

# Academic Challenge



EASTERN ILLINOIS UNIVERSITY

## 2019 Academic Challenge BIOLOGY TEST – SECTIONAL

### Physics Test Production Team

Donna Ford, John A. Logan College – Author/Team Leader

Julie Littrell, Kaskaskia College – Author

Keith Krapf, John A. Logan College - Reviewer

### 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**

**Number of Questions: 50**

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

©2019 Eastern Illinois University

All rights reserved



Academic Challenge

Biology Test (Sectional) - 2019

1. Hollow bones and feathers are characteristics of \_\_\_\_\_.
  - a. Mammalia
  - b. Aves
  - c. Actinopterygii
  - d. Reptilia
  - e. Amphibia
  
2. Which of the following is **not** a component of the human GI tract?
  - a. ilium
  - b. duodenum
  - c. cecum
  - d. jejunum
  - e. All of the above are components.
  
3. Which of the following is a trifoliolate vine?
  - a. Virginia creeper
  - b. honeysuckle
  - c. mayapple
  - d. poison ivy
  - e. None of the above are correct.
  
4. Cellular respiration takes place in the \_\_\_\_\_.
  - a. lysosomes
  - b. mitochondria
  - c. ribosomes
  - d. Golgi complex
  - e. endoplasmic reticulum
  
5. Light independent photosynthetic reactions take place in the \_\_\_\_\_.
  - a. thylakoid membranes
  - b. stroma
  - c. grana
  - d. Both a and c are correct.
  - e. None of the above are correct.
  
6. Which is **not** considered an emerging infectious disease (EID)?
  - a. West Nile encephalitis
  - b. MERS – Middle East respiratory syndrome
  - c. SARS – Severe acute respiratory syndrome
  - d. biofilm
  - e. CJD – Creutzfeldt-Jacob disease

7. Given a beaker of 10% NaCl and a red blood cell containing .01% NaCl, which of the following is true?
- A .01% solution would be hypotonic to the solution in the beaker.
  - The red blood cell would shrink if placed in the beaker.
  - The beaker of 10% NaCl would be hypertonic to the red blood cell.
  - Both b and c are correct.
  - All of the above are correct.
8. Bonds formed by transfer of electrons and the attraction of opposite charges are called \_\_\_\_\_.
- polar covalent
  - nonpolar covalent
  - hydrogen
  - ionic
  - None of the above are correct.
9. Which of the following is **not** associated with the endoplasmic reticulum?
- detoxification
  - ribosomes
  - protein synthesis
  - lipid synthesis
  - All of the above, are associated with the endoplasmic reticulum.
10. Which of the following **is/are** correct statements?
- Hydrogen bonds help stabilize the structure of DNA.
  - The second law of thermodynamics states that the universe is becoming more disorganized or that entropy is increasing.
  - On the periodic table the electronegativity of an atom can be determined by its position on the table.
  - Both a and c are correct.
  - All the above are correct.
11. Which of the following **is/are** an example/s of how materials can either get into or out of the cell through the plasma membrane?
- pinocytosis
  - phagocytosis
  - endocytosis
  - exocytosis
  - All of the above are correct.

12. The outward physical characteristics of an individual or a plant, is called its \_\_\_\_.

- allele combination
- genotype
- phenotype
- Both a and b are correct.
- All of the above are correct.

13. Which is **not** a major component of an animal plasma membrane?

- phospholipids
- cholesterol
- protein
- nucleic acid
- lipids

14. Match the structure in **Column A** with the appropriate function from **Column B**.

**Column A**

- cristae
- cytosol
- matrix
- thylakoid
- inner mitochondrial membrane

**Column B**

- glycolysis
- light dependent reactions
- citric acid cycle
- electron transport chain
- chemiosmosis

**Select the correct matching sequence:**

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

15. If **R** is dominant for red flower color and **r** is recessive for white flower color, which of the following is true?

- In incomplete dominance, the flower resulting from a homozygous dominant parent and a homozygous recessive parent would have a pink phenotype.
- If the offspring from a cross between a homozygous dominant and homozygous recessive parent displays both red and white phenotypes within the same flower, this would be an example of co-dominance.
- According to Mendel's genetics the result of a cross between a homozygous dominant parent and a homozygous recessive parent would result in 100% red offspring.
- Both b and c are correct.
- All of the above are correct.

