



2024 Academic Challenge

BIOLOGY TEST – REGIONAL

Biology Test Production Team

Donna Ford, John A. Logan College – Author

Julie Ellis, Kaskaskia College – Author

Keith Krapf, John A. Logan College – Reviewer

Aaron White, Illinois Academic Challenge – Coordinator of Test Production

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!

© 2024 Eastern Illinois University
All Rights Reserved

Academic Challenge
Biology Test (Regional) – 2024

1. Which of the following scientists have been involved with the study of or the discovery of DNA?

- a. James Watson
- b. Francis Crick
- c. Francis Collins
- d. both a and b
- e. all of the above

2. In humans, widows peak (W) is dominant to straight-hair line (w). Match the terms in **Column A** with the correct symbols in **Column B**.

Column A

Column B

- | | |
|-----------------------------------|-----------|
| 1. homozygous dominant | i. W |
| 2. heterozygous | ii. WW |
| 3. gamete with straight-hair line | iii. Ww |
| 4. homozygous recessive | iv. w |
| 5. gamete with widows peak | v. ww |

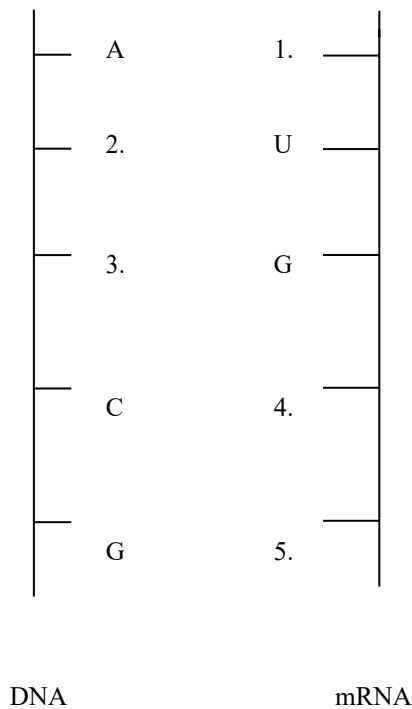
Select the most appropriate matching sequence:

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

3. If free earlobes (E) are dominant and attached earlobes (e) are recessive, what would two parents with heterozygous free earlobes expect in their children?

- a. 100% of their children will have free earlobes
- b. 75% of their children will have attached earlobes
- c. 25% of their children will have attached earlobes
- d. 50% of their children will have attached earlobes
- e. 35% of their children will have attached earlobes

4. Fill in the missing DNA and mRNA bases in the following figure.



Assuming no mutations, select the correct bases to complete the figure above:

- a. 1 – T; 2 – G; 3 – U; 4 – G; 5 – U
- b. 1 – T; 2 – A; 3 – C; 4 – G; 5 – C
- c. 1 – A; 2 – U; 3 – G; 4 – C; 5 – G
- d. 1 – U; 2 – A; 3 – C; 4 – G; 5 – C
- e. 1 – T; 2 – T; 3 – C; 4 – G; 5 – C

5. RNA consists of a _____ chain of nucleotides.

- a. single
- b. double
- c. triple
- d. both b and c
- e. all of the above

6. In DNA, the backbone or uprights are composed of _____.

- a. deoxyribose and a nitrogenous base
- b. phosphate and a nitrogenous base
- c. phosphate, deoxyribose, and a nitrogenous base
- d. phosphate and deoxyribose
- e. deoxyribose only

