic growth rate
 - an exponential growth curve
 - sigmoid growth pattern
 - cyclic growth pattern

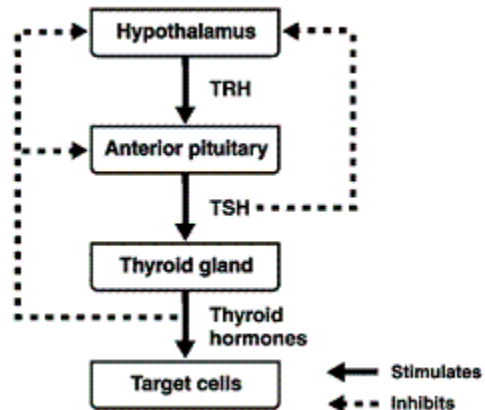
38. Erin Finan, a student of Dr Miller at Cornell University, ran an experiment to prevent the flopping of the flower stem of narcissus without affecting flower size or longevity. The diagram below demonstrates the experiment's results. On the left is an untreated plant growing in pebbles with water. On the right the plant in pebbles is grown with a low 5% isopropyl alcohol solution. This action caused water stress. What happens to the stem under water stress?



- a. water pressure is increased making the stem fatter
- b. less water pressure on the stem cells would result in less cell-stretching, so stems would be shorter
- c. demands of water increases water pressure resulting increase allowing cell-stretching in stems therefore, turgor becomes variable.
- d. alcohol is toxic in high concentrations to the flowers

39. In the flow chart below, what type of control is exerted by the thyroid hormone thyroxine, on TSH and TRH?

- a. positive feedback
- b. negative feedback
- c. temperature regulation
- d. reflex arc



40. Which of the following events is a density independent factor for bear populations?

- a. food
- b. disease
- c. forest fire
- d. shelter for hibernation

41. If global climate changes over a long time period, a region that is currently a subtropical desert, receives substantially more rainfall, what will this region most likely become next?

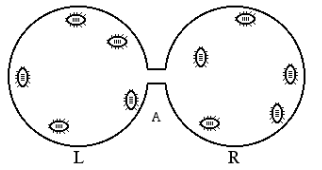
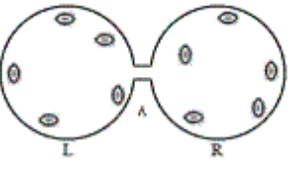
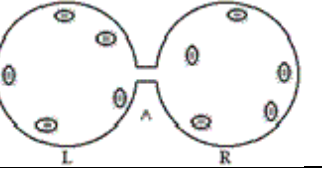
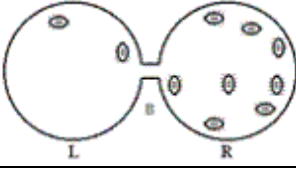
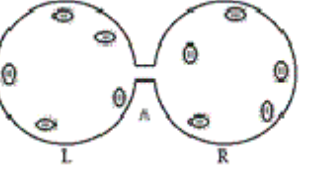
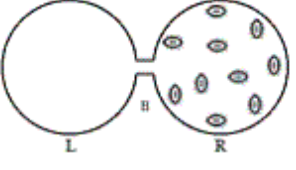
- a. rain forest
- b. boreal forest
- c. grassland
- d. savanna

42. In a microbial community the autotrophs generate 1000 calories per hour of GPP and 500 calories per hour of NPP. The primary consumers are able to convert 60 calories per hour into their own biomass. What is ecological efficiency in the link between the autotrophs and the primary consumers?

- a. 6%
- b. 10%
- c. 12%
- d. 16%

43. Which of the following processes result in the greatest number of functional daughter cells?
a. mitosis b. conjugation c. oogenesis d. spermatogenesis
44. A point mutation that results in a codon for an amino acid with a hydrophobic R group replacing a codon for an amino acid with a hydrophilic R group on the exterior of the translated protein. What will change?
a. DNA structure due to abnormal base pairing
b. mRNA structure due to abnormal bonds between nucleotides
c. molecular properties of the proteins due to abnormal interactions between the protein and other molecules
d. protein secondary structure due to abnormal interactions between R groups in the backbone of the molecule
45. At a certain locus of the human genome, 200 different alleles exist in the population. How many alleles would one individual have?
a. 1 c. 100
b. 2 d. 200
46. Scientist utilizes carpet beetles to reduce an animal carcass to bones. Unlike bacteria that decompose all soft tissues, the beetles leave the skeleton connected. What do beetles avoid consuming?
a. epiphyseal plate b. ligaments c. periosteum d. tendons
47. What is the probable biological and evolutionary function for a species of desert lizards to return to female-only reproduction?
a. This species is probably going extinct.
b. This is not unusual since most reptiles are asexual.
c. The desert is uniform, and variation is of little or no advantage and a waste of energy.
d. Such switching in mating behavior is easily accomplished by crossing over in chromosomes.
48. What keeps a nerve impulse from flowing backwards in a neuron? All full credit. Key has A.
a. The synapse receptors form a one-way gate.
b. The sodium ions can only move towards a synapse
c. The neurolemmocytes keep impulse flowing only in one direction.
d. The dendrites attract sodium ions towards their membrane receptor within the neuron
49. One hen is able to peck another hen on the farm without fear of being pecked back. What is being demonstrated?
a. stereotyped behavior c. territorial defense
b. social breakdown d. dominance hierarchy

50. A pillbug experiment set up with 3 parts shown below. All tests were run for 10 minutes. What the purpose of the entire experiment as shown with the results?

<p>Test 1</p> <p>Compared a wet paper on the left to a wet paper on the right.</p>		
<p>Test 2</p> <p>Compared dry paper on the left to wet paper on the right.</p>		
<p>Test 3</p> <p>Compared vinegar-soaked paper on the left to wet paper on the right.</p>		

- To determine which petri dish the pill bugs preferred; preferred the right dish
- To determine if pill bugs prefer water; preferred water
- To determine if pill bugs prefer wet surfaces; preferred wet surfaces
- To determine if pill bugs prefer acids (vinegar); did not prefer acid

NEW JERSEY SCIENCE LEAGUE **Corrections**

Biology II Ans Key Date: April Exam 2017 **White Paper Test**

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

BIOLOGY 11 For AP 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 NonMendelian 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 2017 Season

Thursday January 12, 2017 Thursday February 9, 2017

Thursday March 9, 2017 Thursday April 13, 2017

All areas and schools must complete the April exam and mail in the results by April 28th, 2017

New Jersey Science League

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phone # 908-213-8923 fax # 908-213-9391 email: newjssl@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 2018 Season

Thursday January 11, 2018 Thursday February 8, 2018
Thursday March 8, 2018 Thursday April 12, 2018