



2024 Academic Challenge

BIOLOGY TEST – Sectional

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
Biology Test (Sectional) – 2024

1. Bonds found between nitrogenous bases of DNA are called_____, and bonds between amino acids of proteins are called_____.
 - a. ionic; covalent
 - b. covalent; ionic
 - c. peptide; hydrogen
 - d. hydrogen; peptide
 - e. peptide; covalent

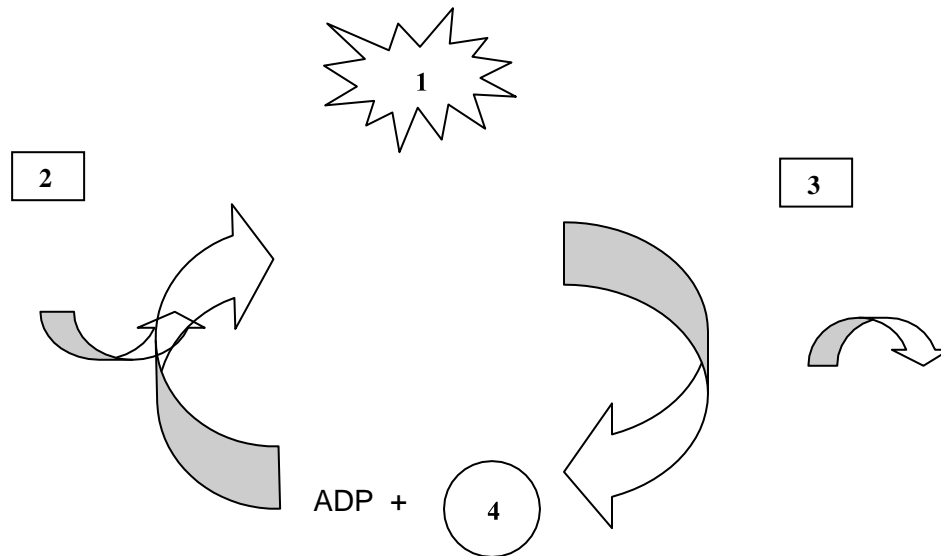
2. Molecules are composed of_____, and eukaryotic cells contain structures called_____.
 - a. tissues; organs
 - b. compounds; tissues
 - c. atoms; organelles
 - d. both b and c
 - e. none of the above

3. In which of the following types of cells would you expect to see the most abundant numbers of lysosomes?
 - a. Red blood cells
 - b. White blood cells
 - c. Muscle cells
 - d. Cardiac cells
 - e. Adipose cells

4. The four major tissue types are:
 - a. Muscle, bone, blood, and nervous
 - b. Connective, blood, nervous, and epithelial
 - c. Epithelial, nervous, connective, and muscle
 - d. Fat, connective, epithelial, and muscle
 - e. None of the above

5. Which of the following is **not** one of the four main types of fruit?
 - a. Multiple fruit
 - b. Dispersal fruit
 - c. Aggregate fruit
 - d. Accessory fruit
 - e. Simple fruit

6. Correctly identify the components of the ATP cycle:



Select the correct answer:

- 1 – ATP, 2 – phosphate, 3 – endergonic reaction, 4 – exergonic reaction
 - 1 – phosphate, 2 – ATP, 3 – exergonic reaction, 4 – endergonic reaction
 - 1 – exergonic reaction, 2 – endergonic reaction, 3 – phosphate, 4 – ATP
 - 1 – ATP, 2 – endergonic reaction, 3 – exergonic reaction, 4 – phosphate
 - 1 – ATP, 2 – exergonic reaction, 3 – endergonic reaction, 4 – phosphate
7. The ability to produce ATP aerobically within muscle cells requires:
- Glucose
 - Oxygen
 - Mitochondria
 - Both a and b
 - All of the above
8. In peas, round seeds (R) are dominant to smooth seeds (r) and yellow seeds (Y) are dominant to green seeds (y). What is the expected phenotypic ratio for a cross between a plant heterozygous for both traits and a plant homozygous recessive for both traits?
- 1: 1: 1: 1
 - 3: 1
 - 1: 2: 1
 - 9: 3: 3: 1
 - 9: 3: 4

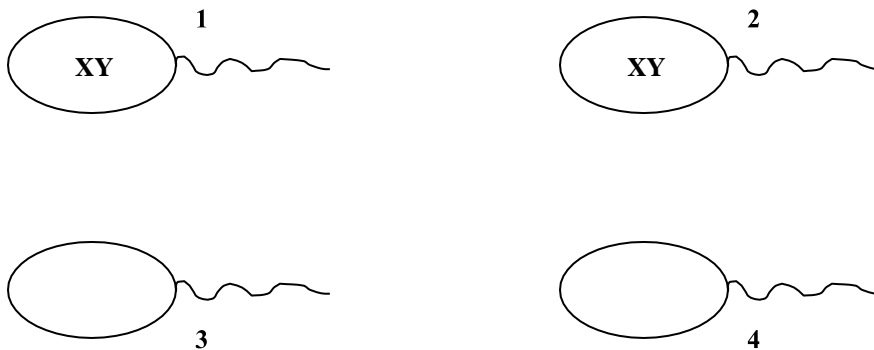
9. The adrenal gland is _____ to the kidney.