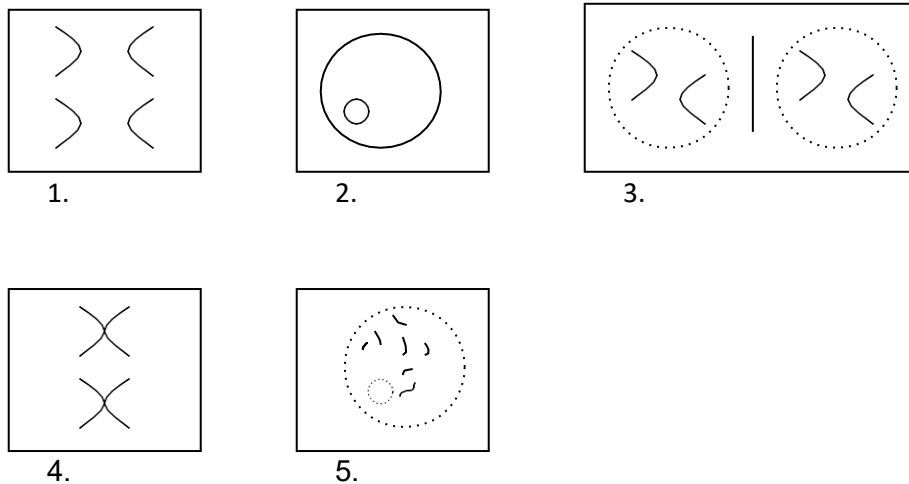
7. The following cross is an example of a _____ cross.

Rr x rr

- test
- dihybrid
- trihybrid
- dominant
- recessive

Refer to Figure A in answering questions 8 and 9.

Figure A.



8. Select the correct sequence of diagrams from **figure A**, beginning with the stage of the cell cycle in which DNA is synthesized.

- 3, 4, 5, 2, 1
- 4, 2, 3, 5, 1
- 5, 2, 4, 1, 3
- 2, 5, 4, 1, 3
- 1, 2, 3, 4, 5

9. Identify the stages of a cell's cycle represented in **figure A**.

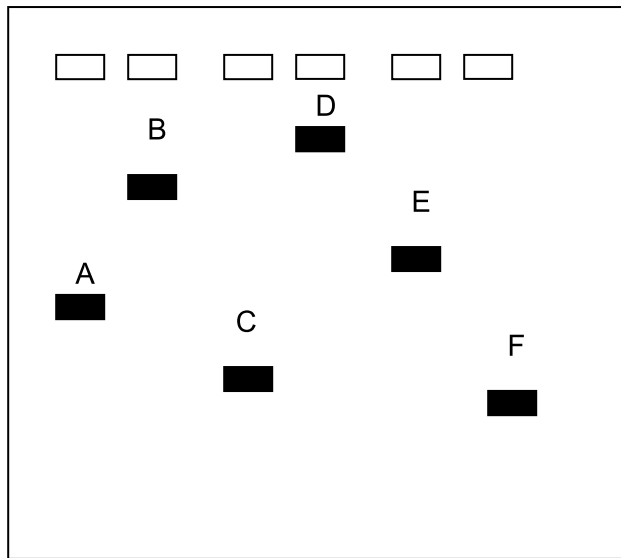
- 1 – interphase; 2 – prophase; 3 – anaphase; 4 – metaphase; 5 – telophase
- 1 – anaphase; 2 – interphase; 3 – telophase; 4 – metaphase; 5 – prophase
- 1 – telophase; 2 – prophase; 3 – metaphase; 4 – anaphase; 5 – interphase
- 1 – metaphase; 2 – telophase; 3 – anaphase; 4 – prophase; 5 – interphase
- 1 – prophase; 2 – metaphase; 3 – telophase; 4 – anaphase; 5 – interphase

10. Select the proper codon sequence for the following section of DNA.

ATGCATGCA

- a. AUGCAUGCA
- b. TACGTACGT
- c. UACGUACGU
- d. TUCGUACGT
- e. TGCATCGAT

11. In the following figure, the bands represent DNA fragments. Place the bands in order from smallest to largest.



- a. A – B – C – D – E – F
- b. D – B – E – A – C – F
- c. F – C – A – E – B – D
- d. D – E – F – A – B – C
- e. Not enough information to answer the question.

