



**ENGINEERING  
AT ILLINOIS**

## **2016 Academic Challenge**

### **BIOLOGY TEST – SECTIONAL**

**– This Test Consists of 50 Questions –**

#### **Biology Test Production Team**

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#### **GENERAL DIRECTIONS**

Please read the following instructions carefully. This is a timed test; any instructions from the test supervisor should be followed promptly.

The test supervisor will give instructions for filling in any necessary information on the answer sheet. Most Academic Challenge sites will ask you to indicate your answer to each question by marking an oval that corresponds to the correct answer for that question. One oval should be marked to answer each question. Multiple ovals will automatically be graded as an incorrect answer.

Be sure ovals are marked as  , not  ,  ,  , etc.

If you wish to change an answer, erase your first mark completely before marking your new choice.

You are advised to use your time effectively and to work as rapidly as you can without losing accuracy. Do not waste your time on questions that seem too difficult for you. Go on to the other questions, and then come back to the difficult ones later if time remains.

**\*\*\* Time: 40 Minutes \*\*\***

**DO NOT OPEN TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO!**

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WYSE – Academic Challenge  
Biology Test (Sectional) – 2016

1. Vaccines help \_\_\_\_\_.
  - a. protect individuals from disease
  - b. aid bacteria to digest by phagocytosis
  - c. aid the digestive system
  - d. carry oxygen in a cell
  - e. aid the excretory system
2. Which term is **not** associated with enzymes?
  - a. allosteric site
  - b. active site
  - c. protein
  - d. catalyst
  - e. energy source
3. An independent variable can best be described as the \_\_\_\_\_.
  - a. control group
  - b. variable that is measured or observed
  - c. variable that is changed
  - d. variable that should be the same
  - e. null hypothesis
4. Communities consists of \_\_\_\_\_.
  - a. the physical characteristics of an ecosystem
  - b. all of the living organisms in an area
  - c. a single species in an area
  - d. all the ecosystems in the world
  - e. the biotic and abiotic factors in an area
5. Which of the following is true of prokaryotes?
  - a. they contain ribosomes
  - b. they may be spiral or rod shaped
  - c. they contain membrane bound organelles
  - d. Both a and b are true.
  - e. All of the above are true.
6. \_\_\_\_\_ is to the liver, as \_\_\_\_\_ is to the kidney.
  - a. Pleural; hepatic
  - b. Hepatic; pleural
  - c. Hepatic; renal
  - d. Renal; hepatic
  - e. None of the above are correct.

7. Which of the following is secreted by a normal functioning human pancreas?
  - a. glucagon
  - b. somatostatin
  - c. insulin
  - d. Both b and c are correct.
  - e. All of the above are correct.
8. Which of the following is **not** a mechanism that uses ATP?
  - a. phagocytosis
  - b. pinocytosis
  - c. osmosis
  - d. endocytosis
  - e. Na<sup>+</sup>/K<sup>+</sup> pump
9. Which of the following is true?
  - a. Mitochondria produce ATP through cellular respiration.
  - b. Centrioles play an important role in plant mitosis.
  - c. Homologous chromosomes synapse and cross over during Metaphase I.
  - d. Chromosomes migrate to opposite poles during telophase.
  - e. Cellular division for growth and repair occurs through mitosis in prokaryotes.
10. Phytoplankton is \_\_\_\_\_.
  - a. a major decomposer in aquatic environments
  - b. heterotrophic
  - c. a free floating autotroph in aquatic environments
  - d. firmly attached to a substrate
  - e. any organism that is photosynthetic
11. Select the term, referring to within living systems, of the human body.
  - a. in vitro
  - b. in vivo
  - c. ecosystem
  - d. All of the above except b are correct.
  - e. None of the above are correct.
12. Which of the following is true?
  - a. Enzymes lower the activation energy of a reaction.
  - b. Lactose is the enzyme that catalyzes lactase.
  - c. All proteins are enzymes.
  - d. Both b and c are true.
  - e. All of the above are true.

13. Match the stages of cellular respiration in **Column A** with their descriptions in **Column B**.

**Column A**

1. glycolysis
2. citric acid cycle
3. electron transport chain
4. chemiosmosis

**Column B**

- a. hydrogen ions diffuse through ATP synthase
- b. glucose is split into two pyruvate molecules
- c. yields 4 CO<sub>2</sub>, 6 NADH, 2 FADH<sub>2</sub>, and 2 ATP
- d. contains cytochromes

**Select the correct matching sequence.**

- |          |       |       |       |
|----------|-------|-------|-------|
| a. 1 – d | 2 – c | 3 – a | 4 – b |
| b. 1 – c | 2 – b | 3 – a | 4 – d |
| c. 1 – b | 2 – d | 3 – c | 4 – a |
| d. 1 – c | 2 – d | 3 – b | 4 – a |
| e. 1 – b | 2 – c | 3 – d | 4 – a |

