



2020 Academic Challenge

BIOLOGY TEST – SECTIONAL

Biology Test Production Team

Donna Ford, John A. Logan College – Author/Team Leader

Julie Littrell, Kaskaskia College – Author

Keith Krapf, John A. Logan College - Reviewer

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
2020 Sectional Biology Exam

1. A plant with a genotype of TtRyy. Which could be from a gamete possibility?
 - a. TRY
 - b. tRY
 - c. Try
 - d. trY
 - e. All the above could be a gamete possibility.

2. Which of the following is a hamstring muscle?
 - a. semitendinosus
 - b. semimembranosus
 - c. rectus femoris
 - d. Both a and b are correct.
 - e. All of the above are correct.

3. Which functional group is **not** matched with the correct chemical formula?
 - a. Amino – NH_2
 - b. Sulfhydryl – SO_4^{-2}
 - c. Phosphate – PO_4^{-3}
 - d. Carboxyl – COOH
 - e. Hydroxyl – OH

4. The Golgi apparatus is **not** involved in _____.
 - a. transcription
 - b. shipping
 - c. sorting
 - d. receiving
 - e. Both a and b are not correct.

5. Which of the following is **not** a CAM plant?
 - a. orchid
 - b. cactus
 - c. pineapple
 - d. agave
 - e. corn

6. Kidneys, ureters and the urethra would all be studied and examined closely by a/an _____.
 - a. pediatrician
 - b. urologist
 - c. respiratory therapist
 - d. oncologist
 - e. None of the above are correct.

7. Forging behaviors include all but ____.
- locating food
 - preparing food
 - selecting food
 - capturing food
 - gathering food
8. Which disease does **not** have a vaccine?
- polio
 - measles
 - malaria
 - hepatitis A
 - cholera
9. Posttranscriptional modification in eukaryotes involve all of the following, **except**:
- pre-mRNA containing both introns and exons
 - adding a cap and a tail
 - introns removed
 - exons spliced together
 - All of the above are correct.
10. Which is **not** caused by an aneuploidy?
- Klinefelter syndrome
 - Turner syndrome
 - Huntington's disease
 - Down syndrome
 - Patau syndrome
11. Which chemical is **not** needed for the light-independent reaction?
- NADPH
 - Rubisco
 - ATP
 - Chlorophyll
 - RuBP
12. Which element does **not** have a high electronegativity?
- Hydrogen
 - Fluorine
 - Chlorine
 - Nitrogen
 - Oxygen

13. Which is **not** a correct association?
- Cyanobacteria – photoautotroph
 - Amoeba* – chemoheterotroph
 - Purple nonsulfur bacteria – photoheterotroph
 - Staphylococci* – chemoautotroph
 - Methanogen – chemoautotroph
14. All of the following are in Class ____: nudibranch, slug, and snails.
- Mollusca
 - Gastropoda
 - Polyplacophora
 - Cephalopoda
 - Pelecypoda
15. Which of the following has vascular tissue?
- Liverworts
 - Mosses
 - Ferns
 - Hornworts
 - All of the above have vascular tissue.
16. Which symbiotic relationship is **incorrect**?
- Bird's nest in a tree – commensalism
 - Ticks on a dog – parasitism
 - Coral polyp and zooxanthellae – mutualism
 - Nitrogen – fixing bacteria and legumes – commensalism
 - Mycorrhizae – mutualism
17. Match the scientific method terms in **Column A** with their definitions in **Column B**.

Column A

- Dependent variable
- Control group
- Independent variable
- Experimental group
- Hypothesis
- Prediction

Column B

- A working explanation to an observation.
- What is counted or measured.
- The organisms that receive the treatment.
- The variable that is changed.
- The expected the results of an experiment.
- The organisms that do not receive the treatment.

Select the correct matching sequence.

