

## Biology I Feb 2006 Exam

Please **PRINT** your name, school, area, and which test you are taking on the scan-tron. This exam is not for AP level students. Choose the best answer to the following: Make sure all erasures are completely erased.

1. The branch of biology that names and groups organisms according to their characteristics and evolutionary history is
- a. morphology
  - b. taxonomy
  - c. phylogeny
  - d. embryology
  - e. genealogy

For 2-7, match the correct kingdom to each statement. The choices may be used once, more than once or not at all.

- a. Archeobacteria      b. Protista      c. Animalia      d. Eubacteria

2. prokaryotic, chemosynthetic, withstand the harshest of environments.
3. autotrophic and/or heterotrophic; unicellular or multicellular.
4. disease-causing prokaryotes.
5. eukaryotic, facultative autotroph/heterotroph.
6. eukaryotic, obligate heterotroph.
7. seaweeds.
8. Which of the following taxonomic categories refers only to plants?
- a. phyla
  - b. class
  - c. genus
  - d. division
  - e. family
9. A modern taxonomist would likely consider the following when classifying an organism:
- a. the fossil record, morphology, embryological development, and macromolecules
  - b. the fossil record, morphology, embryological development, and habitat
  - c. behavior, morphology, embryology and habitat
  - d. the fossil record, macromolecules, habitat, and embryological development.
  - e. ecological relationships, physiology and behavior
10. What would be an example of systematic taxonomy?
- a. Classifying organisms in a group according to their habitat.
  - b. Grouping organisms according to the binomial nomenclature used for each species.
  - c. Classifying organisms according to their morphology, embryology and fossil record.
  - d. None of these.
11. What is the most likely explanation for the reclassifying of the Kingdom Monera into Kingdoms Archeobacteria and Eubacteria (in an 8-kingdom system)?
- a. The Kingdom Monera had too many species in it and this made the kingdom unmanageable.
  - b. Taxonomists chose to regroup all bacteria by where they live.
  - c. Significant biochemical and morphological differences were discovered.
  - d. Archeobacteria are prokaryotic and Eubacteria are eukaryotic thus creating the need for two kingdoms.
  - e. The King of Monera died and left no heir to the throne.
12. Which is TRUE about the three-Domain system in classification?
- a. The three Domains are Archea, Bacteria and Eukarya.
  - b. rRNA studies show significant differences between two main groups of prokaryotes.
  - c. The Domain Eukarya contains ALL eukaryotic species.
  - d. The Eukarya uncludes unicellular species.
  - e. Statements a, b, c, and d are all true.
13. Bacterial cells typically lack
- a. a cell membrane
  - b. mitochondria
  - c. a cell wall
  - d. ribosomes
  - e. DNA

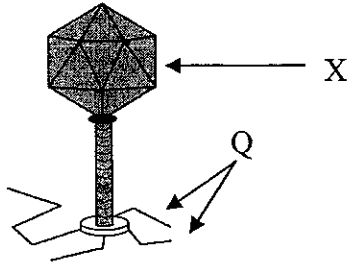
14. Which has the mode of bacterial motility incorrectly paired with a bacterial trait?
- pilus for crawling
  - flagellum for moving forward while turning and tumbling
  - slime layer for gliding
  - spiral shape for a corkscrew motion
15. Which does not apply to the actions of antibiotics?
- inhibiting cell wall synthesis
  - inhibiting conjugation
  - inhibiting protein synthesis
  - inhibiting DNA synthesis
  - inhibiting RNA synthesis
16. Gram-positive bacteria are different than Gram-negative bacteria in
- their response to Gram staining.
  - the composition of their cell walls.
  - their vulnerability to antibiotics.
  - their post-stain microscopic appearance
  - All of the above are differences.
17. Traditionally, what criteria are used to classify bacteria?
- shape
  - response to Gram stain
  - type of respiration
  - reproductive strategy
  - All of the above.

From the caves surrounding an inactive volcano, a scientist has collected samples of greenish water, of unknown mineral content, containing bacterial life. She takes the samples back to the lab for analysis. Match the following types of bacteria to its possible environmental location around the volcano. Use them as often as needed or not at all. Use with questions #18, 19, 20.