14. Chromatin material that is loosely packed is referred to as \_\_\_\_.

- a. heterochromatin
- b. Barr body's on the X chromosome
- c. euchromatin
- d. methylated DNA
- e. inactive DNA

15. Match the terms in **Column A** with their definitions in **Column B**.

**Column A**

1. sepals
2. anther
3. peduncle
4. receptacle

**Column B**

- a. flower stalk
- b. where the floral parts are attached
- c. flower bud
- d. pollen is produced

**Select the correct matching sequence.**

- |          |       |       |       |
|----------|-------|-------|-------|
| a. 1 – c | 2 – d | 3 – a | 4 – b |
| b. 1 – a | 2 – b | 3 – d | 4 – c |
| c. 1 – b | 2 – d | 3 – c | 4 – a |
| d. 1 – c | 2 – d | 3 – b | 4 – a |
| e. 1 – d | 2 – c | 3 – a | 4 – b |

16. If a hydrocarbon has four carbons in which there is one double bond between two carbons, then the number of hydrogen atoms would be \_\_\_\_.
- a. 8
  - b. 9
  - c. 10
  - d. 11
  - e. 12
17. Which of the following genetic diseases is **not** correctly matched?
- a. Cystic fibrosis – autosomal recessive, where individuals have mucus build up in their bronchi
  - b. Sickle cell anemia – autosomal recessive, where the red blood cells are not shaped properly
  - c. Phenylketonuria – autosomal recessive, where individuals are missing an enzyme to break down phenylalanine properly
  - d. Huntington's disease – autosomal recessive, where the individual is missing lysosomal enzymes to digest lipids
  - e. Hemophilia A – an X-linked trait, where the individual is missing a blood clotting factor
18. Which of the following is **not** true?
- a. A pH of 6 is 10 times more acidic than a pH of 7.
  - b. The normal pH of human blood is 7.35 – 7.45.
  - c. At a pH of 7, hydrogen ion and hydroxide ion concentrations are equal.
  - d. Pure water is neutral at a pH of 7.
  - e. All of the above are correct.
19. Which of the following is **not** an eukaryote?
- a. bacteria
  - b. protists
  - c. animal
  - d. plant
  - e. Both a and b are not eukaryotes.
20. Striations are characteristic of which of the following tissue types?
- a. cardiac
  - b. skeletal
  - c. epithelial
  - d. Both a and b are correct.
  - e. None of the above are correct.

21. A prophage can be described as \_\_\_\_.
- a bacterial virus that is actively infectious
  - a virus that produces reverse transcriptase
  - viral DNA that is incorporated into a bacterial chromosome
  - bacterial DNA that is incorporated into viral DNA
  - bacterial DNA that is incorporated into viral RNA
22. Match the organic molecules in **Column A** with their descriptions or examples in **Column B**.

**Column A**

- proteins
- lipids
- nucleic acids
- carbohydrates

**Column B**

- saturated fatty acids, steroids
- amino acids, enzymes
- cellulose, glucose, glycogen
- DNA, ATP, RNA

**Select the correct matching sequence.**

- |          |       |       |       |
|----------|-------|-------|-------|
| a. 1 – b | 2 – c | 3 – d | 4 – a |
| b. 1 – b | 2 – a | 3 – d | 4 – c |
| c. 1 – b | 2 – a | 3 – c | 4 – d |
| d. 1 – d | 2 – c | 3 – a | 4 – b |
| e. 1 – c | 2 – a | 3 – d | 4 – b |

23. Which animal is **not** matched with its appropriate Class?
- Jelly fish – Scyphozoa
  - Leech – Hirudinida
  - Schistosoma* – Trematoda
  - Sand dollar – Echinoidea
  - Lancelets – Urochordata
24. A color blind man and a normal vision woman, have two daughters and one son. Color blindness is an X-linked trait. Which of the following statements is true?
- The son must be colorblind.
  - The daughters must be colorblind.
  - The son must be a carrier of colorblindness.
  - The daughters are carriers of colorblindness, if they themselves are not colorblind.
  - The son is a carrier of colorblindness, if he is not colorblind.