- a. medial
- b. inferior
- c. lateral
- d. superior
- e. none of the above

10. Ions from which elements are considered the most important for nerve fiber conduction?

- a. Oxygen and Nitrogen
- b. Potassium and Sodium
- c. Chlorine and Magnesium
- d. Hydrogen and Sulfur
- e. Iron and Magnesium

11. The following sperm cells were produced during spermatogenesis.



Select the correct answer pertaining to the four sperm cells above:

- a. The sperm cells were more than likely produced by nondisjunction.
- b. Sperm cell number 1 or 2 could fertilize an egg causing Klinefelter syndrome.
- c. Sperm cell number 3 or 4 could fertilize an egg causing Turner syndrome.
- d. Only statements b and c are true.
- e. All of the statements above are true.

12. Select the element that is not considered one of the four major elements that make up about 96% of the material found in the human body:

- a. Sulfur
- b. Hydrogen
- c. Oxygen
- d. Nitrogen
- e. Carbon

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

- a. Coxal-hip
- b. Crural-elbow
- c. Cutaneous-skin
- d. Femoral-thigh
- e. Tarsal-ankle

14. In Caucasians, an individual with curly hair and one with straight hair would produce a baby with wavy hair. This is an example of:

- a. Codominance
- b. X-linked inheritance
- c. Incomplete dominance
- d. Dominant inheritance
- e. Recessive inheritance

15. Which of the following statements is **incorrect**?

- a. Acids release hydroxyl ions and bases release hydrogen ions.
- b. Fluctuations in pH, temperature, and various chemicals could denature proteins.
- c. Enzymes act as catalysts without being consumed by the reaction.
- d. Amino acids are the building blocks for proteins.
- e. Salts provide ions for various metabolic activities.

16. A pH of 9 means that a solution contains 10^{-9} g of hydrogen ions per liter. This logarithm can be translated to ____g of hydrogen ions per liter:

- a. 0.000001
- b. 0.0000001
- c. 0.00000001
- d. 0.000000001
- e. 0.0000000001

17. Which is/are **true** of gel electrophoresis?

- a. A current is conducted along the gel due to a buffer containing a salt solution
- b. Molecules separate according to size and charge, and the larger molecules do not travel on the gel as far as smaller ones
- c. Electropositive substances will migrate along the gel toward the anode
- d. Both b and c
- e. All of the above

18. Which of the following cell types contain a cell wall composed primarily of peptidoglycan?

- a. Plant
- b. Animal
- c. Bacteria
- d. Fungi
- e. None of the above

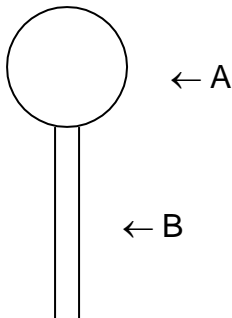
19. A typical dicot would have all of the following parts **except** a/an_____.

- a. pith
- b. vascular bundle
- c. cuticle
- d. spongy mesophyll
- e. epidermis

20. The gametophyte generation is dominant in_____.

- a. ferns
- b. gymnosperms
- c. mosses
- d. angiosperms
- e. all of the above

21. The following figure represents a phospholipid. The part labeled A is _____, while the part labeled B is _____.



- a. hydrophilic; hydrophobic
- b. the tail; the head
- c. the head; the tail
- d. Both a and b are correct.
- e. Both a and c are correct.

22. Which base or bases are purines of DNA?

- a. Adenine
- b. Guanine
- c. Cytosine
- d. Both a and b
- e. Both b and c

23. In cattle, a white cow and a red bull produce a calf that has both reddish hair and white hair. This can best be explained by_____.

- a. codominant alleles
- b. incomplete dominant alleles
- c. complete dominant alleles
- d. epistasis
- e. X-linked traits

24. Which of the following is/are products of the noncyclic light-dependent pathway of photosynthesis?

- a. NADH
- b. NADPH
- c. FADH₂
- d. ATP
- e. both b and d

25. Which is/are secreted by the pancreas?

- a. insulin
- b. glycogen
- c. glucagon
- d. both a and b
- e. both a and c

26. Down's syndrome is usually caused by_____.

- a. a dominant trait
- b. a recessive trait
- c. an X-linked trait
- d. oncogenes
- e. nondisjunction

27. Fish have a lateral line, which helps_____.

- a. with sight
- b. maintain equilibrium
- c. with swimming
- d. with respiration
- e. detect vibrations in the water

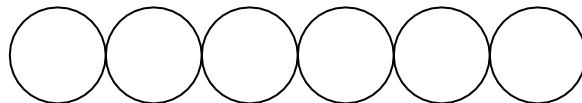
28. Which biochemical cycle requires bacteria?