- 1 – v; 2 – vi; 3 – ii; 4 – i; 5 – iv; 6 – iii
- 1 – ii; 2 – vi; 3 – iv; 4 – iii; 5 – i; 6 – v
- 1 – iv; 2 – vi; 3 – ii; 4 – iii; 5 – i; 6 – v
- 1 – ii; 2 – iv; 3 – v; 4 – iii; 5 – vi; 6 – i
- 1 – vi; 2 – iv; 3 – ii; 4 – i; 5 – iii; 6 – v

18. Which association of cell division is **incorrect**?
- Z ring – bacteria
 - cell plates – plants
 - cleavage furrows – animals
 - budding – yeast
 - All of the above are correct.
19. The lactose operon is a/an _____, while the tryptophan operon is a/an _____.
- repressible operon; inducible operon
 - controlled operon; inducible operon
 - inducible operon; controlled operon
 - inducible operon; repressible operon
 - repressible operon; controlled operon
20. Which is **not** a characteristic Mendel used in his experiment?
- pod color
 - flower position
 - pod shape
 - carbohydrate content
 - Mendel used all of these characteristics.
21. Which of the following would be the outgroup?
- snake
 - Amphioxus*
 - Perca*
 - frog
 - shark
22. Which structure found in eukaryotes is **not** correctly described?
- cilia – 9 + 2 structure
 - centriole – 9 x 3 structure
 - flagella – 9 + 2 structure
 - vacuole – maintains hydrostatic pressure
 - microfilaments – tubulin
23. If an element has an atomic number of 20 and has 20 neutrons, then _____.
- it would have an atomic mass of 40 amu
 - if there were 40 grams then it would be 6.02×10^{23} atoms
 - it would probably would form an ion with a +2 charge
 - it would have 4 space orbitals
 - All of the above statements are correct.

24. Two glucose molecules joined together by dehydration reactions will form ____.
- sucrose
 - fructose
 - galactose
 - maltose
 - None of the above are correct.
25. Which genetic disorder is **not** correctly matched?
- Menkes disease – defective copper transport protein
 - Cystic fibrous – defective chloride ion transport protein
 - Cri du chat – deletion on chromosome 5
 - Angelman syndrome – deletion on chromosome 15 from the sperm
 - Phenylketonuria – missing an enzyme to metabolize phenylalanine
26. Which of the following is **not** associated with bacterial protein synthesis?
- intron
 - operon
 - operator
 - polyribosome
 - promoter
27. Which does **not** apply to Phylum Nematoda?
- parasite
 - decomposer
 - predator
 - ecdysis
 - parapodia
28. Which of the following plants did **not** contribute to the production of coal?
- ferns
 - liverworts
 - horsetails
 - club mosses
 - All of the above contributed to the production of coal.
29. Which is **not** a correct association with ribosomes?
- P site – tRNA with the growing peptide chain
 - E site – tRNA leaves the ribosome
 - A site – tRNA bringing the next amino acid
 - Small subunit – area where the mRNA attaches
 - All of the above are correct associations.

30. The zone between low and high tide is the ____.
- intertidal zone
 - abyssal zone
 - euphotic zone
 - aphotic region
 - neritic province
31. Which of the following pathogens causes the plague?
- Salmonella typhi*
 - Bordetella pertussis*
 - Borrelia burgdorferi*
 - Yersinia pestis*
 - Helicobacter pylori*
32. Which of the following is **not** classified as a lipid?
- carotenoid
 - steroid
 - chitin
 - wax
 - triacylglycerol
33. Which is **not** a correct association?
- corm – underground stem
 - stolon – adventitious roots
 - rhizome – horizontal underground stem
 - pneumatophores – protrude from the water
 - spines – modified leaves
34. Confocal microscopes use ____ to image.
- lasers
 - light
 - electrons
 - light rays directed from the sides
 - fluorescent molecules
35. Which of the following is **not** used to help classify organisms into taxa?
- comparison of protein structure
 - DNA sequencing
 - homologous structures
 - cells
 - embryology

36. Match the symbols in **Column A** with their meanings in **Column B**.

Column A

1. H
2. S
3. T
4. G

Column B

- i. free energy
- ii. enthalpy
- iii. entropy
- iv. absolute temperature

Select the correct matching sequence.

