

Academic Challenge



EASTERN ILLINOIS UNIVERSITY

2019 Academic Challenge BIOLOGY TEST – STATE

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

Number of Questions: 50

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

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Academic Challenge
2019 State Biology Exam

1. Endosperm is formed when _____.
 - a. pollen fertilizes the ovule
 - b. two polar nuclei fuse with the second sperm cell from the pollen
 - c. the anther goes through meiosis
 - d. the seed starts to germinate
 - e. the pollen tube forms

2. The definitive host for a parasite can best be described as the host _____.
 - a. where sexual reproduction occurs
 - b. where asexual reproduction occurs
 - c. in which the parasite cannot complete its lifecycle
 - d. in which the parasite burrows through the host's skin
 - e. in which the parasite is transmitted via an arthropod vector

3. The ectoderm is thought to give rise to the _____.
 - a. skeletal system
 - b. nervous system
 - c. integumentary system
 - d. Both a and b are correct.
 - e. None of the above are correct.

4. When starch is digested, _____.
 - a. water is required
 - b. glucose molecules are released
 - c. energy is released
 - d. hydrolysis is taking place
 - e. All of the above are correct.

5. Which is **not** another term for the Calvin cycle?
 - a. C₃ cycle
 - b. light-independent cycle
 - c. carbon fixation
 - d. photophosphorylation
 - e. All of the above are terms for the Calvin cycle.

6. _____ do not contain protein-coding genes.
 - a. Telomeres
 - b. Exons
 - c. Chromatin
 - d. Chromosomes
 - e. None of the above are correct.

7. Match the organelle in **Column A** with its function from **Column B**.

Column A

1. lysosome
2. ribosome
3. chloroplast
4. mitochondrion
5. nucleolus

Column B

- a. photosynthesis
- b. cellular respiration
- c. digestive enzymes
- d. ribosomal subunits
- e. protein synthesis

Select the correct matching sequence:

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

8. Which is **not** a method of antibody function?

- a. activation of a complement
- b. precipitation
- c. agglutination
- d. secretion of perforin
- e. neutralization

9. Which of the following is **not** used in genetic engineering?

- a. plasmid
- b. reverse transcriptase
- c. genetic probe
- d. restriction enzymes
- e. All can be used for genetic engineering.

10. Which is **not** a correct association?

- a. xylem – tracheids
- b. periderm – conduction of carbohydrates
- c. phloem – sieve tube elements
- d. epidermis – guard cells
- e. collenchyma – support

11. Which of the following is an example of how the environment can influence gene expression?

- a. Hydrangea flower color depends on the pH of the soil.
- b. The fur color of Himalayan rabbit depends on temperatures.
- c. Human height can be influenced by diet.
- d. Both a and b are true.
- e. All of the above are true.

12. Which scientist/s is/are **not** matched to their discovery?
- Meselson and Stahl – DNA replicates by semiconservative replication
 - Hershey and Chase – DNA is the genetic material in bacteriophages
 - Kary Mullis – Polymerase Chain Reaction
 - Walter Sutton – Mitosis
 - Peter Mitchell – chemiosmosis

13. Which is **not** correctly matched to either their phylum or class?

- Schistosoma* – Trematoda
- Necator americanus* – Platyhelminthes
- Ascaris lumbricoides* – Nematoda
- Taenia saginata* - Cestoda
- Enterobius vermicularis* – Nematoda

14. Given the following information, determine which molecular formula is **not** correct.

Element	Oxygen	Carbon	Hydrogen	Sodium	Chlorine
Number of protons	8	4	1	11	17

- CH₄
- Na₂O
- NaCl
- CCl₄
- All of the above are correct.

15. Which is **not** an example of bacterial horizontal gene transfer?

- binary fission
- transduction
- transformation
- conjugation
- All of the above are examples of bacterial horizontal gene transfer.

16. Some fungi produce hyphae that are dikaryotic which is symbolized as ____.

- n
- 2n
- 3n
- n + n
- None of the above are correct.

17. Which of the following is **not** an ectoparasite?

- fluke
- fleas
- lamprey
- tick
- lice

18. Match the pigments in **Column A** and their colors in **Column B**.

Column A	Column B
1. carotene	a. green
2. xanthophyll	b. orange
3. anthocyanin	c. yellow
4. chlorophyll	d. red

Select the correct matching sequence:

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

19. Which of the following is an example of a genetic disorder associated with genetic imprinting?

- Angelman syndrome
- Prader-Willi syndrome
- Martin-Bell syndrome
- Both a and b are correct.
- None of the above are correct.

