

ACADEMIC CHALLENGE FOR
ACES
ENGINEERING AND SCIENCE



EASTERN ILLINOIS UNIVERSITY

2020 Academic Challenge

BIOLOGY TEST – REGIONAL

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

2020 Regional Biology Exam

- _____ is the movement of particles from areas of high concentration to low concentration.
 - Active transport
 - Cotransport
 - Pinocytosis
 - Exocytosis
 - Diffusion
- Oxygen has an atomic number of 8 and it has 8 neutrons. How many valence shell electrons does carbon have?
 - 2
 - 4
 - 6
 - 8
 - 16
- In peas, round seeds are dominant to wrinkled seeds. Using the letters in the table, determine the genotype ratio for a cross between a heterozygous round seeded plant and a wrinkled seeded plant.

Round seeded	R
Wrinkled seeded	r

- 1:1
 - 3:1
 - 1:2:1
 - 1:1:1:1
 - 9:3:3:1
- The Phylum that has a water vascular system is Phylum _____.
 - Mollusca
 - Cnidaria
 - Echinodermata
 - Porifera
 - Arthropoda

5. Which association is **inaccurate**?
- vascular tissue – moves water and organic material
 - seeds – nourishes the plant embryo
 - thylakoid – light – dependent reaction
 - roots – absorbs water and minerals
 - stomata – light – independent reaction

6. DNA ____.
- is described as a double helix
 - is composed of nucleotides
 - replication is called semiconservative
 - can have thymine as a base
 - All of the above are correct.

7. Match the scientists in **Column A** with their discoveries in **Column B**.

Column A

- Watson and Crick
- Gregor Mendel
- Charles Darwin
- Theodor Schwann

Column B

- Natural selection
- All animals are made up of cells.
- Father of Genetics
- Structure of DNA

Select the correct matching sequence.

- 1 – iv; 2 – i; 3 – iii; 4 – ii
 - 1 – iii; 2 – iv; 3 – i; 4 – ii
 - 1 – iv; 2 – iii; 3 – i; 4 – ii
 - 1 – i; 2 – iii; 3 – ii; 4 – iv
 - 1 – ii; 2 – i; 3 – iv; 4 – iii
8. Put the layers of the tropical rain forest in order from tallest to shortest.
- canopy → emergent layer → understory → forest floor
 - canopy → understory → emergent layer → forest floor
 - emergent layer → canopy → understory → forest floor
 - forest floor → understory → canopy → emergent layer
 - understory → forest floor → emergent layer → canopy
9. Viruses have ____.
- proteins and nucleic acid core
 - capsules and envelopes
 - capsules and fimbria
 - proteins and pili
 - nucleic acid and capsules

10. The stages of the cell cycle are ____.
- $G_1 \rightarrow S \rightarrow G_2$
 - prophase \rightarrow metaphase \rightarrow anaphase \rightarrow telophase
 - interphase $\rightarrow S \rightarrow$ cytokinesis
 - interphase \rightarrow mitosis \rightarrow cytokinesis
 - cytokinesis \rightarrow telophase \rightarrow metaphase
11. Match the macromolecules in **Column A** with their monomers or parts in **Column B**.

Column A

- starch
- proteins
- triglyceride
- DNA

Column B

- amino acid
- glycerol and fatty acids
- glucose
- nucleotides

Select the correct matching sequence.

- 1 – i; 2 – ii; 3 – iii; 4 – iv
 - 1 – iii; 2 – i; 3 – ii; 4 – iv
 - 1 – ii; 2 – i; 3 – iii; 4 – iv
 - 1 – iv; 2 – i; 3 – iii; 4 – ii
 - 1 – iii; 2 – iv; 3 – ii; 4 – i
12. Carrying capacity is the number of individuals ____.
- that move into or out of an area
 - that are born per 1000
 - an area can sustain
 - that die per 1000
 - making up 75% of the biomass
13. The cytoskeleton ____.
- gives the cell shape
 - is made up of microtubules, microfilaments, and intermediate filaments
 - can anchor proteins
 - allows for movement of organelles
 - All of the above are correct.
14. Which association is **inaccurate**?
- pores – Porifera
 - pseudocoelom – Cnidaria
 - amniotic egg – Reptilia
 - visceral mass – Mollusca
 - bilateral symmetry – Annelida