25. Which of the following molecules is **not** organic?

- a.  $\text{CH}_4$
- b.  $\text{CO}_2$
- c.  $\text{C}_6\text{H}_{12}\text{O}_6$
- d.  $\text{C}_2\text{H}_6$
- e.  $\text{C}_3\text{H}_8\text{O}_3$

26. Endotoxin produced by Gram negative bacteria is associated with \_\_\_\_.

- a. teichoic acid
- b. porin proteins
- c. O polysaccharide
- d. periplasm
- e. lipid A

27. Match the type of horizontal gene transfer in **Column A** with their descriptions in **Column B**.

**Column A**

- 1. conjugation
- 2. transduction
- 3. transformation

**Column B**

- a. DNA from the environment is taken up by a bacteria
- b. bacterial phage transports DNA from another bacterium
- c. a sex pilus forms and a plasmid is transported

**Select the correct matching sequence.**

- |          |       |       |
|----------|-------|-------|
| a. 1 – c | 2 – b | 3 – a |
| b. 1 – c | 2 – a | 3 – b |
| c. 1 – a | 2 – b | 3 – c |
| d. 1 – b | 2 – a | 3 – c |
| e. 1 – a | 2 – c | 3 – b |

28. Which of the following animals is **not** in Order Rodentia?

- a. porcupine
- b. squirrels
- c. mice
- d. beavers
- e. hares

29. Which of the following structures is **not** associated with leaves?

- a. stomata
- b. cuticle
- c. mesophyll
- d. blade
- e. periderm

30. Malaria is caused by *Plasmodium*. Gametes for *Plasmodium* are produced inside the *Anopheles* mosquito. If an infected mosquito bites a person, the mosquito transmits the sporozoites in a human. The sporozoites undergo changes in the human causing the disease. Which statement is **not** true?
- The *Anopheles* mosquito is the vector.
  - The *Anopheles* mosquito is the definitive host.
  - Plasmodium* life cycle needs two hosts.
  - Plasmodium* is an ectoparasite.
  - Controlling the *Anopheles* mosquito will help stop the spread of malaria.
31. CAM plants fix carbon \_\_\_\_.
- twice using two different cells
  - using two different chloroplasts
  - twice using the same cell
  - only at night
  - using the lower epidermal cells
32. \_\_\_\_ is/are a saturated fat.
- Olive oil
  - Canola oil
  - Butter
  - Both a and b are saturated fats.
  - All of the above are saturated fats.
33. Which of the following does **not** reflect a change in chromosome number?
- non-disjunction
  - inversion
  - trisomy
  - Both a and b are correct.
  - Both b and c are correct.
34. Match the cell parts in **Column A** with their functions in **Column B**.

**Column A**

- nucleolus
- intermediate filaments
- cilia
- Golgi complex
- ribosomes

**Column B**

- protein synthesis
- provides support
- packages and modifies proteins
- rRNA synthesis
- movement

Select the correct matching sequence.

- |          |       |       |       |       |
|----------|-------|-------|-------|-------|
| a. 1 – c | 2 – e | 3 – b | 4 – d | 5 – a |
| b. 1 – d | 2 – e | 3 – b | 4 – c | 5 – a |
| c. 1 – b | 2 – a | 3 – e | 4 – c | 5 – d |
| d. 1 – a | 2 – b | 3 – c | 4 – d | 5 – e |
| e. 1 – d | 2 – b | 3 – e | 4 – c | 5 – a |

35. Which of the following is a dicot?

- bean
- corn
- squash
- Both a and c are dicots.
- All of the above are dicots.

36. Match the terms in **Column A** with their definitions in **Column B**.

**Column A**

- Gel electrophoresis
- Restriction enzymes
- cDNA
- Reverse transcriptase
- PCR

**Column B**

- enzyme that uses RNA as a template to make DNA
- a technique used to make many copies of DNA
- a technique used to separate DNA fragments by size
- an enzyme that cuts DNA at its backbone
- segments of DNA without introns

Select the correct matching sequence.

- |          |       |       |       |       |
|----------|-------|-------|-------|-------|
| a. 1 – c | 2 – d | 3 – e | 4 – a | 5 – b |
| b. 1 – c | 2 – a | 3 – e | 4 – d | 5 – b |
| c. 1 – d | 2 – a | 3 – b | 4 – c | 5 – e |
| d. 1 – e | 2 – a | 3 – b | 4 – c | 5 – d |
| e. 1 – d | 2 – b | 3 – e | 4 – a | 5 – c |

37. Which of the following is true?

- The uprights of deoxyribonucleic acid consists of alternating 5 carbon sugar and phosphate groups.
- In the DNA double helix, the strands are antiparallel (5' -> 3').
- DNA ligase is a proofreading enzyme and cleaves DNA when the correct DNA sequence is detected.
- Both a and b are correct.
- All of the above are true.

38. Algae blooms are influenced by \_\_\_\_.
- sunlight
  - carbon
  - nitrogen
  - Both a and b are correct.
  - All of the above are correct.
39. \_\_\_\_ connect amino acids in the structure of hemoglobin.
- Hydrogen bonds
  - Peptide bonds
  - Ionic bonds
  - Both b and c are correct.
  - None of the above are correct.