12. The expected genotype ratio for the monohybrid cross below is _____.

Bb x Bb

- a. 3 : 1
- b. 1 : 2 : 1
- c. 9 : 3 : 3 : 1
- d. 1 : 1 : 1 : 1
- e. 1 : 1

13. Which genetic disorder is **not** correctly matched with its inheritance type?

- a. Huntington's Disease – autosomal dominant
- b. Cystic fibrosis – autosomal recessive
- c. Hemophilia A – X – linked recessive
- d. Trisomy 21 – autosomal recessive
- e. Phenylketonuria – autosomal recessive

14. As a child grows or a scratch heals, both of these occur because of:

- a. binary fission
- b. meiosis
- c. spermatogenesis
- d. mitosis
- e. none of the above

15. Which of the following are examples of homeostasis?

- a. regulation of blood glucose levels
- b. temperature regulation
- c. regulation of carbon dioxide levels
- d. both a and b
- e. all of the above

16. Which is **not** part of the endomembrane system?

- a. endoplasmic reticulum
- b. Golgi apparatus
- c. nucleolus
- d. vacuoles
- e. lysosomes

17. Which of the following components will **not** be found in plant cells?

- a. centriole
- b. chloroplast
- c. cell wall
- d. plasma membrane
- e. ribosome

18. Match each cellular component in **Column A** with the most correct description in **Column B**.

Column A

1. cytoplasm
2. plasma membrane
3. cytoskeleton

Column B

- i. each cell's outer boundary
- ii. helps keep organelles in place and aids in cellular movements
- iii. inside the membrane of a cell, but outside the nucleus

Select the most appropriate matching sequence:

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

19. Which of the following is **not** stored in the plant's central vacuole?

- a. water b. amino acids c. toxins d. ATP e. wastes

20. Which of the following statements is false?

- a. Mitosis produces daughter cells that are genetically identical to each other and to the parent cell.
- b. Meiosis II is more similar to mitosis than meiosis I.
- c. Crossing – over adds genetic diversity.
- d. DNA replication takes place during the S stage of interphase.
- e. Apoptosis is the inability of a cell to die off.

21. _____ is the outermost covering over woody stems and roots.

- a. Cork cambium
- b. Vascular cambium
- c. Bark
- d. Wood
- e. Parenchyma

22. Double fertilization is common in_____.

- a. frogs
- b. crayfish
- c. marsupials
- d. flat worms
- e. daylilies

23. _____ uses light energy harvested from the sun to convert CO₂ into energy rich food.

- a. Aerobic respiration
- b. Anaerobic respiration
- c. Cellular respiration
- d. Photosynthesis
- e. Citric acid cycle

24. Which of the following is **not** a primary producer?

- a. zooplankton
- b. grass
- c. algae
- d. cacti
- e. moss

25. Which leaf part is **not** correctly matched to its function?

- a. stomata – guards the leaf openings
- b. palisade mesophyll – photosynthesis
- c. vascular bundle – transports water and carbohydrates
- d. cuticle – reduces water loss
- e. epidermis – protection

26. Carbon has six protons and usually six neutrons, but some carbons have six protons and eight neutrons. These carbon atoms are called:

- a. isotopes
- b. isomers
- c. ions
- d. cations
- e. anions

27. Which example/(s) is/(are) **not** an organic molecule?

- a. CO₂
- b. CH₄
- c. C₆H₁₂O₆
- d. C₂H₄
- e. both b and d

28. The pyrimidines of DNA are _____ and _____.

- a. adenine; thymine
- b. thymine; uracil
- c. guanine; cytosine
- d. cytosine; thymine
- e. a and c

29. Which is **not** considered one of the four most abundant chemical elements of living organisms?
- hydrogen
 - oxygen
 - phosphorus
 - nitrogen
 - carbon
30. Which is a structural protein of hair, nails, and a rhino's horn?
- enamel
 - erector pili
 - wax
 - collagen
 - keratin
31. What are plants that maintain color throughout the year and that do not lose all of their leaves in the fall called?
- annual
 - perennial
 - evergreen
 - deciduous
 - none of the above
32. Which best describes the reactants of photosynthesis?
- H_2O , CO_2 , sun
 - CO_2 , O_2 , $\text{C}_6\text{H}_{12}\text{O}_6$
 - H_2O , O_2 , $\text{C}_6\text{H}_{12}\text{O}_6$
 - H_2O , CO_2 , $\text{C}_6\text{H}_{12}\text{O}_6$
 - O_2 , $\text{C}_6\text{H}_{12}\text{O}_6$, sun
33. Energy rich sugars or carbohydrates serve as a quick energy source for humans. Which of the following is the most abundant monosaccharide found in the human body?
- glycogen
 - glycerol
 - fructose
 - maltose
 - glucose
34. $\text{O} = \text{O}$ represents _____.
- an ionic bond
 - a peptide bond
 - a double bond
 - a hydrogen bond
 - elemental oxygen

