



# 2015 Academic Challenge

## BIOLOGY TEST - STATE

This Test Consists of 50 Questions

### **Mathematics 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. Only 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) – 2015

1. Which is an incorrect association?
  - a. skin – first line of defense
  - b. tears –second line of defense
  - c. mucus – first line of defense
  - d. neutrophils – second line of defense
  - e. inflammation – second line of defense
  
2. Which is an **incorrect** association?
  - a. Nematocysts – Cnidaria
  - b. Colloblasts – Ctenophora
  - c. water vascular system – Echinoderms
  - d. thyroid/endostyle – Chordata
  - e. pseudocoelomate – Platyhelminthes
  
3. HPLC stands for \_\_\_\_\_.
  - a. Heavy Polymerase Length Chain
  - b. High Polymerase Level Characterization
  - c. High Performance Liquid Chromatography
  - d. Heat Pressure Liquid Characterization
  - e. None of the above are correct.
  
4. A holoenzyme consists of a/an \_\_\_\_\_.
  - a. apoenzyme and coenzyme
  - b. substrate and coenzyme
  - c. apoenzyme and substrate
  - d. allosteric and end product
  - e. allosteric site and apoenzyme
  
5. Primary succession \_\_\_\_\_.
  - a. would occur after a volcanic eruption
  - b. would occur after a forest fire
  - c. allows for nutrients to cycle quickly through the ecosystem
  - d. allows for rapid growth in an ecosystem
  - e. All of the above are true.
  
6. Which of the following statements is true?
  - a. HeLa cells were first grown in tissue culture in the 1950's.
  - b. Apoptosis is a natural cycle following interphase.
  - c. Interphase follows metaphase and consists of 3 stages.
  - d. Kinetochore fibers aid in aligning linkage groups along the chromosome.
  - e. Both a and b are true.

7. Thomas Morgan is to \_\_\_\_\_ as Gregor Mendel is to \_\_\_\_\_.
- pea plants; fruit flies
  - human studies; cattle studies
  - hydrangea; hibiscus
  - chemistry; biology
  - none of the above
8. Which of the following is correct?
- Human urinary bladders and hollow organs have been developed in the laboratory and used in some clinical studies.
  - The human genome project was complete in 1980.
  - Sex linked traits in fruit flies were discovered by Ian Wilmut.
  - Both a and b are correct.
  - All of the above are correct.
9. Amino acids have \_\_\_\_\_ functional group(s).
- NH<sub>3</sub>
  - COOH
  - PO<sub>4</sub>
  - both a and b
  - both b and c
10. Water is \_\_\_\_\_.
- resistant to rapid temperature changes
  - the solvent of life
  - important for chemical and physical reactions in the human body
  - non-conductive if pure
  - all of the above
11. Which of the following is true?
- In the structure of a water molecule the oxygen is more electronegative than hydrogen.
  - Lipids are polar molecules that are hydrophobic.
  - Pure water is neutral at a pH of 7.0.
  - Both a and c are true.
  - All of the above are true.
12. Which of the following is **not** related to a chloroplast?
- double membrane
  - cristae
  - thylakoid
  - photosystems
  - stroma
13. A genetic code table would be used \_\_\_\_\_.
- during transcription
  - during replication
  - during translation
  - only by eukaryotes
  - All of the above are true.

14. The cytoskeleton is composed of \_\_\_\_.
- skeletal muscle
  - cytosol
  - microtubules and microfilaments
  - cellulose and pectin
  - sclereids
15. Which of the following is true?
- The cytosol is the fluid of the cell and organelles are the parts of the cell.
  - Cyclic and non-cyclic photosynthetic pathways occur in the ribosome.
  - Cell walls of a bacterial cell are composed of chitin.
  - Both a and b are true.
  - Both a and c are true.
16. Which of the following is **not** true?
- Endocytosis and exocytosis both involve plasma membrane shape changes.
  - Phagocytosis is a form of endocytosis by which a macrophage can destroy pathogens or other harmful microorganisms.
  - Cellulose, chitin and keratin are all types of protein.
  - Enzymes are types of proteins that act as catalysts by lowering the energy of activation.
  - Both glucose and fructose have the same chemical formula.
17. Which of the following is **not** true?
- A genetic cross between a homozygous tall plant and a homozygous recessive short plant will result in all tall plants in the  $F_2$  generation.
  - The phenotypic ratio for a cross between a heterozygous dominant tall purple flowered plant and a homozygous recessive short white flowered plant is 1:1:1:1.
  - The phenotypic ratio for a cross between two heterozygous purple flowers / smooth seed plants is 9:3:3:1.
  - Genotypes determine the phenotype and incomplete dominance results in a blend between parent traits.
  - Albinism is an autosomal recessive inherited trait.
18. Which lobe of the human cerebrum is most closely associated with motor function?
- insula
  - occipital
  - parietal
  - cerebellum
  - frontal
19. Thirty six bases of mRNA would be equivalent to \_\_\_\_ codons.
- 3
  - 6
  - 9
  - 12
  - none of the above

