
**EMS 2022 National Championship Biology Exam**

Name _____

School

_____

Grade _____

Email address _____

**Instructions – Circle the correct answer or leave it blank. Correct answers are worth 2 points. Incorrect answers are worth −1 point. Questions left blank are worth 0 points.**

1. How does camouflage help an animal survive?
    A. Aids in thermoregulation
    B. Ensures that it blends in with the surroundings
    C. Aids in helping to keep the predator or prey from seeing it
    D. Makes it stand out

2. Which of the following is a special adaptation for survival in desert plants?
    A. Larger surface area to volume ratio
    B. Reduced leaf surface area
    C. Thorns
    D. Increased number of stomata

3. In order to survive, plants need: light, space, nutrients, water and what else?
    A. Carbon dioxide
    B. Hydrogen
    C. Soil
    D. Glucose

4. Microorganisms have to compete with each other for which of the following?
    A. A mate
    B. Carbon dioxide
    C. Light
    D. Nutrients

5. Which of the following statements is true of extremophiles?
    A. Extremophiles are tolerant to high temperatures
    B. Extremophiles are intolerant to high pressure
    C. Extremophiles are tolerant to light intensity variations
    D. Extremophiles are intolerant to low salt levels

6. Animals can display features similar to those of poisonous animals, to deter predators. What is this known as?
    A. Marquetry
    B. Mimicry
    C. Mockery
    D. Minimalism

7. Arctic animals have which adaptation to allow survival?
    A. Brown fur in the summer and white fur in the winter for camouflage
    B. Thick layer of fat so they can survive hibernation
    C. Small eyes and ears to keep out the cold
    D. Ability to swim faster than their prey

8. Identify the most abundant organic substance on earth.
    A. cellulose
    B. fructose
    C. amylopectin
    D. starch

9. What is the waste gas released by aerobic respiration?
    A. Carbon monoxide
    B. Ozone
    C. Carbon dioxide
    D. Ammonia

10. Identify the compound that is NOT an amino acid.
    A. phenylalanine
    B. methionine
    C. histidine
    D. guanine

11. What does aerobic mean?
    A. With oxygen
    B. With carbon dioxide
    C. With hydrogen
    D. With nitrogen

12. Muscles store glucose in which form?
    A. As starch
    B. As glycogen
    C. As protein
    D. As oxygen

13. A heterotroph.
    A. obtains its energy from sunlight, harnessed by pigments
    B. obtains its energy by oxidizing organic molecules
    C. makes organic molecules from CO2
    D. obtains its energy by consuming

14. Antibiotics are not effective against which of the following?
    A. Bacteria
    B. Viruses
    C. Fungi
    D. Protoctista

15. The MMR vaccine protects against measles, mumps, and which other condition?
    A. Red eye
    B. Rickets
    C. Rhinitis
    D. Rubella

16. Which of the following is NOT a characteristic of bacteria?
    A. Circular double-stranded DNA
    B. Membrane-bound cellular organelles
    C. Plasma membrane consisting of lipids and proteins
    D. Ribosomes that synthesize polypeptides

17. Mutation of bacteria can lead to new strains of bacteria which are…
    A. to antibiotics
    B. Resistant to antibiotics
    C. Susceptible to antibiotics
    D. Killed by all antibiotics

18. Release of which substance from pathogens makes us feel ill?
    A. Antitoxin
    B. Toxin
    C. Hormone
    D. Enzyme

19. What does a pathogen cause?
    A. Addiction
    B. Heart attacks
    C. Disease
    D. Hallucinations

20. What is agar used for in microbiology?
    A. Provide nutrients for growth
    B. Dilute the bacteria to avoid competition
    C. As an antibiotic to kill unwanted bacteria
    D. To maintain the stability of the solid growth media

21. What do white blood cells use to protect us against pathogens?
    A. Antibodies
    B. Platelets
    C. Mucous
    D. Auxin

22. What name is given to sterile handling techniques in microbiology?
    A. Septic
    B. Asdeptic
    C. Skeptic
    D. Diagnostic

23. MRSA is a type of bacteria that is resistant to what?
    A. Antiviral drugs
    B. Antibiotics
    C. Pain killers
    D. Statins

24. Rosalind Franklin's x-ray diffraction images taken in the 1950s most directly support which of the following claims about DNA?
    A. The ratios of base pairs are constant
    B. The nucleotide sequence determines genetic information
    C. The two strands of DNA are antiparallel
    D. The basic molecular structure is a helix