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

37. Histones, scaffolding proteins, and condensin are associated with ____.

- a. eukaryotic chromosomes
- b. prokaryotic chromosomes
- c. mitochondria
- d. nucleolus
- e. Both a and b are correct.

38. Genetic maps can be constructed by ____.

- a. studying recessive traits
- b. determining recombination of loci during crossing-over
- c. studying Y chromosomes
- d. test cross analysis
- e. studying dosage compensation

39. Oxidation in cells usually involved the removal a/an ____ from a covalent molecule.

- a. lipid
- b. amino acid
- c. hydrogen
- d. oxygen
- e. nitrogen

40. Facilitated diffusion ____.

- a. requires a transport protein
- b. moves against the concentration gradient
- c. is another name for active transport
- d. always occurs at the same rate
- e. requires the substances to be small nonpolar molecules

41. Which is **not** a correct association?
- Domain Archaea – 1 Kingdom
 - Domain Eukarya – nuclei
 - Clade – organisms with a common ancestor
 - Domain Bacteria – 2 Kingdoms
 - Phylogenetic trees – show evolutionary relationships among organisms
42. Which of the following does **not** refer to aerobic respiration?
- inorganic final electron acceptor
 - produces ATP by both substrate – level phosphorylation and oxidative phosphorylation
 - chemiosmosis produces the most ATP
 - steps: fermentation – citric acid cycle – electron transport – chemiosmosis
 - electron carrier – NAD⁺/NADH
43. All of the following are prezygotic reproductive isolating mechanisms, **except** ____.
- behavioral isolation
 - hybrid sterility
 - habitat isolation
 - temporal isolation
 - mechanical isolation
44. Translocation Down syndrome involves an individual with ____.
- 46 chromosomes
 - one chromosome 14, one combined chromosome 14/21, and two chromosome 21
 - one parent that usually has only 45 chromosomes
 - All of the above are correct.
 - None of the above are correct.
45. Which of the following does **not** have a four chambered heart?
- frogs
 - humans
 - cats
 - pigs
 - birds
46. Which of the following is true about pH 7.4?
- It would have 10 times more hydrogen ions than a pH of 8.4.
 - If this were a human's blood pH they would feel fine and could be considered in a state of homeostasis.
 - It is not quite neutral and has less hydrogen ions than a pH of 7.0.
 - All of the above are correct.
 - None of the above are correct.

47. 10 mls of 5% NaCl solution is placed in dialysis tubing and tied at both ends, so that the solution will not leak. Next, the filled tubing is placed in a beaker of 500 mls pure distilled water. After 40 minutes, the volume inside the tubing is measured. Which of the following is true?
- Since the beaker solution is hypotonic, the contents inside or inside volume of liquid in the tubing will be less.
 - The net movement of water will be toward the inside of the tubing.
 - There is not enough information provided to form a hypothesis or expected outcome.
 - Osmotic pressures are not present in the experiment.
 - Both a and b are correct.
48. Which of the following have cilia as a means of locomotion and contractile vacuoles?
- Paramecium*
 - Amoeba*
 - Euglena*
 - Both a and c are correct.
 - None of the above are correct.
49. Which of the following is correct?
- Microfilaments are components of the cytoskeleton and aid in movement.
 - Thylakoid membranes are found in the chloroplasts of animal cells.
 - The endosymbiont theory involves both the chloroplasts and mitochondria.
 - Both a and c are correct.
 - All of the above are correct
50. Which of the following would be considered polar covalent?
- polyunsaturated fats
 - water molecules
 - steroids
 - fatty acids
 - all the above, except b