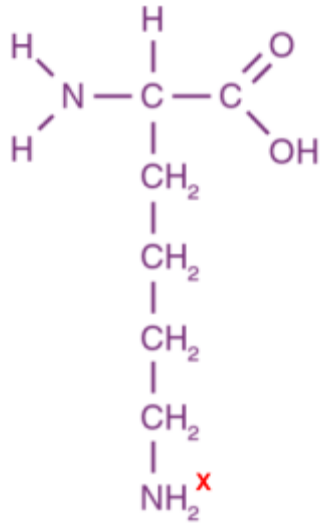


HUSO Dubai 9th/10th Grade Biology Final Round Exam

Instructions:

- This test is one hour long and has 45 questions.
- Each question has five answer choices and is multiple-select multiple choice.
- Each question has at least one correct selection but may have up to five correct selections.
- The grading scheme for each question will be as follows:
 - +2 for perfectly correct
 - +1 for one mistake (only one of the answer choices was incorrectly selected/not selected)
 - +0 for two or more mistakes
- The tiebreaker is the sum of the scores on questions 9, 12, 13, 22, and 39.
- Don't spend too much time on any single question.

Name:



Question 01. Which of the following are correct about this amino acid?

- A) It breaks the formation of alpha helices.
- B) It is nonpolar.
- C) It would be negatively charged at physiological pH.
- D) It would be found at high abundances in DNA binding proteins.
- E) The amine group labeled with an X is part of the backbone of the amino acid.

Question 02. Which of the following statements are correct about polysaccharides?

- A) Animals do not produce cellulose.
- B) Cellulose has alpha monomers while starch has beta monomers.
- C) Glycogen and cellulose are both used for structural purposes.
- D) Glycogen is made by linking together long chains of sucrose.
- E) Glycogen is produced in animals while starch is produced in plants.

Question 03. Which of the following statements correctly contrast RNA and DNA?

- A) RNA is assembled from 3' to 5' while DNA is assembled from 5' to 3'.
- B) RNA is generally double-stranded while DNA is generally single-stranded.
- C) RNA nucleotides have an extra hydroxyl group compared to DNA nucleotides.
- D) RNA possesses thymine while DNA possesses cytosine.
- E) Unlike RNA, DNA is prone to breaking down in acidic environments.

Question 04. Which of the following are true about cell membrane fluidity?

- A) Cell membranes need very low fluidity in order to function.
- B) Cholesterol decreases membrane fluidity at high temperatures.
- C) Cholesterol increases membrane fluidity at low temperatures.
- D) Increased saturated fatty acid proportion decreases membrane fluidity at high temperatures.
- E) Increased saturated fatty acid proportion increases membrane fluidity at low temperatures.

Question 05. Which of the following are NOT present in a prokaryotic cell?

- A) Cell Wall
- B) Nucleoid
- C) Nucleus
- D) Ribosomes
- E) Rough Endoplasmic Reticulum

Name:

Question 06. Which of the following spaces inside a cell would have a low pH?

- A) Lysosome
- B) Mitochondrial Intermembranal Space
- C) Mitochondrial Matrix
- D) Rough Endoplasmic Reticulum
- E) Smooth Endoplasmic Reticulum

Question 07. Which of the following organelles/structures will a membrane protein pass through on its pathway to the cell membrane?

- A) Golgi Apparatus
- B) Ribosome
- C) Rough Endoplasmic Reticulum
- D) Secretory Vesicle
- E) Smooth Endoplasmic Reticulum

Question 08. Which of the following are pieces of evidence for the endosymbiotic origin of mitochondria?

- A) Mitochondria are only passed down from mother to offspring.
- B) Mitochondria are susceptible to antibiotics.
- C) Mitochondria can survive outside of the host cell.
- D) Mitochondria possess a double membrane.
- E) The mitochondrial genome lacks histones.

Question 09. Which of the following is TRUE regarding photosynthesis?

- A) The oxygen atoms of carbon dioxide show up in the sugar produced during photosynthesis.
- B) The oxygen atoms of water show in the oxygen gas produced during photosynthesis.
- C) The light-dependent reactions can run indefinitely without the light-independent reactions (Calvin cycle).
- D) The light-independent reactions (Calvin cycle) can run indefinitely without light.
- E) Oxygen is produced and carbon dioxide is fixed during the light-dependent reactions.