**a. chemoautotroph      b. photoautotroph      c. thermophile      d. halophile**

18. The sample of water taken nearest the surface would contain these bacteria.
19. The presence of these bacteria tells her that there must be an underwater vent of heat.
20. Some of the samples were confused after the collection took place but she knew that this type of bacteria would be found in the water sample closest to a large outcropping of rock salt.
21. Genetic recombination in bacteria always involves
- viruses
  - transfer of DNA through a conjugation bridge
  - transfer of one or more plasmids
  - transfer of genes between bacterial cells
  - sex
22. Which statement is TRUE concerning viruses and their classification?
- They are in the Kingdom Archeabacteria due to their primitive cellular structure.
  - They are in their own domain because they are not considered living.
  - Scientists have grouped them according to the type and number of their nucleic strands.
  - Scientists have classified them according to the living organisms that they attack.
  - They are classified according to the shape of the cell.

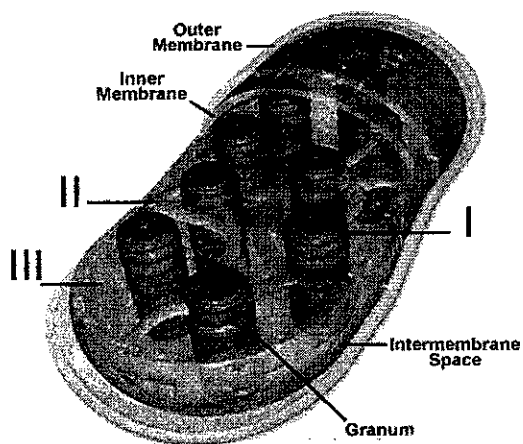
Use the diagram to answer the following questions.



23. The structure labeled X is called the \_\_\_\_\_ and forms an envelop for \_\_\_\_\_.
- capsid, nucleic acid
  - capsid, long chain fatty acids
  - capsid, protein
  - capsomere, transcriptase
  - lunar lander, astronauts
24. The structures labeled Q will
- attach to receptor sites on a host cell.
  - produce an enzyme that dissolves the cell membrane.
  - act as springs to catapult "X" into the air.
  - aid in capsid contraction.
  - clump together to form a flagellum.
25. The diagram represents a(n)
- adenovirus
  - bacteriophage
  - retrovirus
  - AIDS virus
  - recombinant capsid
26. Reverse transcriptase
- synthesizes RNA using DNA as a template.
  - synthesizes DNA using a protein as a template.
  - synthesizes DNA using RNA as a template.
  - All of the above.
27. A person who has AIDS is different than a person with HIV in that
- the person with AIDS has a virulent form of the virus.
  - the person with HIV has a virulent form of the virus.
  - in the person with AIDS the virus has entered the lysogenic cycle.
  - in the person with AIDS the virus is dormant within the host cells.
  - a person with HIV can't infect anyone else.
28. To a culture of Paramecia are added yeast cells stained with a red dye. A few minutes later the Paramecia are observed under the compound microscope and are seen to contain numerous food vacuoles filled with red yeast cells. How did the yeast cells get into the Paramecia's food vacuoles?
- By exocytosis.
  - By diffusion.
  - By endocytosis.
  - By osmosis.
  - By magic
29. In what process would microtubules and microfilaments NOT be used?
- cell division
  - cytoplasmic streaming
  - RNA synthesis
  - vesicle migration to the cell membrane
  - ciliary motion
30. Which type of cell would have the greatest concentration of mitochondria?
- skin
  - muscle
  - blood
  - brain
  - fat

31. Which statement correctly names two functions of the proteins embedded in the cell membrane?
- They transport substances across the membrane and aid in protein synthesis.
  - They store wastes and form the outer layer of the membrane.
  - They serve as attachment sites for external molecules and transport substances across the membrane.
  - They aid in cell movement and serve as attachment sites for molecules from other cells of the organism.
32. Which scientist did NOT contribute to the cell theory?
- Louis Pasteur
  - Matthias Schlieden
  - Theodore Schwann
  - Rudolph Virchow
  - answer b & c
33. Which cell type would most likely contain many lysosomes?
- red blood cell.
  - skin cell
  - phagocytic white blood cell.
  - onion root tip cell.
  - cork cell
34. Which statement is **incorrect** in describing the function of the structure?
- The nucleolus contains DNA and is involved with cell duplication.
  - The ER works with the ribosome to synthesize proteins.
  - Chloroplasts perform photosynthesis.
  - Plant cell vacuoles store water.
  - Pseudopods aid in phagocytosis.
35. Which is the most widely accepted description of Earth's earliest cells?
- They were prokaryotic and photosynthesized their food.
  - They were eukaryotic and colonial.
  - They were prokaryotic and chemoautotrophs.
  - They were eukaryotic and heterotrophic.
  - None of the above is correct.
36. Vegetables will stay crisp for a fairly long time when kept in the vegetable crisper of the refrigerator. Which of the following items below does **NOT** play a role in keeping the veggies crisp?
- turgor
  - osmosis
  - pinocytosis
  - membrane permeability
  - water

Use the diagram below to answer questions 37-38.



