



**ENGINEERING  
AT ILLINOIS**

## 2016 Academic Challenge

### BIOLOGY TEST – STATE

– 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 (State) – 2016

1. Which statement is **not** true?
  - a. A complete flower has both stamens and carpels.
  - b. An imperfect flower contains both stamens and carpels, but is missing either sepals, or petals.
  - c. All the petals of a flower are referred to as the corolla.
  - d. All the sepals of a flower are referred to as the calyx.
  - e. The four whorls of a flower are the sepals, petals, stamens, and carpels.
  
2. Which of the following is true?
  - a. Covalent bonds may be polar, such as in the water molecule, or non-polar, as in lipids.
  - b. Polar molecules are hydrophilic.
  - c. Hydrolysis reactions are catabolic.
  - d. Both b and c are correct.
  - e. All of the above are correct.
  
3. Which of the following is **not** true?
  - a. Crossing over takes place in Prophase I.
  - b. Capillary action occurs because water has both adhesive and cohesive forces.
  - c. Plasmodesmata allow for movement of ions between plant cells.
  - d. Pinocytosis is a type of exocytosis.
  - e. All of the above are true.
  
4. In the bioscience industry, GMP is an abbreviation for \_\_\_\_\_, and SOP is an abbreviation for \_\_\_\_\_.
  - a. good manufacturing practice; standard operating procedure
  - b. gene modification procedure; simple operating procedure
  - c. green mapping protein; single operating procedure
  - d. good maintenance procedure; safe operative protocol
  - e. None of the above are correct.
  
5. Which of the following is true of the sodium potassium pump?
  - a. It is a passive transport mechanism.
  - b. It aids in maintaining a polarized state of nerve cell membrane potentials.
  - c. It is an active transport mechanism.
  - d. Both b and c are correct.
  - e. None of the above are correct.

6. \_\_\_\_\_ are to the femur, as \_\_\_\_\_ are to the biceps brachii, and as \_\_\_\_\_ are to articular cartilage.
- Chondrocytes; osteocytes; myocytes
  - Myocytes; osteocytes; chondrocytes
  - Osteocytes; myocytes; chondrocytes
  - Osteocytes; chondrocytes; myocytes
  - Myocytes; chondrocytes; osteocytes

7. Translate the following DNA strand, using the following information in the table.

Codon	AGA	GAG	UUC	AUG	GUA	CUC
Amino Acid	Arg	Glu	Phe	Met	Asp	Leu

**T A C A A G C A T T C T G A G C T C**

- Met – Phe – Arg – Leu – Asp – Glu
  - Phe – Met – Asp – Arg – Glu – Leu
  - Met – Phe – Arg – Asp – Leu – Glu
  - Met – Phe – Asp – Arg – Leu – Glu
  - Phe – Met – Arg – Asp – Glu – Leu
8. Match the genetic disorder in **Column A** with the cause in **Column B**.
- | <b>Column A</b>         | <b>Column B</b>  |
|-------------------------|--|
| 1. Sickle cell anemia   | a. Found on chromosome 4 with repeating nucleotide sequences of CAG 40 to 150 times.               |
| 2. Phenylketonuria      | b. Found on chromosome 15, missing an enzyme needed to breakdown lipids properly in the lysosomes. |
| 3. Huntington's disease | c. The nucleotide sequence CGG repeats 200 to more than 1000 times.                                |
| 4. Fragile X syndrome   | d. A mutation on chromosome 12, missing an enzyme to breakdown phenylalanine.                      |
| 5. Tay Sachs            | e. Caused by a base substitution on the beta-globulin chain.                                       |

**Select the correct matching sequence.**

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

9. \_\_\_\_ are chemical signals that do not require a great deal of energy to produce and most cause a very specific behavior between members of the same species.
- Enzymes
  - Pheromones
  - Antibodies
  - Auxins
  - Hemolymphs
10. Which of the following is **not** true?
- During inspiration, the diaphragm raises as it contracts.
  - Each lung is surrounded by pleural membranes.
  - Pleuritis refers to the inflammation of the pleura.
  - The human heart is protected or surrounded by a fibrous pericardium as well as pericardial membranes.
  - Peritoneal membranes are found within the abdominal cavity of the human body.
11. \_\_\_\_ is a transitional zone where two ecosystems meet and intergrade.
- Edge effect
  - Ecotone
  - Succession
  - Metapopulation
  - None of the above are correct.
12. Match the plants in **Column A** with the term that is associated with the plant from **Column B**.

