



ACADEMIC CHALLENGE FOR  
**ACES**  
ENGINEERING AND SCIENCE



EASTERN ILLINOIS UNIVERSITY

## 2023 Academic Challenge

# SECTIONAL BIOLOGY EXAM

**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  
2023 Sectional Biology Exam

1. Match the molecules in **Column A** with the appropriate description from **Column B**.

<b>Column A</b>	<b>Column B</b>
1. Thymine	i. pyrimidine
2. Guanine	ii. sugar
3. Deoxyribose	iii. enzyme
4. DNA polymerase	iv. purine

**Select the correct matching sequence.**

- |             |         |          |         |
|-------------|---------|----------|---------|
| a. 1 – iv;  | 2 – i;  | 3 – iii; | 4 – ii  |
| b. 1 – ii;  | 2 – iv; | 3 – i;   | 4 – iii |
| c. 1 – i;   | 2 – iv; | 3 – iii; | 4 – ii  |
| d. 1 – i;   | 2 – iv; | 3 – ii;  | 4 – iii |
| e. 1 – iii; | 2 – iv; | 3 – i;   | 4 – ii  |

2. Oxygen is the final electron acceptor during \_\_\_\_.
- a. aerobic cellular respiration
  - b. photosynthesis
  - c. fermentation
  - d. protein synthesis
  - e. all of the above
3. Which of the following scientists is responsible for the AIDS cocktail?
- a. Edward Jenner
  - b. Alexander Fleming
  - c. James Watson
  - d. David Ho
  - e. Joseph Lister
4. Codon, anticodon, and ribozyme are terms associated with \_\_\_\_.
- a. protein synthesis
  - b. photosynthesis
  - c. mitosis
  - d. DNA replication
  - e. lipid synthesis
5. Blood enters the heart through the \_\_\_\_.
- a. right ventricle
  - b. left ventricle
  - c. left atrium
  - d. right atrium
  - e. aorta
6. Which of the following is **not** associated with ferns?
- a. spores
  - b. seeds
  - c. fronds
  - d. rhizomes
  - e. roots
7. Chromatin is made up of \_\_\_\_.
- a. rRNA and proteins
  - b. mRNA and DNA
  - c. DNA and rRNA
  - d. DNA and proteins
  - e. mRNA and proteins

8. Kidneys, green glands, and metanephridium are used for \_\_\_\_\_.  
a. fermentation b. digestion c. circulation d. respiration e. excretion
9. \_\_\_\_\_ is an area where two communities meet and intergrade.  
a. Ecosystem b. Estuaries c. Ecotone d. Habitat e. Niche
10. Slime mold, ameba, algae, and diatoms are members of \_\_\_\_\_.  
a. Protista b. Fungi c. Plantae d. Bacteria e. Archae
11. In a nucleotide, the sugar is bonded to \_\_\_\_\_.  
a. a phosphate and a base  
b. a phosphate only  
c. a base only  
d. a lipid and a base  
e. a carbohydrate and phosphate
12. The \_\_\_\_\_ contain digestive enzymes and play an important role in removing cellular waste as well as recycling cellular components.  
a. ribosomes  
b. chloroplasts  
c. lysosomes  
d. both a and b  
e. none of the above
13. The ability for a salamander's tail to reform following amputation is called \_\_\_\_\_.  
a. selective reproduction  
b. regeneration  
c. vegetative propagation  
d. meiosis  
e. none of the above
14. A/An \_\_\_\_\_ has the ability to both pick up and release hydrogen ions.  
a. base b. acid c. buffer d. ion e. cation
15. Stigma, style, and ovule make up the \_\_\_\_\_ of the flower.  
a. pistil b. stamen c. corolla d. calyx e. receptacle
16. Which of the following traits is an example of codominance in humans?  
a. Phenylketonuria  
b. Huntington's  
c. skin color  
d. Hemophilia A  
e. AB blood type
17. A/An \_\_\_\_\_ bond is the bond found in table salt.  
a. polar covalent  
b. ionic  
c. hydrogen  
d. peptide  
e. none of the above

18. \_\_\_\_\_ is to pollen production, as \_\_\_\_\_ is to vegetative propagation.
- Mitosis; meiosis
  - Mitosis; binary fission
  - Binary fission; meiosis
  - Binary fission; mitosis
  - Meiosis; mitosis
19. \_\_\_\_\_ is defined as one pair of alleles being able to mask the expression of another pair of alleles. An example of this can be seen in the coat/fur coloration of Labrador retrievers.
- Pleiotrophy
  - Epistasis
  - Incomplete dominance
  - Codominance
  - Polygenetic inheritance
20. Rain, transpiration, evaporation, and condensation are parts of the \_\_\_\_\_ cycle.
- carbon
  - phosphorous
  - nitrogen
  - sulfur
  - hydrologic