25. In a double blind trial, who is allowed to know if the patient has taken the drug?
    A. Both patients and doctors
    B. Neither patients or doctors
    C. Patients know but doctors do not
    D. Only the doctors know

26. Which of the following is a reason that patients must stop taking a prescribed drug?
    A. If the benefits outweigh the side effects
    B. If the drug has been shown not to work
    C. If no toxicity is observed
    D. If the optimum dose is achieved

27. Villi and microvilli are present in the small intestine and aid in reabsorption by
    A. increasing the surface area of the small intestine
    B. decreasing the surface area of the small intestine
    C. making the small intestine more hydrophilic
    D. making the small intestine more hydrophobic

28. New drugs are all tested for efficacy, toxicity, dosage, and what else?
    A. Safety
    B. Variables
    C. Placebo
    D. Double blind

29. In animal cells, which of the following represents the most likely pathway that a secretory protein takes as it is synthesized in a cell?
    A. Plasma membrane–Golgi apparatus–ribosome–secretory vesicle–rough ER
    B. Ribosome–Golgi apparatus–rough ER–secretory vesicle–plasma membrane
    C. Plasma membrane–Golgi apparatus–ribosome–secretory vesicle–rough ER
    D. Ribosome–rough ER–Golgi apparatus–secretory vesicle–plasma membrane

30. Before clinical trials, which of the following are new drugs not tested on for toxicity?
    A. Cells
    B. Humans
    C. Tissues
    D. Animals

31. Statins are drugs which lower the blood concentration of what?
    A. Cholesterol
    B. Amino acids
    C. Glucose
    D. Insulin

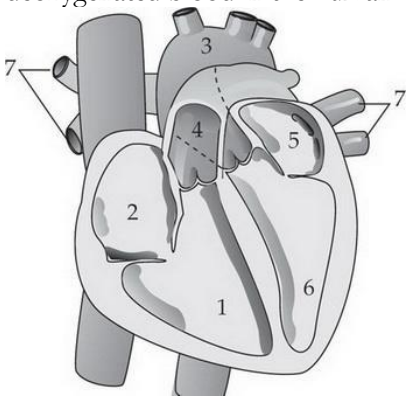
32. What are biofuels made from?
    A. Coal
    B. Oil
    C. Gas
    D. Animal and plant material

33. Which of the following adaptive features would least likely be found in an animal living in a hot arid environment?
    A. Long loops of Henle to maximize water reabsorption
    B. Storage of water in fatty tissues
    C. Large ears to aid in heat dispersion
    D. Short loops of Henle to maximize water secretion

34. Biogas is primarily made up of which gas?
    A. Methane
    B. Oxygen
    C. Carbon dioxide
    D. Hydrogen

35. Biogas is made by which process?
    A. Aerobic respiration
    B. Alcoholic fermentation
    C. Anaerobic digestion
    D. Respiration

36. Question below refers to the diagram below. Which of the following chambers or vessels carry deoxygenated blood in the human heart?




    A. 4 only
    B. 1 & 2 only
    C. 5 only
    D. 1, 2, and 4

37. Biogas generators can be filled with which of the following?
    A. Air
    B. Water
    C. Feces

D. Nitrogen

38. Some strains of viruses can change normal mammalian cells into cancer cells in vitro. This transformation of the mammalian cell is usually associated with the.
    A. formation of a pilus between the mammalian cell and the virus
    B. incorporation of the viral genome into the mammalian cell's nuclear DNA
    C. conversion of the host's genome into the viral DNA
    D. release of spores into the mammalian cell

39. Cloning has not been demonstrated in which of the following?
    A. Plants
    B. Sheep
    C. Humans
    D. Cattle

40. Crossing-over occurs during which of the following phases in meiosis?
    A. Prophase I
    B. B. Metaphase I
    C. C. Anaphase I
    D. D. Prophase II

41. During cloning, what is an electrical current used for?
    A. To stimulate cell division
    B. To destroy the egg cell nucleus
    C. To start growth of the egg
    D. To remove the contents of the fused cell

42. A plant grows in the opposite direction of the gravitational force. This is an example of.
    A. positive thigmotropism
    B. negative phototropism
    C. positive phototropism
    D. negative gravitropism

43. Enucleate means the removal of what?
    A. A cell
    B. A nucleus
    C. An egg
    D. A sperm

44. 'Tall' is an example of which of the following?
    A. A genotype
    B. An allele
    C. A gene
    D. A phenotype