37. In the presence of sunlight the lumen of structure I
- will glow a vivid red.
  - will experience a sudden loss of hydrogen ions.
  - will produce beta carotene
  - will experience a drop in pH.
  - will collapse
38. Light dependent reactions occur in
- I, II and III
  - II only
  - I only
  - the intermembrane space
  - III only

39. Sunlight initiates the process of photosynthesis by striking the  
a. thylakoid membrane    b. lumen    c. stroma    d. cristae    e. none of these

Match statements 40-45 to the items below. The answers may be used as often as needed or not at all.

- a. Light reactions    b. Calvin cycle    c. C<sub>4</sub> pathway    d. None of these
40. Adaptation for CO<sub>2</sub> fixation under conditions of bright sunshine and high temperatures.
41. It is here that water is split into H<sup>+</sup> and O<sub>2</sub>.
42. Ribulose biphosphate binds to CO<sub>2</sub> during this process.
43. Adenosine diphosphate is phosphorylated into ATP during this process.
44. Takes place in the stromal lamellae of C<sub>3</sub> plants.
45. Glucose molecules are used up as energy sources.
46. The \_\_\_\_\_ is the site of glycolysis and \_\_\_\_\_ is the site of the Krebs cycle.  
a. cytoplasm, chloroplast    b. mitochondria, cytoplasm  
c. mitochondria, chloroplast    d. cytoplasm, mitochondria    e. ribosome, crista
47. Glycolysis produces a net yield of  
a. one RuBP and two ATP    b. two PGAL and two ATP    c. 46 ATP  
d. one glycogen    e. none of these.
48. Which molecules donate electrons to the mitochondrial electron transport chain?  
a. ATP and Acetyl-CoA    b. FADH<sub>2</sub> and ATP  
c. NADH and FADH<sub>2</sub>    d. NADPH and water    e. none of these
49. What happens to the electrons that are transported along the respiratory electron transport chain?  
a. They end up in PGAL.  
b. They gain energy.  
c. They are pumped into the space between the inner and outer mitochondrial membrane.  
d. They combine with protons and O<sub>2</sub> to form water.  
e. None of the above is correct.
50. Where does the Krebs cycle occur in the cell?  
a. cristae of the mitochondria    b. inner membrane of the mitochondria  
c. vesicles in the cytoplasm    d. thylakoid discs  
e. in the endoplasmic reticulum
51. Which statement is FALSE concerning anaerobic respiration?  
a. It produces lactic acid or ethyl alcohol as a by-product.  
b. The process produces the same amount of ATP as aerobic respiration.  
c. The process can happen in both unicellular and multicellular organisms.  
d. The Krebs cycle and electron transport chain are not part of aerobic respiration.
52. Which organism cannot participate in anaerobic respiration?  
a. grass    b. yeast    c. duck    d. bacterium    e. human
53. Alcoholic fermentation produces  
a. lactic acid only    b. ethyl alcohol only  
c. CO<sub>2</sub> only    d. both CO<sub>2</sub> and ethyl alcohol    e. lactic acid and CO<sub>2</sub>
54. Which process below is common to both photosynthesis and respiration?  
a. carbon fixation.  
b. oxidation of PGAL  
c. synthesis of ATP from a proton gradient  
d. fermentation  
e. absorption of light by pigments.

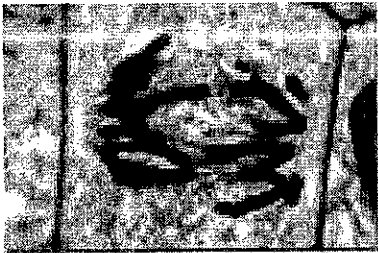
55. In alcoholic fermentation, two molecules of ethyl alcohol are formed from one molecule of glucose. Ethyl alcohol's formula is  $C_2H_5OH$ . How many molecules of  $CO_2$  are made in fermentation for each molecule of glucose that starts out in the process?

- a. 1    b. 6    c. 4    d. 2    e. Can not be determined

56. Suppose we label water with heavy (tritium  $^3H$ ) hydrogen atoms ( $^3H_2O$ ) and trace the radioactive hydrogen in the process of photosynthesis. Which product would most likely exhibit radioactivity from the heavy hydrogen?

