



**ENGINEERING  
AT ILLINOIS**

## 2017 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) – 2017

1. A cluster of flowers is known as \_\_\_\_\_.
  - a. inflorescence
  - b. a whorled arrangement
  - c. a pistillate flower
  - d. a staminate flower
  - e. carpellate
2. Which of the following is **not** correct?
  - a. Isotopes decay over a period of days, months, or years.
  - b. Isotopes are the same atom, but contain a different number of protons.
  - c. The atomic weight of isotopes vary.
  - d. Isomers will have the same number of atoms in their molecular formula.
  - e. Glucose, amino acids, and nucleotides are monomers.
3. Which of the following is **not** a rotator cuff muscle?
  - a. teres minor
  - b. infraspinatus
  - c. supraspinatus
  - d. latissimus dorsi
  - e. subcapularis
4. Which of the following is **not** correct?
  - a. Yeast cells produce alcohol under anaerobic conditions.
  - b. Fermentation products vary depending on the organism.
  - c. Albumin is an important carbohydrate in human cells.
  - d. Beta oxidation is associated with the catabolism of triglycerides.
  - e. Deamination is associated with the digestion of proteins.
5. The wavelength or light absorption of Photosystem II is \_\_\_\_\_ nm, and Photosystem I is \_\_\_\_\_ nm.
  - a. 680; 700
  - b. 700; 680
  - c. 770; 680
  - d. 680; 770
  - e. 660; 700
6. Which is **not** a correct association?
  - a. Class Aves – pneumatic bones
  - b. Class Myxini – jawless
  - c. Class Actinopterygii – males with claspers
  - d. Class Chondrichthyes – placoid scales
  - e. Class Repiltia – first class with amniotic egg

7. Which of the following is **not** a product of the citric acid cycle?
- NADH
  - FADH<sub>2</sub>
  - ATP
  - CO<sub>2</sub>
  - Pyruvate
8. Which genetic disorder is **not** correctly matched with its mode of expression?
- Duchene muscular dystrophy – X-linked
  - Hemophilia A – X-linked
  - Huntington disease – recessive disorder
  - Tay-Sachs disease – recessive disorder
  - Marfan syndrome – dominant disorder
9. Which immunoglobulin can be transferred from mother to fetus through the placenta?
- IgA
  - IgD
  - IgE
  - IgG
  - IgM
10. Match the protist groups in **Column A** with their examples in **Column B**.

**Column A**

- Excavates
- Chromalveolates
- Rhizarians
- Archaeplastids
- Unikonts

**Column B**

- water mold
- actinopods
- Amoeba*
- Euglena*
- green algae

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

11. Starting out with 10 DNA segments, how many would there be after 10 PRC cycles?
- 100
  - 640
  - 1280
  - 5120
  - 10,240

12. Which of the following is **not** considered a lipid?
- steroid
  - wax
  - triglyceride
  - cortisol
  - collagen
13. Which vitamin is produced in human skin?
- Vitamin A
  - Vitamin C
  - Vitamin D
  - Vitamin E
  - All of the above are vitamins produced by human skin.
14. Which is **not** associated with chromatin material?
- RNA
  - DNA
  - Histone proteins
  - Nucleosomes
  - Microtubules
15. Match the plant in **Column A** with the type of photoperiodism in **Column B** they possess.

**Column A**

- Chrysanthemum
- Black-eyed Susan
- Coleus*
- Sunflowers

**Column B**

- Day – neutral plants
- Intermediate – day
- Short – day plants
- Long – day plants

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

16. An inducible gene such as in the lactose operon \_\_\_\_.
- is controlled by a repressor protein
  - is usually actively being transcribed
  - usually codes for anabolic reactions
  - has a corepressor/repressor system
  - codes for the same number of enzymes as in the tryptophan operon

17. A part of a chromosome may attach to another, this is called \_\_\_\_.
- nondisjunction
  - deletion
  - translocation
  - duplication
  - None of the above are correct.
18. Using the Hardy – Weinberg Principle, predict the number of individuals in a population of 1000, who are heterozygous for a trait given the frequency of the recessive allele is 0.4.
- 160
  - 240
  - 360
  - 480
  - 600
19. Match the scientists in **Column A** with their discoveries in **Column B**.