**Column A**

- Fern
- Horsetail
- Moss
- Wisk fern

**Column B**

- protonema
- dichotomous branching
- strobilus
- sori

**Select the correct matching sequence.**

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

13. Which is **not** a subviral agent?
- prion
  - viroid
  - satellite
  - mycoplasma
  - All of the above are subviral agents.

14. Which of the following is **not** a prezygotic isolating mechanism?
- behavioral isolation
  - hybrid inviability
  - temporal isolation
  - mechanical isolation
  - gametic isolation
15. Which of the following is true related to microscope use?
- One should always use the fine focus adjustment knob on low power before making further focusing adjustments with the course focus adjustment knob.
  - Center specimen in the viewing field prior to changing from low power to high power.
  - When switching from 10X or low power, to 40X or high power, it is necessary to lower the stage even though the specimen is in focus.
  - Both a and b are true.
  - All of the above are true.
16. Deamination is to \_\_\_\_\_, as beta-oxidation is to \_\_\_\_\_.
- lipids; proteins
  - amino acids; proteins
  - amino acids; fatty acids
  - fatty acids; proteins
  - fatty acids; amino acids
17. Which of the following is **not** true?
- A liquid consisting of a mixture of two or more substances is called a solution.
  - An aqueous solution has salt as the solvent and water as the solute.
  - A buffer can be found in biological fluids and helps reduce or minimizes potential changes in pH, which stands for potential hydrogen.
  - It is possible for the freezing of water to crack boulders due to the expansion of water molecules that may be present in a crevice.
  - Hydrogen bonds are more stable in ice than in liquid water.
18. Which of the following causes microtubules of flagella and cilia to bend?
- basal bodies
  - dynein arms
  - kinetochore fibers
  - actin filaments
  - myosin filaments
19. Which of the following is **not** associated with animal cells?
- anchoring junctions
  - tight junctions
  - plasmodesmata
  - gap junctions
  - Both a and c are not associated with animal cells.

20. Which of the following is **not** true?
- Enzymes may require small protein helpers called cofactors.
  - Vitamins may function as coenzymes.
  - Cofactors of some enzymes may be inorganic or organic.
  - Both b and c are not true.
  - All of the above are true.
21. \_\_\_\_ is the number of species in an area.
- Species evenness
  - Species richness
  - Species diversity
  - Edge effect
  - Ecotone
22. Which of the following is Avogadro's number?
- $6.02 \times 10^{19}$
  - $3.04 \times 10^{23}$
  - $4.06 \times 10^{20}$
  - $6.81 \times 10^{23}$
  - None of the above are true.
23. Alcohol fermentation \_\_\_\_.
- reduces FAD to FADH<sub>2</sub>, while producing ethanol
  - oxidizes FADH<sub>2</sub> to FAD, while producing ethanol and carbon dioxide
  - reduces NAD<sup>+</sup> to NADH, while producing ethanol and carbon dioxide
  - oxidizes NADH to NAD<sup>+</sup>, while producing ethanol and carbon dioxide
  - None of the above are true.
24. Which of the following can harvest light energy and turn it into chemical energy?
- bacteria
  - algae
  - plants
  - Both b and c are correct.
  - All the above are correct.
25. Assuming that one carbon dioxide is used during each turn of the Calvin cycle, how many turns are necessary to produce one molecule of glucose?
- 2
  - 4
  - 6
  - 8
  - 12

26. Which of the following are produced by reactions that take place in the thylakoids?
- CO<sub>2</sub> and ATP
  - ATP, CO<sub>2</sub>, and water
  - NADPH, water, and ATP
  - ATP and NADPH
  - None of the above are produced.
27. If scientists add a chemical to cells that inhibits or prevents the synthesis of DNA, which of the following would be true?
- Cells would become trapped in mitosis.
  - Cells would become trapped in the G<sub>2</sub> stage of mitosis.
  - Cells would become trapped in the G<sub>1</sub> stage of mitosis.
  - Cells would become trapped in cytokinesis.
  - Apoptosis would occur rapidly.
28. Which of the following is true of cells grown in culture?
- Cultured cells require growth factors or an essential nutrient in culture medium to proliferate.
  - Density-dependent inhibition will affect the growth and reproduction of cells.
  - Growth will be inhibited in crowded cells and some exhibit anchorage dependence.
  - Removing some crowded cells in a growth plate will allow for additional replication or growth of cells.
  - All of the above are correct.
29. Cancers that originate from external or internal coverings of the body are named \_\_\_\_\_, where as, those that arise in tissues that support the body are named \_\_\_\_\_.
- leukemias; carcinomas
  - sarcomas; leukemias
  - carcinomas; sarcomas
  - leukemias; sarcomas
  - None of the above are correct.
30. A human somatic cell has \_\_\_\_\_ of chromosomes.
- 23 homologous pairs
  - 46 nonhomologous pairs
  - 23, or the haploid number
  - Both a and c are correct.
  - None of the above are correct.
31. Guttation \_\_\_\_\_.
- is the same as dew
  - takes place at the same time as transpiration
  - takes place when the soil is dry
  - takes place when water is forced out of leaves
  - takes place through active transport