40. Match the items from **Column A** with its correct association from **Column B**.

| <b>Column A</b> | <b>Column B</b> |
|-----------------|-----------------|
| 1. Chromosome   | a. mRNA         |
| 2. Codon        | b. rRNA         |
| 3. Blueprint    | c. tRNA         |
| 4. Anticodon    | d. centromere   |
| 5. Ribosome     | e. DNA          |

**Select the correct matching sequence.**

|          |       |       |       |       |
|----------|-------|-------|-------|-------|
| a. 1 – e | 2 – c | 3 – d | 4 – a | 5 – b |
| b. 1 – d | 2 – a | 3 – e | 4 – c | 5 – b |
| c. 1 – d | 2 – c | 3 – e | 4 – a | 5 – b |
| d. 1 – b | 2 – a | 3 – e | 4 – c | 5 – d |
| e. 1 – d | 2 – e | 3 – c | 4 – b | 5 – a |

41. \_\_\_\_ is to the stomach, as \_\_\_\_ is to the eye.
- Gastric; pepsin
  - Lysozyme; pepsin
  - Pepsin; gastric
  - Pepsin; lysozyme
  - None of the above are correct.

42. Which of the following is true, related to microscope use?
- One should use and change both the coarse and fine focus adjustment knobs on each power setting.
  - Increasing the light source on high power may help increase viewing on one's specimen.
  - Air bubbles are difficult to see while viewing specimens under the microscope.
  - Both a and b are true.
  - All of the above are true.
43. Which of the following is **not** true?
- Cations are positively charged ions as a result of oxidation reactions.
  - Anions are negatively charged ions as a result of reduction reactions.
  - Sodium chloride is formed as a result of covalent attractions between two ions.
  - Polar molecules tend to be hydrophilic.
  - Both a and b are not true.
44. Francis Crick is to \_\_\_\_, as Ian Wilmut is to \_\_\_\_.
- protein synthesis; DNA replication
  - DNA replication; protein synthesis
  - DNA; cloning
  - cloning; protein synthesis
  - None of the above are correct.
45. Which of the following is an **incorrect** association?
- cuboidal – muscle
  - epithelial – tissue
  - hepatic – liver
  - fat – adipose
  - All of the above are correct.
46. Which of the following is characteristic of the Domain Eukarya?
- no visible nucleus
  - cells with organelles
  - divides by mitosis
  - Both a and c are characteristics of Domain Eukarya.
  - Both b and c are characteristics of Domain Eukarya.
47. Match the items in **Column A** with the appropriate descriptions in **Column B**.

**Column A**

- Mitosis – only
- Meiosis – only
- Both Meiosis and mitosis

**Column B**

- synapsis of homologous chromosome pairs
- clones
- repair and growth
- crossing over
- new cells

**Select the correct matching sequence.**

- |             |             |          |
|-------------|-------------|----------|
| a. 1 – a; c | b. 2 – b; d | c. 3 – e |
| b. 1 – b; e | b. 2 – a; c | c. 3 – d |
| c. 1 – a; b | b. 2 – c; d | c. 3 – e |
| d. 1 – a; e | b. 2 – b; c | c. 3 – d |
| e. 1 – b; c | b. 2 – a; d | c. 3 – e |

48. Which statement is **not** true, if human muscle cells have an oxygen debt?

- Lactic acid builds up in the cells.
- Muscles fatigue.
- There is only a net gain of 2 ATP per glucose molecule.
- Carbon dioxide is given off.
- NADH is oxidized forming NAD<sup>+</sup>.

49. Which is **not** associated with the light-dependent reaction of photosynthesis?

- oxygen
- ATP
- NADPH
- glucose
- chlorophyll

50. Match the terms in **Column A** with their definitions in **Column B**.

- | <b>Column A</b>     | <b>Column B</b>                                            |
|---------------------|------------------------------------------------------------|
| 1. Epistasis        | a. more than two allele choices                            |
| 2. Pleiotrophy      | b. one allele pair that affects many traits                |
| 3. Codominance      | c. one allele pairs that affects the expression of another |
| 4. Multiple alleles | d. both traits are expressed                               |

**Select the correct matching sequence.**

- |          |       |       |       |
|----------|-------|-------|-------|
| a. 1 – c | 2 – b | 3 – d | 4 – a |
| b. 1 – c | 2 – a | 3 – b | 4 – d |
| c. 1 – b | 2 – c | 3 – d | 4 – a |
| d. 1 – d | 2 – a | 3 – b | 4 – c |
| e. 1 – d | 2 – b | 3 – c | 4 – a |