20. Which of the following is true?
- The first step of protein synthesis is transcription which involves tRNA transferring the proper amino acid to the mRNA sequence along the ribosome.
  - During translation, mRNA is formed from a DNA template in the nucleus and then transported to the ribosome.
  - In recombinant DNA research, the sticky ends of DNA are repaired or sealed with specialized restriction enzymes.
  - All of the above are true.
  - None of the above are true.
21. Which of the following is true?
- Aseptic techniques are critical to every research experiment.
  - It only takes a few years to create most pharmaceutical products.
  - Patents for pharmaceuticals are only 7 years.
  - All of the above are true.
  - None of the above are true.
22. Which of the following is **not** true?
- In DNA, complementary base pairing occurs between purines and pyrimidines which make up the back bone of the DNA molecule.
  - Three types of RNA include mRNA, tRNA and rRNA.
  - Amino acids have functional groups called amines and are held together by peptide bonds during the construction of a protein.
  - Ribosomal subunits are associated with the nucleolus.
  - The strands of DNA are antiparallel.
23. Which of the following best describes the components and sequence of events during a complete reflex arc?
- receptor, afferent neurons, interneurons, efferent neurons, effector
  - effector, efferent neurons, interneurons, afferent neurons, receptor
  - afferent neurons, interneurons, receptor, efferent neurons, effector
  - interneurons, receptor, effector, afferent neurons, efferent neurons
  - none of the above
24. Which is **not** a correct association?
- phloem – sieve tube elements
  - xylem – vessel elements
  - periderm – cork cells
  - phloem – companion cells
  - epidermis – sclereid
25. Which of the following is true?
- Bacilli, spirilli, and cocci are major shapes of prokaryotes.
  - Prokaryotic cells do not have flagellar propulsion.
  - Bacteria and all eukaryotic cells have a cell wall.
  - Both a and b are true.
  - All of the above are true.

26. Which of the following are characteristics of eukaryotic cell?

- a. presence of organelles
- b. mitotic division
- c. binary fission
- d. both a and b
- e. both a and c

27. Match organelles in **Column A** with its most appropriate function from **Column B**.

**Column A**

- 1. plasma membrane
- 2. cytoskeleton
- 3. cilia and flagella
- 4. peroxisome
- 5. centrioles

**Column B**

- a. helps give shape to the cell
- b. forms spindles
- c. oxidation of hydrogen peroxide
- d. movement
- e. allows some particles to enter and leave the cell

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

28. Which plant tissue would have the most chloroplasts?

- a. epidermal
- b. root cells
- c. mesophyll cells
- d. xylem
- e. phloem

29. Subphylum Urochordata \_\_\_\_.

- a. have animals commonly called tunicates
- b. have a larval form that resembles a tadpole
- c. retain their notochord during their adult life
- d. Both a and b are true.
- e. Both a and c are true.

30. In the human digestive system, the \_\_\_\_ is located between the pharynx and stomach.

- a. duodenum
- b. esophagus
- c. cardiac sphincter
- d. Both a and b are correct.
- e. Both b and c are correct.

31. Which of the following is **not** a prezygotic reproductive isolating factor?

- a. hybrid inviability
- b. temporal isolation
- c. habitat isolation
- d. behavioral isolation
- e. gametic isolation