32. Someone with trisomy 21 would have how many autosomes?
- a. 44
  - b. 45
  - c. 46
  - d. 47
  - e. None of the above are correct.
33. Which of the following is **not** an X – linked inherited trait?
- a. Duchenne muscular dystrophy
  - b. red-green color blindness
  - c. hemophilia
  - d. Both a and b are true.
  - e. All of the above are X – linked traits.
34. If a particular gene for a protein is 200 amino acids long, how many nucleotides would be needed to code for the protein?
- a. 20
  - b. 200
  - c. 400
  - d. 600
  - e. None of the above are true.
35. Which of the following is **not** considered alive?
- a. viruses
  - b. plants
  - c. fungi
  - d. bacteria
  - e. None of the above are correct.
36. Which of the following is **not** a formed element of human blood?
- a. leukocytes
  - b. erythrocytes
  - c. platelets
  - d. plasma
  - e. basophils
37. Which of the following does **not** apply to eukaryotic mature messenger RNA?
- a. exon
  - b. introns
  - c. poly-A tail
  - d. 5' cap
  - e. All of the above apply to mature messenger RNA.

38. In the human body, \_\_\_\_\_ carry blood away from the heart that is high in oxygen, except in the \_\_\_\_\_ circuit.
- veins; pulmonary
  - arteries; pulmonary
  - veins; systemic
  - arteries; systemic
  - None of the above are true.
39. Which of the following is true?
- During the digestion of proteins, amino acids are released through hydrolysis reactions and then reassembled into other proteins through dehydration reactions.
  - Isomers are various forms of an atom that decay over time and have different quantities of neutrons.
  - Certain carbohydrates are specialized macromolecules that act as catalysts.
  - Both a and b are true.
  - All the above are true.
40. Which of the following allows viral DNA replication without destroying the host cell?
- citric acid cycle
  - lytic cycle
  - noncyclic pathway
  - lysogenic cycle
  - none of the above
41. Pancreatic islet cells called beta cells secrete \_\_\_\_\_, and alpha cells secrete \_\_\_\_\_.
- somatostatin; glucagon
  - glucagon; insulin
  - insulin; somatostatin
  - insulin; glucagon
  - None of the above are true.
42. Which term is **not** associated with eukaryotic transcription?
- RNA polymerase
  - operator
  - enhancer
  - ligase
  - upstream promoter elements
43. Which does **not** cause allele frequencies to change?
- genetic drift
  - mutation
  - random selection of mates
  - natural selection
  - genetic bottleneck

44. The vascular cambium produces the \_\_\_\_.
- secondary vascular tissue
  - bark
  - periderm
  - cork parenchyma
  - apical meristem
45. A \_\_\_\_ mutation changes one amino acid.
- frameshift
  - missense
  - silent
  - nonsense
  - insertion
46. An individual has the following genotype: AaBbCcDd. The possibility of producing a gamete with the following alleles, ABCD, is \_\_\_\_.
- 1/4
  - 1/2
  - 1/8
  - 1/16
  - There is not enough information to determine this.
47. Which of the following organisms uses cilia for locomotion?
- Amoeba*
  - Euglena*
  - Paramecium*
  - Both b and c utilize cilia.
  - None of the above use cilia for locomotion.
48. During the light dependent reactions, lost electrons are ultimately replaced by the \_\_\_\_.
- oxidizing of NADPH
  - breaking down of ADP
  - breaking down of ATP
  - splitting of water
  - carbon fixation
49. Bees are pollinators. Which is **not** associated with bees and pollination?
- Bees prefer yellow, blue, and purple flower colors.
  - Bees usually pollinate flowers during the day.
  - Bees target flowers that have a strong floral scent.
  - Bees pollinate to gather nectar.
  - All of the above are associated with bees and pollination.

50. Which is **not** associated with Prader-Willi syndrome (PWS)?
- a. over eating
  - b. genomic imprinting
  - c. hyperactivity
  - d. poor muscle tone
  - e. behavioral problems