15. Which plant does **not** produce seeds?
- spruce tree
 - roses
 - pine trees
 - ferns
 - All of the above produce seeds.
16. Which of the following is homozygous for 2 traits?
- TTYy
 - TtRr
 - TtRRyy
 - TtRrYy
 - TTYy
17. Red green colorblindness is an X-linked trait. If a male has red green colorblindness, then _____.
- his mom must be colorblind
 - his dad must be colorblind
 - all of his brother's must be colorblind
 - his mom must have at least one X-chromosome with the colorblind allele
 - All of the above are correct.
18. rRNA is **not** associated with _____.
- protein synthesis
 - ribosomes
 - uracil
 - translation
 - smooth endoplasmic reticulum
19. Lab safety is very important. Which is **not** a typical lab safety rule?
- Do not eat or drink in lab.
 - Read and listen to instructions before performing the experiment.
 - Broken glass should be placed in the trash can.
 - Keep your lab area free from clutter.
 - Know where the fire blanket, fire extinguisher, and exits are located.
20. Chlorophyll in plants will be found in the _____.
- Golgi apparatus
 - mitochondrion
 - chloroplast
 - rough endoplasmic reticulum
 - All of the above have chlorophyll.

21. Which of the following is **not** in Domain Eukarya?

- E. coli*
- Paramecium*
- elephants
- yeast
- mold

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

Column A

- homeostasis
- catabolism
- dialysis
- endocytosis

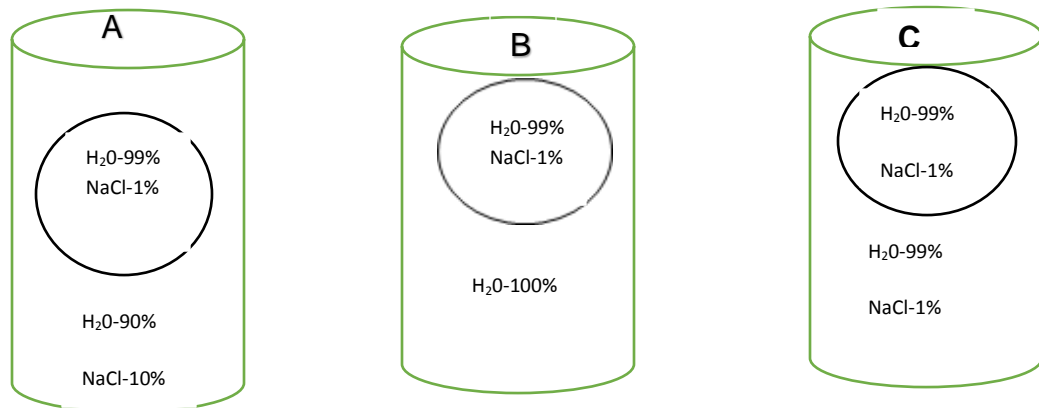
Column B

- break down reaction
- phagocytosis
- maintaining an internal steady state
- the diffusion of a solute through a selectively membrane

Select the correct matching sequence.

- 1 – iii; 2 – i; 3 – ii; 4 – iv
- 1 – iii; 2 – ii; 3 – iv; 4 – i
- 1 – iv; 2 – i; 3 – ii; 4 – iii
- 1 – iii; 2 – i; 3 – iv; 4 – ii
- 1 – ii; 2 – iii; 3 – i; 4 – iv

23. Which statement is true about the figure?



- Cell A is in a hypotonic solution.
- Cell C is in an isotonic solution
- Cell C is will burst
- Cell B will shrink in size.
- All of the above are correct.