32. Ecdysozoa include all of the following **except** \_\_\_\_.
- nematodes
  - Ascaris*
  - locust
  - leeches
  - crayfish
33. Diurnal animals are most active \_\_\_\_.
- at dawn and dusk
  - during the day
  - during the evening
  - during the night
  - during the summer months
34. Some female cats are calico. This can best be explained by \_\_\_\_
- Barr body inactivation
  - incomplete dominance
  - epistasis
  - polygenic inheritance
  - multiple alleles
35. Glycosidic linkage is to \_\_\_\_ as ester linkage is to \_\_\_\_.
- lipids; proteins
  - proteins; lipids
  - carbohydrates; lipids
  - carbohydrates; nucleic acids
  - proteins; nucleic acids
36. Transduction \_\_\_\_.
- is a type of horizontal gene transfer
  - is the process where bacterial cells exchange plasmids
  - is the process where a bacteriophage transfers DNA from one bacteria to another
  - Both a and b are correct.
  - Both a and c are correct.
37. Rhizobia is important to legumes. The function of rhizobia is to \_\_\_\_.
- help the plant synthesize carbohydrates
  - allow plants to receive phosphorus
  - help plants take up carbon dioxide
  - help the plant synthesize proteins
  - allow plants to receive nitrogen
38. Some animals have a home range which is an area that the animal \_\_\_\_.
- seldom leaves during their life
  - will always defend
  - avoids to stay away from predators
  - only goes to get water
  - is a communal mating ground



39. Cystic fibrosis is caused by a \_\_\_\_.
- missing lysosome's enzyme
  - repeating DNA sequence – CAG.
  - defective chloride ion transport protein
  - missing blood clotting factor
  - hemoglobin defect
40. \_\_\_\_ are protective end caps of chromosomes.
- RNA primers
  - Origins
  - Telomeres
  - Okazaki fragments
  - Plasmids
41. A photoreceptor for plants is \_\_\_\_.
- brassinosteriod
  - abscic acid
  - phytochrome
  - cytokinin
  - gibberellin

42. Match the pathogens in **Column A** with the disease it causes in **Column B**.

**Column A**

- Mycobacterium tuberculosis*
- Borrelia burgdorferi*
- Bordetella pertussis*
- Yersinia pestis*
- Helicobacter pylori*

**Column B**

- Plague
- Peptic ulcer disease
- Tuberculosis
- Lyme disease
- Pertussis

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

43. The type of behavior in which an individual acts to benefit others before itself is \_\_\_\_.
- foraging
  - pheromones
  - altruism
  - imprinting
  - fitness

44. Given the following information, determine the genotypes for the parents and offspring.

B – black fur	H – short fur
b – brown fur	h – long fur

A black long fur male guinea pig and a brown short fur female guinea pig have two offspring: offspring 1 has brown short fur and offspring 2 has black long fur.

- |                  |               |                    |                    |
|------------------|---------------|--------------------|--------------------|
| a. Father – BBhh | Mother – bbHH | Offspring 1 – bbHh | Offspring 2 – BBhh |
| b. Father – Bbhh | Mother – bbHh | Offspring 1 – bbHH | Offspring 2 – Bbhh |
| c. Father – BbHh | Mother – bbHH | Offspring 1 – BbHh | Offspring 2 – Bbhh |
| d. Father – Bbhh | Mother – bbHh | Offspring 1 – bbHh | Offspring 2 – Bbhh |
| e. Father – BBhh | Mother – bbHh | Offspring 1 – bbHH | Offspring 2 – Bbhh |

45. Reverse transcriptase \_\_\_\_\_.

- uses RNA as a template to make DNA
- is found in retroviruses
- is a useful tool in genetic engineering
- All of the above are correct.
- None of the above are correct.

46. Which of the following is **not** produced during glycolysis?

- pyruvate
- ATP
- NADH
- FADH<sub>2</sub>
- All of the above are produced during glycolysis.

47. Which of the following is true?

- Cytokinesis is complete in telophase and the spindle apparatus forms during metaphase.
- Anaphase follows metaphase and interphase follows telophase.
- Crossing over occurs in Prophase II during Meiosis II and homologous chromosomes line up on the equator during Meiosis I.
- Cleavage furrows are unique to prokaryotic cells.
- Both a and c are correct.

48. Which association is **not** correct?

- perennial plants – live more than two years
- biennial plants – take two years to complete their life cycle
- annual plants – have a one year life cycle
- perennial plants – are always woody
- annual plants – are always herbaceous

49. Which of the following is **not** a characteristic or example of an Apicomplexans?

- Plasmodium*
- spore forming
- have an apical complex
- produce sporozoites
- move by pseudopods

50. Males are considered \_\_\_\_ because they have only one X chromosome.
- a. heterozygous
  - b. hemizygous
  - c. homozygous
  - d. homologous
  - e. None of the above are correct.