16. \_\_\_\_ is the division of cytoplasm.
- Apoptosis
  - Cytokinesis
  - Necrosis
  - Meiosis
  - None of the above are correct.
17. Which of the following is **not** correctly matched to its function?
- mRNA – transcription
  - tRNA – translation
  - snRNA – exon removal
  - rRNA – ribosomes
  - siRNA – controls transposon
18. Which is **not** correctly matched to the disease it causes?
- bacteria – Lyme disease
  - virus – Rubella
  - protista – Malaria
  - bacteria – Yellow fever
  - virus – SARS
19. During \_\_\_\_ a cell is sometimes said to be resting, but is actually growing and synthesizing DNA.
- prophase
  - cytokinesis
  - apoptosis
  - interphase
  - None of the above are correct.
20. \_\_\_\_ are points of attachment between some animal cells that allow the cells to form strong sheets.
- Plasmodesmata
  - Anchoring
  - Desmosomes
  - Gap
  - None of the above are correct.
21. Which is **not** considered a symbiotic relationship?
- host tree and epiphytes
  - zooxanthellae and coral
  - tapeworm in the intestine of a dog
  - nitrogen-fixing bacteria in the roots of beans.
  - All of the above are examples of symbiotic relationships.

22. The bone of the medial forearm is called the \_\_\_\_.
- ulna
  - radius
  - fibula
  - humerus
  - tibia
23. Which plant part is **not** correctly matched?
- pith – stores and transport nutrients
  - xylem – forms the bark of a tree
  - meristem – plant growth
  - epidermis – outer cells of a leaf
  - anther – pollen production
24. Which of the following does **not** contain amino acids?
- collagen
  - keratin
  - peptidoglycan
  - chitin
  - elastin
25. Match the branch of biology in **Column A** with the experts in that particular field in **Column B**.

**Column A**

- the study of fish
- the study of amphibians and reptiles
- the study of fungi
- the study of viruses
- the study of antibodies

**Column B**

- immunologist
- virologist
- ichthyologist
- herpetologist
- mycologist

**Select the correct matching sequence:**

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

26. Which of the following is **not** a correct association?
- promoter region on DNA – RNA polymerase
  - unwinds the DNA strands – helicase
  - operator – repressor protein can bind to this site
  - attaches exons – reverse transcriptase
  - bonds the Okazaki fragments – DNA ligase

27. Darwin's Theory of Natural Selection consists of all of following **except** \_\_\_\_.
- overproduction
  - random mating
  - variation
  - competition
  - selection
28. The thermocline is caused because the \_\_\_\_.
- less dense cool water moves to the middle of the lake
  - more dense cool water remains toward the bottom of the lake
  - less dense warm water moves to the middle of the lake
  - more dense warm water remains at the top of the lake
  - more dense cool water remains at the top of the lake
29. Maintaining posture, muscle tone and balance are closely associated with the \_\_\_\_.
- cerebrum
  - cerebellum
  - hypothalamus
  - thalamus
  - brain stem
30. Match the biotechnology tools in **Column A** with their functions in **Column B**.

**Column A****Column B**

- |                       |  |
|-----------------------|--|
| 1. restriction enzyme | a. DNA vector  |
| 2. Taq polymerase     | b. electric current used to form pores that DNA enters |
| 3. plasmid            | c. cuts DNA at its backbone                            |
| 4. electroporation    | d. DNA polymerase used during PCR                      |

**Select the correct matching sequence;**

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

31. Which of the following is **not** a modified leaf?
- mycorrhizae
  - spines
  - bracts
  - tendrils
  - bulb



32. Which of the following statements is **false**?
- The simplest amino acid is glycine.
  - The amino acids found in proteins are the D – form of the amino acid.
  - The amino acid cysteine has a sulfhydryl group.
  - All amino acids have an amino group and a carboxyl group.
  - Proteins make up at least 50% of the dry weight of cells.
33. Plant 1 is a round, green seed plant that produced purple flowers and was pollinated with Plant 2 that is a wrinkled, green seed plant that produced white flowers. From this mating, the following were produced: plant A that has round, green seeds that produced purple flowers, plant B that has wrinkled, green seeds that produced white flowers, and plant C that has round, green seeds that produced white flowers.  
Match the plants from the genetics problem in **Column A** with their genotypes or gamete possibility answers in **Column B**.

Trait	Dominant symbol	Recessive symbol
Seed shape	Round – R	Wrinkled - r
Seed color	Yellow – Y	Green - y
Flower color	Purple – P	White - p

**Column A**

- Plant 1 gamete possibilities
- Plant 2 genotype
- Plant A genotype
- Plant B gamete possibilities
- Plant C genotype

**Column B**

- Rr; yy; pp
- r; y; p
- rr; yy; pp
- R,y,P; R,y,p; r,y,P; r,y,p
- Rr; yy; Pp

**Select the correct matching sequence:**

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

34. *Giardia* would most closely be related to \_\_\_\_.
- Trichonympha*
  - corn smut
  - Pseudomonas*
  - methanogens
  - Saccharomyces*

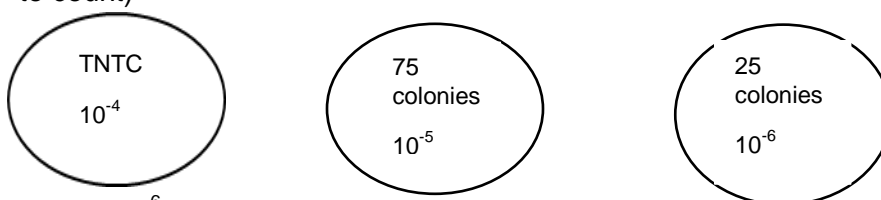
35. \_\_\_\_\_ are found in triglycerides and \_\_\_\_\_ are found in carbohydrates.