Question 10. Which of the following are similarities between photosynthesis and cellular respiration?

- A) Both are catabolic pathways.
- B) Both are utilized by plants.
- C) Both contain an electron transport chain.
- D) Both rely on ATP synthase.
- E) Both use NADH as an electron carrier.

Question 11. Which of the following are true about G-protein coupled receptors?

- A) They are generally located in the nucleus.
- B) They dimerize upon ligand binding.
- C) They have four transmembrane domains.
- D) They often activate adenylyl cyclase.
- E) They release GTP upon ligand binding.

Name:

Question 12. In which of the phases of the cell cycle is the nuclear envelope completely broken down?

- A) Anaphase
- B) Interphase
- C) Metaphase
- D) Prophase
- E) Telophase

Question 13. Which of the following structures would NOT be present in BOTH human and onion cells during mitosis and cytokinesis?

- A) Cell Plate
- B) Centriole
- C) Kinetochore
- D) Phragmoplast
- E) Spindle Microtubules

Question 14. Which of the following correctly contrast mitosis and meiosis?

- A) In mitosis, homologous chromosomes are separated while in meiosis, sister chromatids are separated.
- B) In mitosis, microtubules separate the chromatids while in meiosis, microfilaments separate the chromatids.
- C) Mitosis produces 4 daughter cells while meiosis produces 2 daughter cells.
- D) Mitosis produces genetically identical cells while meiosis produces genetically distinct cells.
- E) Mitosis produces somatic cells while meiosis produces gametes.

Question 15. [Information here pertains to both question 15 and 16] In the petals of a certain flower species, enzyme R converts a white precursor molecule into a yellow pigment and then enzyme S converts this yellow pigment into a pink pigment. The genes for both enzymes R and S have dominant functional alleles (R, S) and recessive non-functional alleles (r, s). If two double heterozygous flowers are crossed with each other in a dihybrid cross, which of the following statements are true?

- A) The ratio of pink to white flowers is 9:4.
- B) The ratio of pink to yellow flowers is 9:4.
- C) The ratio of white to yellow flowers is 1:1.
- D) This is an example of dominant epistasis.
- E) This is an example of incomplete dominance.

Question 16. See question 15 for question statement and information.

- A) This is an example of recessive epistasis.
- B) If you crossed the F1 pink flower offspring with each other, you would see offspring of all three colors.
- C) If you crossed the F1 white flowers with each other, you would only see white flowers.
- D) If you crossed the F1 yellow flowers with each other, you would only see yellow flowers.
- E) If the recessive r allele coded for the functional version of enzyme R and the dominant R allele coded for the non-functional version of enzyme R, the ratio of pink to white flowers would be 3:13.

Name:

Question 17. Which of the following enzymes/proteins is only ever used on the lagging strand (and not the leading strand) during DNA replication in bacteria?

- A) DNA Polymerase I
- B) DNA Polymerase III
- C) Helicase
- D) Ligase
- E) RNA Primase

Question 18. Which of the following are correct about the order in which gene regulation processes control gene expression from gene to protein? Refer to the following events (labelled 1 through 5) below. You should still answer by selecting some subset of A through E.

- 1. Alternative Splicing
 - 2. Histone Acetylation
 - 3. RNA Interference
 - 4. Transcription Factors
 - 5. Ubiquitination
- A) 1 happens before 2
 - B) 2 happens before 3
 - C) 3 happens before 4
 - D) 4 happens before 5
 - E) 5 happens before 1

Question 19. Which of the following processes increase genetic diversity?

- A) Balancing Selection
- B) Bottleneck Effect
- C) Disruptive Selection
- D) Genetic Drift
- E) Mutation

Question 20. Which of the following technologies are types of DNA sequencing?

- A) Illumina
- B) PCR
- C) Restriction Enzyme
- D) Sanger
- E) Western Blot

Question 21. Which of the following structures are present in BOTH cardiac muscle and skeletal muscle?

- A) Actin Filaments
- B) Intercalated Discs
- C) Many Nuclei
- D) Striations
- E) T-Tubules

Question 22. Which of the following correctly match digestive secretions to their function?