**Column A**

- Jacob and Monod
- Kary Mullis
- Peter Mitchell
- Barbara McClintock

**Column B**

- chemiosmosis
- operon
- transposon
- PCR

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

20. Exotoxins are \_\_\_\_.
- produced by all pathogens
  - secreted by bacteria or leak out of the bacteria
  - produced in the cell wall
  - not destroyed by heat
  - None of the above are correct.
21. Which is **not** a deuterostome?
- sea cucumber
  - sea urchin
  - brittle star
  - sea anemone
  - shark

22. In order for seeds to germinate, \_\_\_\_.
- ATP must be produced
  - the seed must absorb water
  - the amount of light and dark exposure must be equal
  - Both a and b are correct.
  - Both a and c are correct.
23. \_\_\_\_ is the geographic area where animals can be found, while \_\_\_\_ is the area the animals will defend.
- Territory; home range
  - Territory; nest
  - Home range; territory
  - Nest; home range
  - Pack; territory
24. Match the protein synthesis terms in **Column A** with their function in **Column B**.

**Column A**

- Release factor
- Molecular chaperone
- Initiation
- Peptidyl transferase
- Aminoacyl-tRNA synthetase

**Column B**

- Uses proteins called initiation factors
- Enzyme that covalently bonds amino acids to tRNA
- Protein that recognizes the stop codon
- Ribosome protein that helps fold the polypeptide
- Enzyme needed for peptide bond formation

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

25. Which is **not** an example of a reduction reaction?
- $\text{NAD}^+ \rightarrow \text{NADH}$
  - $\text{NADP}^+ \rightarrow \text{NADPH}$
  - $\text{Glucose} \rightarrow \text{CO}_2$
  - $\text{O}_2 \rightarrow \text{H}_2\text{O}$
  - All are examples of reduction reactions.
26. In an experiment, if there is 10% glucose inside a cell and 80% glucose outside the cell. Which of the following statements would be true?
- Water will move out of the cell.
  - Water will move to the inside of the cell.
  - There will be no net movement of water.
  - Glucose will move out of the cell.
  - There is no net movement of glucose.

27. What is the probability of getting the following gamete PtRG, from the genotype PpTtRrGg?
- 1/4
  - 1/2
  - 1/8
  - 1/16
  - 1/32
28. Apoptosis \_\_\_\_.
- can occur when cytochrome c activates caspase
  - is important during the development of tadpoles to frogs
  - is a cause for tumor formation
  - is uncontrollable cell death
  - Both a and b are correct.
29. Ocelli detect light in \_\_\_\_.
- lamprey
  - flatworm
  - frogs
  - earthworms
  - sea cucumber
30. Which is a greenhouse gas?
- Methane – CH<sub>4</sub>
  - Carbon dioxide – CO<sub>2</sub>
  - Nitrous oxide – N<sub>2</sub>O
  - Ozone – O<sub>3</sub>
  - All of the above are greenhouse gases.
31. An example of genomic imprinting is \_\_\_\_, which is caused by a deletion on chromosome 15 inherited from the father.
- Angelman syndrome (AS)
  - Prader-Willi syndrome (PWS)
  - Down syndrome
  - Turner syndrome
  - Martin-Bell syndrome
32. A/an \_\_\_\_ would study animal behavior.
- pathologist
  - ethologist
  - etiologist
  - pharmacist
  - entomologist



33. An experiment was performed to determine the rate it will take to digest a 10% starch solution using a 1% amylase solution. Given the following data, determine an independent variable.