- a. Carbon cycle
- b. Phosphorus cycle
- c. Sulfur cycle
- d. Nitrogen cycle
- e. Hydrological cycle

29. Which of the following biomes has the least amount of average rainfall?

- a. Arctic tundra
- b. Prairie
- c. Temperate deciduous forest
- d. Temperate rain forest
- e. Tropical rain forest

30. The figure below represents which type of bacteria?



- a. Diplobacilli
- b. Diplococci
- c. Staphylococci
- d. Streptobacilli
- e. Streptococci

31. Which of the following is **not** a type of connective tissue?

- a. Muscle
- b. Bone
- c. Cartilage
- d. Adipose
- e. Blood

32. Which of the following is **not** one of the mechanisms for microevolution?

- a. Gene flow
- b. Natural selection
- c. Genetic drift
- d. Random mating
- e. Mutation

33. Which are radial animals with stinging threads?

- a. Schistosoma
- b. Sponges
- c. Platyhelminthes
- d. Mollusks
- e. Cnidarians

34. The femoral vein is found in the _____ of the human body.

- a. neck
- b. leg
- c. arm
- d. head
- e. hand

35. DNA polymerase _____.

- a. is only found in eukaryotes
- b. attaches nucleotides to the 3' end
- c. stabilizes the mRNA
- d. has the same function as DNA ligase
- e. cuts DNA at the backbone

36. Which term does **not** have a similar meaning?

- a. Primary producer
- b. Autotroph
- c. Herbivore
- d. Lithotroph
- e. Phototroph

37. Which plant is **not** matched appropriately?

- a. Corn - Monocot
- b. Peanut – Dicot
- c. Pea – Monocot
- d. Beans – Dicot
- e. Tulip – Monocot

38. If an element has an atomic number of 24, the number of valence electrons would be_____.
- 2
 - 4
 - 6
 - 8
 - 10
39. Which of the following would **not** be considered to be a carotenoid color?
- Yellow
 - Orange
 - Green
 - Red
 - All of the above are carotenoids
40. A/an_____ can be described as a coastal water way where fresh water and salt water meet.
- estuary
 - bog
 - swamp
 - marsh
 - delta
41. Which of the following is **not** in the Phylum Mollusca?
- Brain coral
 - Octopus
 - Slug
 - Clam
 - Snail
42. The liquid compartment within the thylakoid of the chloroplast is the_____.
- lumen
 - stroma
 - grana
 - matrix
 - none of the above

43. Match the disaccharide from **Column A** with the appropriate monosaccharide from **Column B**.

Column A

1. sucrose
2. maltose
3. lactose

Column B

- a. galactose
- b. fructose
- c. glucose

Select the most correct matching sequence.

- | | | |
|----------|-------|-------|
| a. 1-b,c | 2-c | 3-a,c |
| b. 1-a | 2-c | 3-b |
| c. 1-c | 2-a,c | 3-b,c |
| d. 1-b | 2-b,c | 3-a,b |
| e. 1-a,c | 2-c | 3-b,c |

44. CAM plants close their stomata during the day to_____.

- a. exchange carbon dioxide
- b. conserve oxygen
- c. conserve water
- d. both a and b
- e. both b and c

45. Which of the following is the largest mammal?

- a. blue whale
- b. shrew
- c. bat
- d. mouse
- e. cheetah

46. Which of the following is **not** true about Gram positive bacteria?

- a. stain purple
- b. thick peptidoglycan layer
- c. teichoic acids
- d. porin proteins
- e. All of the above are true.

47. Mature mRNA is made_____.

- a. using the ribosome
- b. by splicing out the introns
- c. by splicing out the exons
- d. using the tRNA anticodons
- e. by translation

48. If a man with hemophilia has children, which of the following is true?
- a. His daughters could be carriers.
 - b. His daughters could have hemophilia depending on their mom's genotype.
 - c. His sons would not be affected by his hemophilia allele.
 - d. Both a and c are correct.
 - e. All of the above are correct.
49. A _____ may be described as: cold, long winters, many conifers, eagles, wolverines, bobcats, and elks.
- a. temperate rain forest
 - b. boreal forest
 - c. savanna
 - d. tundra
 - e. chaparral
50. Centrioles are _____.
- a. important for digesting worn out cell parts
 - b. made up of microfilaments
 - c. important for keeping the plant cells shape
 - d. made up of microtubules
 - e. none of the above

Scratch Paper