21. Match the branches of biology in **Column A** with what they study in **Column B**.

<b>Column A</b>	<b>Column B</b>
1. Ornithology	i. reptiles
2. Ichthyology	ii. insects
3. Herpetology	iii. birds
4. Entomology	iv. mammal
5. Mammalogy	v. fish

**Select the proper matching sequence.**

- |             |        |          |         |        |
|-------------|--------|----------|---------|--------|
| a. 1 – v;   | 2 – i; | 3 – iii; | 4 – ii; | 5 – iv |
| b. 1 – iii; | 2 – v; | 3 – iv;  | 4 – i;  | 5 – ii |
| c. 1 – i;   | 2 – v; | 3 – iii; | 4 – ii; | 5 – iv |
| d. 1 – iii; | 2 – v; | 3 – i;   | 4 – iv; | 5 – ii |
| e. 1 – iii; | 2 – v; | 3 – i;   | 4 – ii; | 5 – iv |
22. Which Phylum would have the following characteristics: collar cells, pores, spicules, and amoeboid cells?
- Nematoda
  - Porifera
  - Arthropoda
  - Chordata
  - Mollusca
23. The endosperm of a seed is formed when \_\_\_\_\_.
- the pollen tube forms
  - cones form
  - fruit forms
  - a sperm fertilizes two polar nuclei
  - the ovary ripens

24. Allele frequencies may change in a population. This is called \_\_\_\_.
- a. macroevolution
  - b. natural selection
  - c. microevolution
  - d. speciation
  - e. fitness
25. Which of the following is **not** true?
- a. Normal blood pH ranges from 7.35 to 7.45.
  - b. Pure water is neutral and contains an equal amount of hydroxyl and hydrogen ions.
  - c. An acidic solution will have a greater concentration of hydrogen ions than an alkaline solution.
  - d. Proteins are broken down into amino acids.
  - e. Carbonic acid is not found in human blood.
26. Which term is **not** matched properly to its example?
- a. aa – homozygous recessive
  - b. Aa – heterozygous
  - c. long brown fur – phenotype
  - d. P<sub>1</sub> – Mendel's offspring from the first cross
  - e. true breeding – homozygous
27. In bony fish, the structure(s) used for buoyancy is/are the \_\_\_\_.
- a. gills
  - b. swim bladder
  - c. urinary bladder
  - d. heart
  - e. kidney
28. Which of the following is **not** associated with Kingdom Fungi?
- a. Plankton
  - b. Mycorrhizae
  - c. Lichen
  - d. Hyphae
  - e. Spores
29. Which plant tissue is matched correctly with its function?
- a. cuticle – gas exchange
  - b. phloem – conducts minerals
  - c. xylem – conducts water
  - d. mesophyll – reduces water loss
  - e. ground tissue – absorbs water

30. Match the terms in **Column A** with their definitions in **Column B**.

**Column A Column B**

- |                |   |
|----------------|---|
| 1. Pathogen    | i. one organism kills and eats the other organism |
| 2. Mycosis     | ii. fungi that act like root hairs                |
| 3. Mycorrhizae | iii. a disease causing organism                   |
| 4. Competition | iv. a fungal disease                              |
| 5. Predation   | v. both organisms are harmed                      |

**Select the proper matching sequence.**

- |             |          |         |         |         |
|-------------|----------|---------|---------|---------|
| a. 1 – ii;  | 2 – iii; | 3 – iv; | 4 – v;  | 5 – i   |
| b. 1 – iii; | 2 – v;   | 3 – ii; | 4 – iv; | 5 – i   |
| c. 1 – iii; | 2 – ii;  | 3 – iv; | 4 – i;  | 5 – v   |
| d. 1 – i;   | 2 – iv;  | 3 – ii; | 4 – v;  | 5 – iii |
| e. 1 – iii; | 2 – iv;  | 3 – ii; | 4 – v;  | 5 – i   |

31. If an atom gains electrons, it is a/an \_\_\_\_\_.

- a. cation   b. anion   c. polar molecule   d. double bond   e. hybrid

32. Match the scientists in **Column A** with their expertise in **Column B**.

**Column A**

**Column B**

- |                     |                           |
|---------------------|---------------------------|
| 1. Gregor Mendel    | i. sex-linked inheritance |
| 2. Thomas Morgan    | ii. genetics              |
| 3. Carolus Linnaeus | iii. evolution            |
| 4. Charles Darwin   | iv. taxonomy              |