Temperature	Time of digestion in minutes
25° C	3 minutes
37° C	1 minute
85° C	Never digested

- a. the time in minutes to digest starch  
 b. the concentration of starch  
 c. the temperature of each test  
 d. the concentration of amylase  
 e. All of the above are true.
34. \_\_\_\_ synthesis is to smooth endoplasmic reticulum, as, \_\_\_\_ synthesis is to rough endoplasmic reticulum.  
 a. Protein; ATP  
 b. Protein; lipid  
 c. Lipid; ATP  
 d. Lipid; protein  
 e. None of the above.
35. In the human body there are \_\_\_\_ cervical vertebrae, \_\_\_\_ thoracic vertebrae, and \_\_\_\_ lumbar vertebrae.  
 a. 6: 7: 3  
 b. 7: 7: 5  
 c. 7: 10: 5  
 d. 7: 12: 5  
 e. None of the above are correct.
36. \_\_\_\_ is to chloroplast, as, \_\_\_\_ is to mitochondrion.  
 a. Stroma; matrix  
 b. Stomata; cristae  
 c. Matrix; cristae  
 d. Cristae; stroma  
 e. None of the above are true.
37. Which of the following statements is/are true?  
 a. Vacuoles can provide storage of molecules in plant cells.  
 b. Cytoplasmic streaming may be observed while viewing plant cells.  
 c. The T<sub>4</sub> bacteriophage uses bacterial cells in order to reproduce.  
 d. Plants produce ATP through aerobic cellular respiration.  
 e. All of the above are correct.

38. Which of the following statements is **not** true?
- DNA duplication and cytokinesis occur during the G stage of the cell cycle.
  - At the end of oogenesis, one egg is produced.
  - RNA transports genetic material and DNA stores genetic material.
  - Exocytosis and endocytosis both require ATP.
  - Interkinesis occurs between Meiosis I and Meiosis II.
39. Which of the following statements is true?
- Macrophages are phagocytic cells.
  - Heparin promotes inflammation and allergic responses.
  - Cytotoxic T cells are formed from B lymphocytes.
  - Surfactant is secreted by the ventricles of the human brain.
  - All of the above are correct.
40. The protein coat of a virus is called a/an \_\_\_\_\_.
- envelope
  - capsule
  - capsid
  - endospore
  - cyst
41. Which statement is **not** true?
- Cholesterol is a steroid.
  - Phosphodiester linkages are found in DNA.
  - Hemoglobin has four polypeptide chains.
  - Collagen has two polypeptide chains.
  - Chitin is made up of many N-acetylglucosamine molecules.
42. Which does **not** apply to Phylum Glomeromycota?
- symbionts
  - mycorrhizae
  - coenocytic hyphae
  - produce zygospores
  - produce asexual blastopores
43. Which is **not** a correct association?
- monosaccharide – ribose
  - protein – carbon, hydrogen, oxygen, nitrogen, sometimes sulfur
  - carotenoids – isoprene units
  - nucleic acids – pentose – phosphate backbone
  - lipids – all have fatty acids

44. Lysogenic conversion is responsible for \_\_\_\_.
- Diphtheria
  - Botulism
  - Chicken pox
  - Both a and b are correct.
  - Both b and c are correct.
45. Which is **not** a correct association?
- carrots – biennial
  - marigold – annual
  - rhubarb – perennial
  - cabbage – annual
  - asparagus – perennial
46. The light-dependent reactions requires \_\_\_\_.
- Ribulose biphosphate
  - Carbon dioxide
  - Adenosine triphosphate
  - Nicotinamide adenine dinucleotide phosphate
  - All of the above are required for carbon fixation.
47. Which of the following is/are amphipathic?
- phospholipids
  - integral membrane proteins
  - steroids
  - cellulose
  - Both a and b are amphipathic.
48. Which statement is true?
- Metaphase occurs after Anaphase during mitosis.
  - Lipids are non polar molecules associate with the plasma membrane.
  - Adding a buffer to a solution, will help lower the pH.
  - Unlike the endoplasmic reticulum, the nucleolus is not responsible for ribosomal subunits.
  - All of the above are true.
49. The main type of cell surface receptors are \_\_\_\_.
- hormones and enzyme – linked receptors
  - enzyme – linked receptors, G protein – linked receptors, and ion channel – linked receptors
  - neurotransmitters and cAMP
  - cAMP, hormones, and ion channel – linked receptors
  - None of the above are cell surface receptors.

50. If a population is decimated by disease leaving only a few alive to repopulate, this would be an example of \_\_\_\_.
- a. founder effect
  - b. macroevolution
  - c. genetic bottleneck
  - d. gene flow
  - e. mutation