- A) Amylase - Digests Starch
- B) Bile Salts - Digest Nucleic Acids
- C) Lipase - Emulsify Lipids
- D) Pepsin - Lowers pH of Stomach
- E) Trypsin - Digests Proteins

Question 23. Which of the following correctly match a vitamin with its associated deficiency disease?

- A) Vitamin A - Night Blindness
- B) Vitamin B1 - Rickets
- C) Vitamin C - Anemia
- D) Vitamin D - Scurvy
- E) Vitamin K - Beriberi

Name:

Question 24. A patient comes in with decreased TSH and elevated T4 levels. Which of the following are true about this patient?

- A) This patient could be suffering from an iodine deficiency.
- B) This patient could be treated with injections of TSH.
- C) This patient likely has bulging eyes.
- D) This patient likely has goiter (swelling of the thyroid).
- E) This patient likely has gained weight due to their condition.

Question 25. Which of the following ions have a higher concentration inside of a neuron than outside of it?

- A) Calcium (Ca^{2+})
- B) Chloride (Cl^-)
- C) Potassium (K^+)
- D) Sodium (Na^+)
- E) All of the above ions are at a higher concentration outside of a neuron compared to inside.

Question 26. Which of the following are correct about the order of blood flow through the heart starting from when it enters the right atrium? Refer to the following events (labelled 1 through 5) below. You should still answer by selecting some subset of A through E.

1. Blood passes through the left atrium.
 2. Blood passes through the mitral valve.
 3. Blood passes through the pulmonary artery.
 4. Blood passes through the right ventricle.
 5. Blood passes through the tricuspid valve.
- A) 1 happens before 2
 - B) 2 happens before 3
 - C) 3 happens before 4
 - D) 4 happens before 5
 - E) 5 happens before 1

Question 27. Which of the following blood type donations can be done?

- A) A+ donor to AB- recipient
- B) A- donor to B+ recipient
- C) AB- donor to A+ recipient
- D) B- donor to AB+ recipient
- E) O+ donor to O- recipient

Name:

Question 28. Which of the following statements correctly describe adaptations of blood vessels?

- A) Arteries have thick muscular walls to regulate blood flow and pressure.
- B) Arteries have valves to prevent backflow during diastole.
- C) Capillaries have thin walls to allow for gas exchange.
- D) Veins have extensive elastic fibers to handle large pressure changes.
- E) Veins have thin walls to extract oxygen from the oxygen-poor blood they carry.

Question 29. Which of the following cells are involved in the adaptive immune response?

- A) B Cells
- B) Dendritic Cells
- C) Macrophages
- D) Neutrophils
- E) T Cells

Question 30. Which of the following statements correctly describe functions of antibodies?

- A) Antibodies agglutinate pathogens into large clumps that are more easily targeted for destruction by immune cells.
- B) Antibodies block the molecules on pathogens required for cell entry and successful infection.
- C) Antibodies mark pathogens for destruction by immune cells in a process called opsonization.
- D) Antibodies neutralize pathogens by puncturing holes in their cell wall upon binding.
- E) Antibodies promote the activation of B and T cells in what is termed the complement system.

Question 31. Which of the following structures of the nephron are responsible for the reabsorption of water?

- A) Ascending Loop of Henle
- B) Collecting Duct
- C) Descending Loop of Henle
- D) Distal Convoluted Tubule
- E) Proximal Convoluted Tubule

Question 32. Which of the following are true about vision disorders?

- A) Farsightedness is when objects that are far away appear blurry.
- B) Farsightedness is when the eyeball is too long.
- C) Nearsightedness is when the light focuses in front of the retina.
- D) Nearsightedness should be treated with convex lens glasses.
- E) Night blindness can be caused by vitamin C deficiency.

Question 33. Which of the following are true about malaria?

- A) Malaria is caused by a virus.
- B) Malaria is most widespread in dry countries like the UAE.
- C) Malaria is vulnerable to antibiotics like penicillin.
- D) Mosquitoes are a vector for malaria.
- E) The malaria pathogen infects red blood cells.

Question 34. Which of the following structures are part of a plant's dermal tissue?