20. Place the following in the correct sequence beginning with the smallest level of organization.

- | | | | |
|--------------|-----------------|---------------|--------------|
| 1. tissue | 2. cells | 3. organs | 4. chemical |
| 5. community | 6. organ system | 7. population | 8. ecosystem |

Select the correct sequence:

- 2 – 4 – 1 – 5 – 3 – 6 – 8 – 7
- 3 – 1 – 2 – 4 – 6 – 7 – 5 – 8
- 4 – 2 – 1 – 3 – 6 – 5 – 7 – 8
- 4 – 2 – 1 – 3 – 5 – 6 – 8 – 7
- 1 – 2 – 4 – 3 – 6 – 7 – 8 – 5

21. Which of the following are the correct components of the human brain stem?

- medulla, pons, midbrain
- cerebellum, pons, medulla
- vermis, pons, medulla
- hind brain, pituitary, medulla
- None of the above are correct.

22. Which is **not** a correct association?
- histones – nucleosomes
 - euchromatin – active genes
 - molecular chaperones – helps proteins fold
 - operon – a group of structural genes that are transcribed together
 - All of the above are correct associations.
23. The hydrogen ions in photophosphorylation comes from ____.
- glucose
 - Photosystem I
 - water
 - NADPH
 - chlorophyll
24. During oxidation reactions, ____ are ____.
- protons; received
 - electrons; received
 - neutrons; received
 - protons; given off
 - electrons; given off
25. The pentose phosphate pathway ____.
- takes place in the cytosol
 - can produce ribose
 - can produce NADPH
 - breaks down glucose
 - All of the above are correct.
26. Which microbiologist is **not** correctly matched to one of their discoveries?
- Joseph Lister – aseptic surgery
 - Ignaz Semmelweis – washing hands between mother's giving birth decreased infections
 - Edward Jenner – first vaccine
 - Paul Ehrlich – discovered quinine was used to treat malaria
 - Robert Koch – discovered the cause of anthrax
27. Which of the following does **not** pertain to plant germination?
- imbibition
 - seed sprouting
 - suspensor
 - ATP production
 - temperature requirements
28. Which is **not** associated with biofilm?
- communities of microbes
 - slimy polysaccharide substances
 - dental plaque
 - only prokaryotes
 - can form on contact lenses

29. Match the biogeochemical cycles in **Column A** with their descriptions in **Column B**.

Column A

1. carbon cycle
2. nitrogen cycle
3. phosphorus cycle
4. hydrologic cycle

Column B

- a. assimilation, ammonification, denitrification
- b. precipitation, evaporation, transpiration
- c. carbon dioxide, photosynthesis, respiration
- d. lacks a gaseous state, erosion releases phosphates

Select the correct sequence:

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

30. Which of the following is **not** an amino acid?

- a. lysine
- b. sterol
- c. histidine
- d. glutamic acid
- e. asparagine

31. Which structure is **not** normally found in sharks?

- a. swim bladder
- b. lateral line
- c. placoid scales
- d. cloaca
- e. electroreceptors

32. In humans red-green colorblindness is an X-linked trait and albinism is an autosomal recessive trait. Using the information in the table below, determine the probability of producing a male child who has normal skin pigmentation and is colorblind, if the mother is albino who is a carrier for colorblindness and the father is heterozygous for normal skin pigmentation and is colorblind.

Normal vision	Colorblind	Normal skin pigmentation	Albinism
X^N	X^n	A	a

- a. $\frac{1}{8}$
- b. $\frac{1}{6}$
- c. $\frac{1}{4}$
- d. $\frac{1}{2}$
- e. $\frac{3}{4}$

33. Match the organisms in **Column A** with the structure outside of their plasma membrane in **Column B**.

Column A

1. protozoan
2. fungi
3. animals
4. plants

Column B

- a. cellulose
- b. glycocalyx
- c. chitin
- d. pellicle

Select the correct sequence:

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

34. Which of the following vegetables is **not** a member of the species *Brassica oleracea*?

- a. broccoli
- b. cabbage
- c. kale
- d. spinach
- e. kohlrabi

35. Which of the following can form electrolytes?

- a. salts
- b. acids
- c. sugars
- d. alcohols
- e. Both a and b can form electrolytes.

36. Which of the following is **not** a correct association?

- a. apoenzyme – protein part
- b. entropy – energy required to do cellular work
- c. holoenzyme – cofactor and the protein part of an enzyme
- d. sulfa drugs – competitive inhibitors
- e. transferase – class of enzymes that transfer a functional group

37. Jasmonic acid affects ____.

- a. root growth
- b. pollen development
- c. fruit ripening
- d. senescence
- e. All of the above are correct.