- Phosphodiester linkages; ester linkages
- Ester linkages; peptide bonds
- Ester linkages; glycosidic linkages
- Glycosidic linkages; ester linkages
- Phosphodiester linkages; glycosidic linkages

36. Compound leaves are characteristic of \_\_\_\_\_ trees.

- walnut
- maple
- chestnut
- Both a and c are correct.
- All of the above have compound leaves.

37. Determine the approximate number of microbes in a sample given the following plates with the number of colonies and the dilution on each petri dish. (TNTC – too numerous to count)



- $7.5 \times 10^{-6}$
- $2.5 \times 10^{-7}$
- $7.5 \times 10^6$
- $2.5 \times 10^7$
- Both c and d are correct.

38. Use the below DNA sequence to determine the correct order of amino acids.

**TAC GAG CAC TTT TAC GAG**

Codon	AUG	AAA	CUC	GUG
Amino acid	Methionine	Lysine	Leucine	Valine

- Methionine – Lysine – Leucine – Methionine – Valine – Lysine
- Methionine – Leucine – Valine – Lysine – Methionine – Leucine
- Leucine – Methionine – Lysine – Valine – Leucine – Methionine
- Lysine – Leucine – Valine – Methionine – Lysine – Leucine
- Methionine – Valine – Leucine – Lysine – Methionine – Leucine

39. \_\_\_\_ eat leaf litter, wood, feces, and animal carcasses.
- Detritivores
  - Saprotrophs
  - Omnivores
  - All of the above are correct.
  - Both a and b are correct.
40. The difference in the concentration of hydrogen ions between a solution with a pH of 2 and another solution with a pH of 5 is \_\_\_\_.
- 3 times
  - 30 times
  - $10^{-3}$  times
  - $10^3$  times
  - $10^4$  times
41. Human males have an X and Y chromosome, so the X-linked alleles are considered to be \_\_\_\_.
- homozygous
  - heterozygous
  - hemizygous
  - homologous
  - None of the above are correct.
42. Fungi asexual spores are produced in specialized hyphae called \_\_\_\_.
- budding bodies
  - conidiophores
  - plasmogamy
  - karyogamy
  - dikaryotic filaments
43. Which bacteria cell structure is **not** correctly matched to its function?
- capsule – keeps white blood cells from phagocytosis
  - flagella – movement of the bacteria
  - fimbriae – allows bacteria to attach to each other
  - plasmid – protects the bacteria from invasion by bacteriophages
  - cell wall – gives it shape and structure
44. The type of animal that would have book lungs is a \_\_\_\_.
- grasshopper
  - spider
  - horseshoe crab
  - centipede
  - millipede

45. Using the following information, determine the phenotypic ratio for a test cross between a heterozygous black, short fur guinea pig and brown, long fur guinea pig.

Trait	Dominant symbol	Recessive symbol
Fur color	B – black	b – brown
Fur length	H – short	h – long

- 1 : 1
- 3 : 1
- 1 : 2 : 1
- 1 : 1 : 1 : 1
- 9 : 3 : 3 : 1

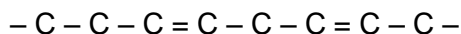
46. The DNA strand used during transcription is the \_\_\_\_\_.

- template DNA strand
- 3' → 5' DNA strand
- non-template DNA strand
- Both a and b are correct.
- All the above are correct.

47. Which of the following is **not** true?

- Gap junctions are similar to plasmodesmata found in plants.
- Photophosphorylation of ADP forms ATP and requires energy.
- Facilitated diffusion requires a protein and flows against the concentration gradient.
- NADP is an important coenzyme for photosynthetic reactions.
- FAD is an important coenzyme for cellular respiration.

48. The third carbon would have \_\_\_\_ hydrogens around it.



- 1
- 2
- 3
- 4
- 5

49. Bird species have their own songs and mating rituals. This is an example of \_\_\_\_\_.

- temporal isolation
- behavioral isolation
- habitat isolation
- mechanical isolation
- gametic isolation

50. Which is **not** correctly matched to products produced in the following metabolic pathways?
- a. Glycolysis – net 2 ATP, pyruvate
  - b. Light - dependent reaction – ATP, oxygen, NADPH
  - c. Citric acid cycle – ATP, CO<sub>2</sub>, NADH
  - d. Electron transport chain – CO<sub>2</sub>, ATP
  - e. Chemiosmosis – ATP

