2023 Academic Challenge

REGIONAL 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!

Academic Challenge
Biology Test (Regional) – 2023

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. Rosalind Franklin d. both a and b e. all of the above

2. Several farmers have noticed that over the past years reproduction and numbers of offspring have increased in cattle. If studies were to conclude that increases in soy products eaten are linked to increases in reproductive activities in cattle, then this would be an example of:

a. positive correlation b. negative correlation c. no correlation
d. ambiguous correlation e. none of the above

3. Which of the following properties is/(are) shared both by DNA and RNA?

a. contain the 5-carbon sugar called deoxyribose
b. contain the nitrogenous base called adenine
c. contain the nitrogenous base called uracil
d. consist of two strands
e. both a and b

4. Which of the following are examples of cells that are specialized both structurally and functionally?

a. muscle b. blood c. nerve d. both a and c e. all of the above

5. The atomic weight is determined by adding the number of ____ and ____ found in the nucleus of an atom.

a. neutrons; electrons b. protons; neutrons c. ions; electrons
d. protons; ions e. none of the above

6. The body cavity that can be subdivided into right and left pleural cavities is called the:

a. abdominal cavity b. thoracic cavity c. mediastinum
d. pelvic cavity e. none of the above

7. 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

8. Which organelle is considered the “power house” of a cell and provides the energy needed for the growth and repair of tissues?

a. Golgi apparatus b. meiosis c. lysosome d. mitochondrion e. none of the above

9. The ____ membranes line the abdominopelvic cavity.

a. pericardial b. pleural c. peritoneal d. both a and b e. none of the above

10. Select the statement that is **not** correct:

a. An individual with Turner syndrome lacks an X chromosome and is male.
b. An individual with Klinefelter syndrome may have enlarged breasts.
c. An individual with Klinefelter syndrome is male and has an extra X chromosome.
d. Normal males have XY sex chromosomes and normal females have XX sex chromosomes.
e. Trisomy 21 is characteristic of Down syndrome.

11. Which of the following is not considered part of the small intestine?

a. ileum b. sigmoid colon c. jejunum d. intestinal villi e. duodenum

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

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

13. Mr. Jones and his son go on a fishing trip. While on Cedar Lake in Carbondale, Illinois, they catch a bluegill fish and observe the flight of a blue heron. Both of these organisms belong to the same:

a. community b. species c. population d. genus e. class

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. There are ____ elements that are naturally occurring on earth.

a. 58 b. 92 c. 96 d. 102 e. 104

16. The term ____ refers to the natural death of a cell.

a. mitosis b. meiosis c. apoptosis d. differentiation e. none of the above

17. Which level of protein structure may be linear and referred to as appearing like a bead on a string?

a. primary b. secondary c. tertiary d. quaternary e. both a and c

18. Some organisms such as worms, spiders, and salamanders have the ability to grow body parts that may have been severed. This phenomenon is known as:

a. regeneration b. vegetative propagation c. reincarnation d. genetic engineering
e. meiosis

19. 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

20. An atom or molecule that is electrically charged because of oxidation or reduction reactions is called a/(an) ____.

a. proton b. isotope c. ion d. plasmid e. isomer

21. Various molecular forms of a gene for a particular trait are called:

a. loci b. alleles c. karyotypes d. both a and c e. none of the above

22. The most important monosaccharide or simple sugar found in the human body is ____, which is stored in liver cells as ____:

a. glucose; glycogen b. starch; glucose c. glucose; galactose d. maltose; starch
e. glycerol; lactose

23. Which of the following is/(are) true of anabolic steroids?

a. they may promote growth of certain tissues
b. doctors may prescribe them to treat different diseases
c. they are a group of proteins that may cause serious and dangerous side effects such as increased risk of heart diseases, infertility, and severe psychological disorders
d. both a and b
e. all of the above

24. Johnny is 2 years old and jumped down from a four foot high slide without shoes on. He is in pain and refuses to put pressure on his right foot. Which of the following would be most cost effective and provide his parents and doctors with the best information to rule out the possibility of a fracture?

a. encephalogram b. X-ray c. MRI d. electrocardiogram e. palpation

25. 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

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 of the following terms is **not** associated with the hydrologic cycle?

a. transpiration b. condensation c. assimilation d. precipitation e. evaporation

28. If a colorblind woman marries a man with normal vision, what is the probability that their sons will be colorblind?

a. 0% b. 25% c. 50% d. 75% e. 100%

29. Which is not part of the endomembrane system?

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

30. Bird wings and insect wings are to whale fins and human arms as ____ is to ____.

a. homologous structures; analogous structures
b. vestigial structures; analogous structures
c. analogous structures; homologous structures
d. analogous structures; vestigial structures
e. vestigial structures; homologous structures

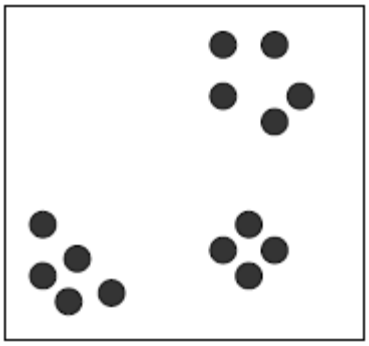
31. A prokaryotic cell would have a:

a. mitochondrion b. nucleoid c. Golgi apparatus d. lysosome e. all of the above

32. ____ is the outermost covering over woody stems and roots.