**Select the proper matching sequence.**

- |            |         |          |         |
|------------|---------|----------|---------|
| a. 1 – ii; | 2 – i;  | 3 – iii; | 4 – iv  |
| b. 1 – iv; | 2 – i;  | 3 – iii; | 4 – ii  |
| c. 1 – i;  | 2 – ii; | 3 – iv;  | 4 – iii |
| d. 1 – ii; | 2 – i;  | 3 – iv;  | 4 – iii |
| e. 1 – ii; | 2 – iv; | 3 – i;   | 4 – iii |

33. Which of the following statements is true?

- a. Prokaryotes reproduce asexually through a process called meiosis.  
 b. Eukaryotes reproduce sexually through a process called binary fission.  
 c. Prokaryotes and eukaryotes both may reproduce asexually.  
 d. Asexual reproduction always consists of prophase, metaphase, anaphase, and telophase.  
 e. Eukaryotes reproduce only through meiosis.

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

- a. Women may receive only one X chromosome.  
 b. Women are more likely to carry and express sex linked traits.  
 c. Men determine the sex of the child by either contributing an X or Y chromosome.  
 d. Klinefelters effects male children and is related to sex chromosomes.  
 e. An individual with Down syndrome would have 45 autosomes.

35. Bacteriophages \_\_\_\_\_.  
a. are animal viruses  
b. infect fungi  
c. infect bacteria  
d. are DNA viruses  
e. both c and d
36. One function of \_\_\_\_\_ is fixing base pair mistakes made during DNA replication.  
a. DNA ligase  
b. DNA polymerase  
c. RNA polymerase  
d. helicase  
e. DNA primase
37. Sucrose, maltose, cellulose, and glycogen are all examples of \_\_\_\_\_.  
a. nucleic acids  
b. proteins  
c. carbohydrates  
d. amino acids  
e. lipids
38. \_\_\_\_\_ helps in stem elongation in plants.  
a. Cytokinin  
b. Ethylene  
c. Abscisic acid  
d. Auxin  
e. Salicylic acid
39. The part of the brain used for coordination is the \_\_\_\_\_.  
a. medulla  
b. cerebrum  
c. hypothalamus  
d. thalamus  
e. cerebellum
40. Which are the products of cellular respiration?  
a.  $H_2O$  and  $CO_2$   
b. ATP molecules  
c.  $O_2$  and  $C_6H_{12}O_6$   
d. both a and b  
e. none of the above
41. Strict anaerobes \_\_\_\_\_.  
a. grow in the presence or absence of oxygen  
b. only grow in the absence of oxygen  
c. only grow in the presence of oxygen  
d. only grow in extremely hot temperatures  
e. only grow in extremely salty conditions



42. The organelle that packages, modifies, and secretes chemicals is the \_\_\_\_.
- Golgi complex
  - lysosome
  - ribosome
  - mitochondrion
  - endoplasmic reticulum
43. Restriction enzymes \_\_\_\_.
- separate DNA bases
  - separate RNA codons
  - cut DNA at the phosphate sugar backbone
  - chemically combine recombinant DNA
  - are isolated from viruses
44. Mutations \_\_\_\_.
- are always carcinogenic
  - are changes in rRNA
  - are always harmful
  - always increase gene expression
  - may be caused by UV light
45. If the genotype is TtRyy, what would the gamete possibilities be?
- TRy, Try, tRy, try
  - TT, Rr, yy
  - TRY, Try, TrY, trY, try, tRY
  - TR, tr, Ty, ty, ry, Ry
  - not enough information is provided
46. Centrosomes, centrioles, and spindles are structures \_\_\_\_.
- found in the cytoskeleton
  - found in a plant cell wall
  - used during cellular respiration
  - used during mitosis
  - used during DNA replication
47. The leaf vascular bundles are made of \_\_\_\_.
- guard cells and stoma
  - xylem and phloem
  - mesophyll and epidermis
  - guard cells and epidermis
  - xylem and water
48. The auditory bones are \_\_\_\_.
- hyoid, temporal, parietal
  - cochlea, stapes, tympanum
  - temporal, malleus, tympanum
  - parietal, incus, temporal
  - malleus, incus, stapes

49. Essential amino acids \_\_\_\_.
- a. are needed in all proteins
  - b. must be synthesized every day
  - c. cannot be synthesized in sufficient amounts
  - d. are the same in all animals
  - e. none of the above
50. The carbon cycle is affected by \_\_\_\_.
- a. animal respiration
  - b. decomposers
  - c. burning fossil fuels
  - d. erosion of limestone
  - e. all of the above