- a. carbon dioxide    b. the oxygen that the plant releases into the air.  
c. glucose.    d. ATP.    e. RuBP carboxylase

Use the below diagram to answer questions 57-59.



~~#~~ 57

57. What stage of mitosis is shown in this picture

- a. Metaphase    b. Telophase  
c.  $G_1$  phase    d. Anaphase  
e. prophase

58. Which statement accurately reflects the happenings before the one in the above picture?

- a. The DNA was copied through transcription.  
b. The chromosomes were aligned on the "equator" of the cell.  
c. The chromatids attached to the centrioles.  
d. The cleavage furrow was created to signal cell division.  
e. The mitotic spindle disappears.

59. Which statement best describes the events directly after the above picture?

- a. The chromosomes will arrive at the "poles" of the original cell.  
b. The stage of mitosis will be telophase.  
c. Chromosomes will decondense.  
d. A cell plate will form.  
e. All of the above.

60. The division of cytoplasm in a eukaryotic cell is called

- a. cytokinesis    b. binary fission  
c. mitosis    d. cytoplasmic streaming  
e. Answers c & b

61. If an organism has 24 chromosomes in a cell before mitosis, the number in a given cell after mitosis would be

- a. 12    b. 24    c. 48    d. unknown    e. polyploid

62. Which of the following events occurs during synapsis?

- a. replication of DNA    b. division of the cytoplasm  
c. appearance of spindle fibers    d. pairing of homologous chromosomes  
e. protein synthesis

63. If an organism's somatic cells have 24 chromosomes each than a germ cell would have

- a. 12    b. 24    c. 48    d. 18    e. none of these

64. Spermatogenesis results in  
 a. four haploid cells      b. four diploid cells      c. one haploid cell and three polar bodies  
 d. two sperm cells and two polar bodies      e. one functional germ cell
65. In which phase of meiosis do tetrads form?  
 a. prophase      b. telophase I      c. metaphase II      d. anaphase II      e. cytokinesis
66. Histones are proteins that  
 a. are found only in prokaryotic cells.  
 b. aid in the packing of DNA in eukaryotic cells.  
 c. aid in controlling the activity of regions of DNA.  
 d. aid in DNA replication.  
 e. All of the above.
67. Which item does NOT apply to the Watson and Crick model of DNA?  
 a. The hydrogen bonds connected phosphates together.  
 b. The molecule formed a double helix.  
 c. Pyrimidines paired with purines.  
 d. The two strands of the molecule ran in opposite directions.  
 e. Answers a & c.
68. The enzyme DNA helicase begins DNA replication by  
 a. creating more nucleotides of DNA.  
 b. unzipping the two strands of DNA.  
 c. pairing complementary nitrogen bases.  
 d. catalyzes the sugar-phosphate bonds.  
 e. producing base pairs for the new DNA.
69. In a eukaryotic cell, \_\_\_\_\_ carries the information for protein synthesis from the nucleus to the cytoplasm.  
 a. tRNA      b. DNA      c. mRNA      d. ribosome      e. rRNA
70. A section of template DNA has a sequence ACCGAGGTT. What is the sequence of an mRNA transcribed from the section?  
 a. ACCGAGGUU  
 b. ACCGAGGTT  
 c. TGGCTCCAA  
 d. UGGCUCCAA  
 e. None of these
71. Which statement is TRUE concerning RNA?  
 a. The nucleotides consist of the same sugar molecule as DNA.  
 b. The presence of hydrogen bonds creates a double helix.  
 c. The nitrogen bases are the same as in DNA.  
 d. The presence of uracil differentiates RNA from DNA.  
 e. Helicase is needed to stabilize the molecule.
72. If two genes are closely arranged on a chromosome, they will probably  
 a. cross over.      b. segregate separately.  
 c. control the same trait.      d. be inherited together.  
 e. cancel each other out.
73. Which of the following mutations does not affect an organism but can be passed on to offspring?  
 a. somatic cell      b. translocation      c. germ cell      d. substitution  
 e. synaptic expression





**New Jersey Science League  
Biology I Answer Key  
Date: Feb 9, 2006**

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

**BIOLOGY I TOPICS OF STUDY 2005 SEASON**

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

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

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

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

**TESTING DATES FOR THE NEW JERSEY SCIENCE LEAGUE**

**TESTING DATES 2006 SEASON**

**JANUARY 12, 2006**

**February 9, 2006**

**March 9, 2006**

**April 13, 2006**

**JANUARY 11, 2007**

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