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

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



Which of the terms describe the distribution pattern?

a. clumped dispersion
b. patchiness
c. aggregate distribution
d. random dispersion
e. answers a, b, and c

34. Biennials:

a. take two years to complete their life cycle
b. are herbaceous plants
c. store carbohydrates
d. typically flower during the second year
e. all of the above

35. Molecules that are attracted to water are said to be:

a. hydrophobic b. hydrophilic c. nonpolar d. buffered e. both b and c

36. All living organisms have the following characteristics **except**:

a. acquiring energy b. growth and development c. cellular
d. response to stimuli e. tissues

37. Which is **not** a stage of mitosis?

a. cytokinesis b. metaphase c. telophase d. anaphase e. prophase

38. In the spring, many fruit trees bloom. If there is a killing frost many blooms will be harmed causing the amount of fruits reaching maturity to decrease. This is an example of:

a. density – dependent factors
b. biotic factors
c. density – independent factors
d. biotic potential
e. both a and b

39. Amino acids, monosaccharides, and nucleotides are examples of ____.

a. inorganic molecules b. monoglycerides c. polymers d. monomers e. polypeptides

40. The cytoskeleton is responsible for:

a. cell shape b. movement c. packaging proteins d. both a and b e. all of the above

41. ____ is the study of the distribution of plants and animals throughout the world.

a. Zoogeography b. Botany c. Zoology d. Ecology e. Biogeography

42. Extreme thermophiles normally live in:

a. salty conditions b. swamps c. cold conditions d. hot conditions e. sulfur environments

43. Match the organisms in Column A with the term that best describes their diets from Column B.

Column A	**Column B**
1. deer, rabbits, cows	i. carnivores
2. lions, tigers, wolves	ii. detritus feeders
3. bears, pigs, humans	iii. herbivores
4. earthworms, mussels, snails	iv. omnivores

Select the most appropriate matching sequence:

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

44. 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

45. What genotypes would correctly complete the following Punnett square?

	A	a
A	1	2
a	3	4

Select the correct matching sequence:

a. 1 – AA; 2 – AA; 3 – Aa; 4 – aa
b. 1 – Aa; 2 – Aa; 3 – Aa; 4 – aa
c. 1 – AA; 2 – Aa; 3 – Aa; 4 – aa
d. 1 – aa; 2 – aa; 3 – Aa; 4 – AA
e. 1 – AA; 2 – Aa; 3 – aa; 4 – Aa

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

a. CO_2 b. CH_4 c. $C_6H_{12}O_6$ d. C_2H_4 e. both b and d

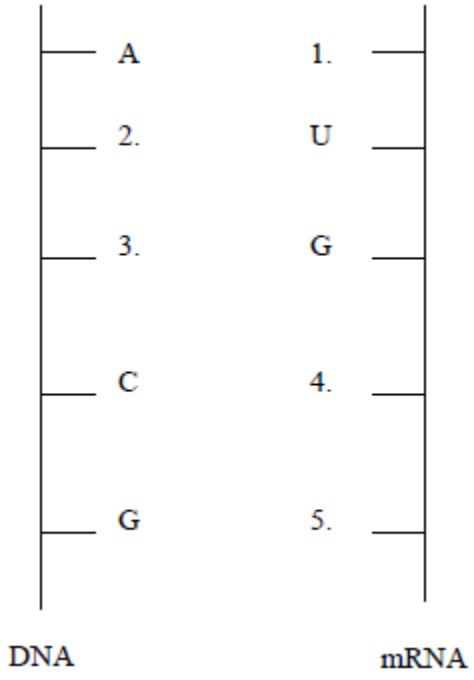
47. Ferns, redwood trees, and oak trees are all examples of:

a. bryophytes b. seed plants c. gametophytes d. vascular plants e. both b and c

48. Reproduction in angiosperms is described as double fertilization. One sperm fertilizes the egg to form a/(an) ____, and the other fertilizes polar nuclei forming ____.

a. endosperm; seed b. zygote; endosperm c. fruit; seed
d. endosperm; zygote e. fruit; zygote

49. 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

50. Match the animal in Column A with their class in Column B.

Column A	**Column B**
1. turtle	i. Aves
2. nurse shark	ii. Mammalia
3. blue whale	iii. Amphibia
4. cardinal	iv. Chondrichthyes
5. frog	v. Reptilia

Select the correct matching sequence:

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