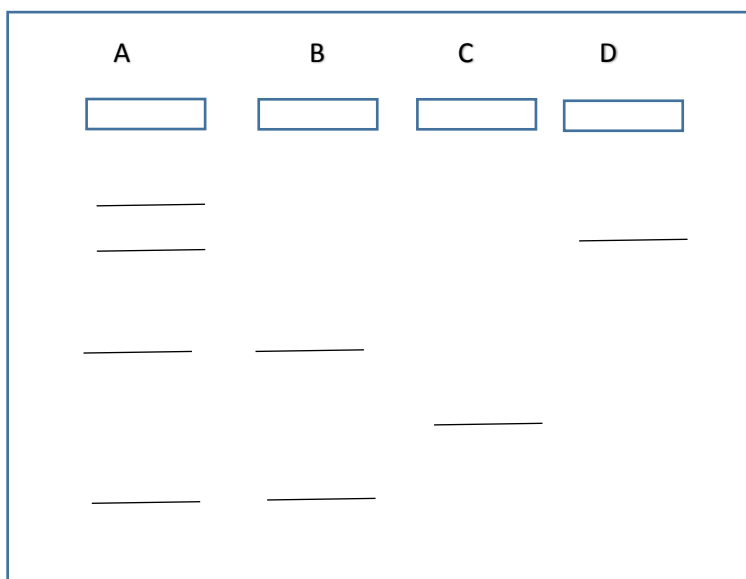
38. ____ are animals most active at dawn, dusk, or both.
- Nocturnal animals
 - Diurnal animals
 - Crepuscular animals
 - Circadian animals
 - None of the above are correct.
39. Which of the following is **not** associated with Prophase I?
- crossing- over
 - synapsis
 - nuclear envelope breaks apart
 - homologous chromosomes line up on the same chromosome
 - genetic recombination
40. Which is **not** a correct association?
- obligate aerobe – requires oxygen
 - facultative anaerobe – can grow either with or without oxygen
 - chemoheterotroph – uses organic carbons and oxidation-reduction reactions
 - photoautotroph – uses carbon dioxide as a carbon source and light as an energy source
 - All of the above are correct associations.
41. A typical leaf has all of the following **except** ____.
- guard cells
 - stele
 - stoma
 - bundle sheath
 - mesophyll
42. Which of the following is **not** associated with Subphylum Urochordata?
- fish shaped
 - tunicate
 - endostyle
 - ascidian tadpole
 - incurrent and excurrent siphon
43. If lactose is present, *E. coli* will ____.
- Some of the lactose will change will into allolactose and the allolactose will bind with the repressor protein.
 - The operator will be open so transcription will occur.
 - RNA polymerase will bind to the promoter region.
 - Three enzymes will be produced from one strand of mRNA.
 - All of the above are correct.

44. All of the following are elements is found in trace amounts in plants and animals **except**

_____.

- copper
- calcium
- zinc
- boron
- manganese

45. Determine the number of base pairs for B, C, and D, using the following information: A 200 bp, 350 bp, 500 bp, 550 bp.



- | | | | |
|----|---------------------|-------------|------------|
| a. | B – 200 bp, 500 bp; | C – 350 bp; | D – 550 bp |
| b. | B – 200 bp, 350 bp; | C – 300 bp; | D – 500 bp |
| c. | B – 550 bp, 500 bp; | C – 350 bp; | D – 200 bp |
| d. | B – 500 bp, 450 bp; | C – 550 bp; | D – 400 bp |
| e. | B – 250 bp, 300 bp; | C – 500 bp; | D – 550 bp |

46. Deforestation _____.

- increases soil erosion
- decreases carbon concentration in the atmosphere
- increases biodiversity
- increases soil fertility
- decreases global warming

47. Which is **not** a correct association?

- making proteins – anabolism
- digesting food – catabolism
- enthalpy – the total kinetic energy of a system
- thermodynamics – energy is neither created nor destroyed
- active transport – sodium potassium pump

48. Which of the following has heart shaped leaves?
- a. red bud
 - b. dogwood
 - c. elm
 - d. Both a and b are correct.
 - e. None of the above are correct.
49. Which of the following is found in the diaphysis and spongy bone?
- a. red marrow
 - b. yellow marrow
 - c. periosteum
 - d. medullary cavity
 - e. None of the above are correct.
50. In Labrador retrievers, black fur (B) is dominant to brown fur (b). In order to allow either of these colors to be expressed, there is another set of genes are required pigmentation (E) no expression (e) leading to yellow coloration. Given this information determine which is **not** correctly matched.
- a. BBee – yellow fur
 - b. BbEe – possible gametes – BE, Be, bE, be
 - c. Bbee x BbEe – could produce yellow, black, and brown colored offspring
 - d. bbEe – brown fur
 - e. All of the above are correct.