35. Which of the following is **not** considered part of the small intestine?
- ileum
 - sigmoid colon
 - jejunum
 - intestinal villi
 - duodenum
36. All living organisms have the following characteristics **except**:
- acquiring energy
 - growth and development
 - cellular
 - response to stimuli
 - tissues
37. What is a frog's hearing apparatus called?
- tympanic membrane
 - brow spot
 - duodenum
 - canaliculi
 - lacuna
38. Involuntary muscle tissue with both intercalated discs and striations would be classified as_____.
- smooth
 - skeletal
 - cardiac
 - striated
 - both b and d
39. Beginning with the mouth and ending with the anus, place the following structures in the proper sequence by number, then select the correct answer.
- large intestine
 - stomach
 - pharynx
 - esophagus
 - small intestine
- 1, 3, 4, 5, 2
 - 4, 2, 3, 5, 1
 - 3, 4, 2, 5, 1
 - 2, 4, 3, 1, 5
 - 3, 2, 4, 5, 1

40. _____disproved the widely accepted view of spontaneous generation.

- a. Robert Koch
- b. Alexander Fleming
- c. Carolus Linnaeus
- d. Louis Pasteur
- e. Gregor Mendel

41. Fossils usually form from_____.

- a. muscles
- b. bones
- c. teeth
- d. both b and c
- e. all of the above

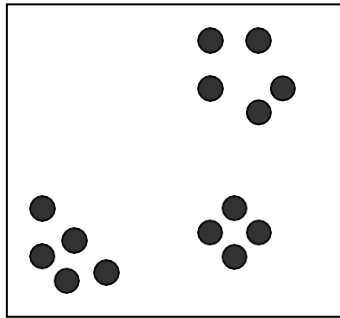
42. Which vector is **not** correctly matched to a disease it carries?

- a. House flies – *Streptococcus*
- b. Mosquito – Malaria
- c. Tick – Lyme disease
- d. Tsetse fly – African sleeping sickness
- e. Mosquito – West Nile Virus

43. Which of the following is **not** a mammal?

- a. dolphin
- b. whale
- c. shark
- d. kangaroo
- e. rat

44. The following figure represents the distribution of organisms within a population.



Which of the terms describe the above distribution pattern?

- a. clumped dispersion
 - b. patchiness
 - c. aggregate distribution
 - d. random dispersion
 - e. answers a, b, and c
45. Extreme thermophiles normally live in:
- a. salty conditions
 - b. swamps
 - c. cold conditions
 - d. hot conditions
 - e. sulfur environments
46. Mushrooms, ferns, sponges, algae, and amebas are all:
- a. found in the domain Eukarya
 - b. found in the domain Archae
 - c. prokaryotes
 - d. heterotrophs
 - e. autotrophs
47. A group of classes would be in a(n)_____.
- a. order
 - b. genus
 - c. phylum
 - d. species
 - e. strain

48. Which of the following is the correct way to write the scientific name of a lemur?

- a. *Lemus Catta*
- b. Lemus Catta
- c. Lemus catta
- d. *Lemus catta*
- e. All of these are proper ways to write the scientific name for a lemur.

49. The living organisms that surround your home may include deer, dogs, cats, trees, birds, turtles, and bacteria. These organisms make up a/(an)_____.

- a. ecosystem
- b. community
- c. population
- d. biome
- e. biosphere

50. _____ is all the Earth's communities.

- a. Hydrosphere
- b. Biosphere
- c. Lithosphere
- d. Atmosphere
- e. Ecosphere

Scratch Paper