- A) Parenchyma
- B) Phloem
- C) Stomata
- D) Trichomes
- E) Xylem

Name:

Question 35. Which of the following are correct about the spatial order of the layers of a secondary growth stem?

1. Primary Phloem
 2. Secondary Phloem
 3. Primary Xylem
 4. Secondary Xylem
 5. Periderm
- A) 1 is exterior to 2
B) 2 is exterior to 3
C) 3 is exterior to 4
D) 4 is exterior to 5
E) 5 is exterior to 1

Question 36. Which of the following are true about transpiration in plants?

- A) The plant does not expend energy for transpiration.
B) Transpiration happens under negative pressure.
C) Transpiration happens via the phloem and stomata.
D) Transpiration increases when the weather is drier.
E) Transpiration is primarily driven by capillary action.

Question 37. Which of the following are true about phloem sucrose transport in plants?

- A) Both sugar loading into the phloem at the source and sugar unloading from the phloem at the sink generally occur via active transport.
B) Sucrose enters the phloem via hydrogen ion cotransport.
C) Sugar is transported unidirectionally from the leaves to the roots.
D) Sugar transport happens under negative pressure.
E) The sieve tube elements that the phloem sap moves through are dead at maturity.

Question 38. Which of the following are true about a flower in which you knock out the C gene in the ABC model of flower development?

- A) The flower will have no carpels.
B) The flower will have no sepals.
C) The flower will be reproductively inviable.
D) The inside whorl will be petals.
E) The outside whorl will be stamens.

Question 39. Which of the following correctly match plant hormones with their functions?

- A) Abscissic Acid - Seed Dormancy
B) Auxin - Apical Dominance
C) Cytokinin - Cell Division
D) Ethylene - Triple Response
E) Gibberellin - Germination

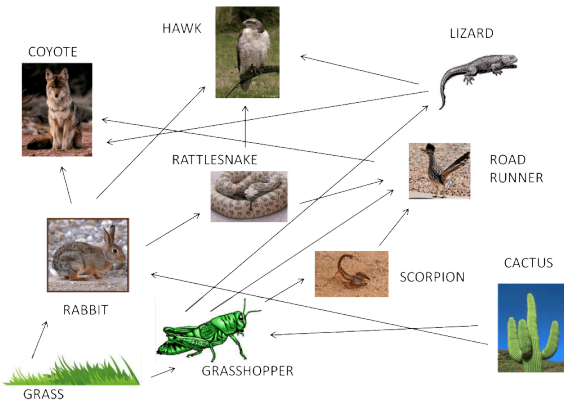
Question 40. Which of the following plants have a dominant sporophyte?

- A) Conifers
B) Ferns
C) Flowering Plants
D) Ginkgo
E) Moss

Question 41. Which of the following characteristics distinguish angiosperms (flowering plants) like roses from gymnosperms like pine trees?

- A) Double Fertilization
B) Double Integument
C) Lignin
D) Vascular Tissue
E) Vessel Elements

Name:



Question 42. Which of the following are true about the above food web?

- A) Coyotes and scorpions are both secondary consumers.
- B) If the rattlesnake population increased, the cactus population likely would too.
- C) If the scorpion population increased, the coyote population likely would too.
- D) The lizard biomass is likely less than the coyote biomass.
- E) There are two producers in this ecosystem.

Question 43. Which of the following are true about defenses against predation?

- A) Aposematic coloration allows organisms to blend in with their environment.
- B) Fish form schools as a way to defend against predation.
- C) In Batesian mimicry, a poisonous species mimics another poisonous species.
- D) Müllerian mimicry can be thought of as a type of parasitism because the mimic decreases the model's fitness.
- E) Poison dart frogs exhibit aposematic coloration.

Question 44. Which of the following organisms are more closely related to butterflies than humans?

- A) Coral
- B) Earthworm
- C) Shark
- D) Starfish
- E) Squid

Question 45. Which of the following correctly match an animal phylum with one of their distinguishing characteristics?

- A) Arthropoda - Mantle
- B) Cnidaria - Nematocyst
- C) Nematoda - Water Vascular System
- D) Platyhelminthes - Coelom
- E) Porifera - Pentaradial Symmetry