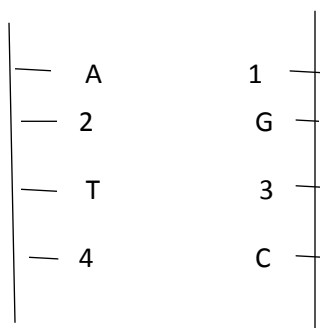
24. Bacteriophages are ____.
- bacterial viruses
 - flesh eating bacteria
 - infectious to human
 - bacteria that infect plants
 - bacteria that infect fungi.
25. Which is **not** an example of a carbohydrates?
- chitin
 - cellulose
 - deoxyribose
 - cholesterol
 - glycogen
26. In Gregor Mendel's experiment, the F1 generation would have which of the following genotype?
- TT or tt
 - Tt
 - TT, Tt, or tt
 - T or t
 - None of the above are correct.
27. There are ____ cervical bones in a human's neck.
- 4
 - 5
 - 6
 - 7
 - 8
28. The stipe of a mushroom is also called the ____.
- fruiting body
 - pileus
 - cap
 - gills
 - stem
29. Natural selection is a process which ____.
- causes mutations
 - only animals use to survive
 - helps organisms with the best adapted traits produce more offspring
 - breeders use to produce different dog types
 - keeps allele frequencies remain the same.

30. Carbon has ____ bonding sites.
- 1
 - 2
 - 3
 - 4
 - 5
31. A cell part found in all organisms is ____.
- nucleus
 - ribosome
 - endoplasmic reticulum
 - mitochondrion
 - Golgi apparatus
32. The enzyme that digests starch is ____.
- pepsin
 - maltase
 - amylase
 - trypsin
 - lactase
33. The calcium pump is an example of ____.
- cotransport
 - diffusion
 - osmosis
 - dialysis
 - active transport
34. Which of the following genetic disorders is X-linked?
- Hemophilia
 - Huntington disease
 - Sickle-cell anemia
 - Tay-Sach disease
 - Cystic fibrous
35. Which is **not** a characteristic of water?
- polar
 - cohesive
 - adhesive
 - surface tension
 - low specific heat

36. Which is **not** considered a monocot?

- a. clover
- b. asparagus
- c. crab grass
- d. onion
- e. corn

37. Determine the missing DNA bases, if A – adenine, G – guanine, C – cytosine, T – thymine.



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

38. What is the imaginary line or plane that divides the human body into equal left and right halves?

- a. parasagittal
- b. midsagittal
- c. midcoronal
- d. horizontal
- e. oblique

39. Which is a Lewis structure for a molecule of hydrogen?

- a. H₂
- b. H – H
- c. H : H
- d. H
- e. All of the above are correct.

40. Which of the following chemicals would **not** be produced during glycolysis?
- ATP
 - NADH
 - H₂O
 - Pyruvate
 - All of the above are produced during glycolysis.
41. A transition zone between two communities is called a/n ____.
- ecosystem
 - ecotone
 - biosphere
 - biome
 - ectoderm
42. Which of the following is **not** associated with ferns?
- spores
 - fronds
 - rhizome
 - nonvascular
 - fiddle head
43. Which scientist is **not** correctly matched to one of their discoveries?
- Louis Pasteur – pasteurization
 - Lynn Margulis – endosymbiosis theory
 - Edward Jenner – small pox vaccine
 - Rachel Carson – DDT is harmful to the environment
 - Alexander Fleming - aseptic surgery techniques
44. The ____ makes leeches different from other animals in Phylum Annelida.
- segments
 - hirudin
 - bilateral symmetry
 - coelom
 - hermaphroditic
45. Plants characteristics include all but, ____.
- cellular respiration
 - photosynthesis
 - chloroplasts
 - cell walls
 - lysosomes

46. Transcription is best described as using ____.
- DNA to make mRNA
 - mRNA to make proteins
 - proteins to make DNA
 - DNA to make tRNA
 - tRNA to make rRNA
47. In the chemical equation, $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$, a reactant is ____.
- NaCl
 - HCl
 - NaOH
 - Both b and c are reactants.
 - All of the above are reactants.
48. During meiosis, ____ are produced.
- somatic cells
 - gametes
 - archaeal cells
 - bacterial cells
 - All of the above are correct.
49. Which of the following is **not** located in the mediastinum?
- heart
 - lungs
 - thymus
 - esophagus
 - sternum
50. Organic chemistry must have ____.
- Oxygen
 - Hydrogen
 - Carbon
 - Both b and c
 - All of the above are correct.