45. Alleles are different forms of the same?
    A. Allele
    B. Gene
    C. Code
    D. Egg

46. What does homozygous mean?
    A. That the alleles are the same
    B. That the alleles are different
    C. That the alleles are varied
    D. That the alleles are mutated

47. Deforestation makes global warming worse because...
    A. The trees have all gone
    B. The trees would have taken up carbon dioxide
    C. The trees would have given off oxygen
    D. There are still plenty of trees left

48. Dialysis is needed when which organ(s) fails?
    A. Kidneys
    B. Liver
    C. Lungs
    D. Heart

49. Dialysis removes this waste material from the blood.?
    A. Protein
    B. Urea
    C. Glucose
    D. Urine

50. To retain glucose and ions in the blood, their concentration in dialysis fluid will be...
    A. Lower
    B. Higher
    C. The same
    D. It does not matter

51. Protease enzymes are located in which organ?
    A. Mouth
    B. Esophagus
    C. Stomach
    D. Colon

52. Which of the following statements about trypsin is NOT true?
    A. It is an organic compound made of proteins.
    B. It is a catalyst that alters the rate of a reaction.

C. It is operative over a wide pH range.
D. The rate of catalysis is affected by the concentration of substrate.

53. A change in a neuron membrane potential from +50 millivolts to -70 millivolts is considered
    A. depolarization
    B. repolarization
    C. hyperpolarization
    D. an action potential

54. The energy given up by electrons as they move through the electron transport chain is used to
    A. break down glucose
    B. make glucose
    C. produce ATP
    D. make NADH

55. Which of the following emulsifies fats so they can be further digested by the enzyme lipase?
    A. Hydrochloric acid
    B. Mucus
    C. Bile
    D. Saliva

56. The shape of an enzyme will change if which of the following is increased?
    A. Temperature
    B. Concentration
    C. Time
    D. Pressure

57. Which enzyme converts starch into sugars in the mouth and small intestine?
    A. Protease
    B. Lipase
    C. Isomerase
    D. Amylase

58. Which of the following organisms in this population are secondary consumers?
    A. Sharks
    B. Mackerels
    C. Herrings
    D. Small crustaceans

59. Isomerase enzyme is used in industry for making high fructose syrup from which of the following?
    A. Maltose
    B. Glucose
    C. Sucrose
    D. Starch

60. Enzymes are which type of molecule?
    A. Protein
    B. Fat
    C. Starch
    D. Amino acids

61. In general, animal cells differ from plant cells in that animal cells have
    A. a cell wall made of cellulose
    B. lysosomes
    C. large vacuoles that store water
    D. centrioles within centrosomes

62. What is used to cut the gene out from a chromosome??
    A. A special type of fat
    B. A special type of hormone
    C. A special type of enzyme
    D. A special type of cell

63. The liver is a vital organ that performs all of the following functions EXCEPT
    A. storing amino acids that were absorbed in the capillaries of the small intestine
    B. detoxifying harmful substances such as alcohol or certain drugs
    C. synthesizing bile salts that emulsify lipids
    D. breaking down peptides into amino acids

64. A major objection to GM crops is the possible creation of wild plants which are resistant to what?
    A. Antibiotics
    B. Herbicides
    C. Insecticides
    D. Viruses

65. In humans, fertilization normally occurs in the
    A. ovary
    B. fallopian tube
    C. uterus
    D. placenta

66. Crops produced using genetic engineering are known as GM. What does GM stand for?
    A. Genes manipulated
    B. Genetically modified
    C. Great Marvel
    D. Genes Made

67. Genetic engineering involves the transfer of what?
    A. The transfer of proteins
    B. The transfer of sugars
    C. The transfer of genes
    D. The transfer of enzymes

68. Glucagon is released from which organ?

A. Liver
B. Kidneys
C. Small Intestine
D. Pancreas

69. Which storage molecule is broken down due to the action of glucagon?
    A. Starch
    B. Cellulose
    C. Glycogen
    D. Glucose

70. The primary site of glucose reabsorption is the
    A. glomerulus
    B. proximal convoluted tubule
    C. loop of Henle
    D. collecting duct

71. All of the following statements are true EXCEPT
    A. thyroxine increases the rate of metabolism
    B. insulin decreases storage of glycogen
    C. vasopressin stimulates water reabsorption in the kidney
    D. epinephrine increases blood sugar levels and heart rate

72. Metafemale syndrome, a disorder in which a female has an extra X chromosome, is the result of nondisjunction. The failure in oogenesis that could produce this would occur in
    A. metaphase I
    B. metaphase II
    C. telophase I
    D. anaphase II

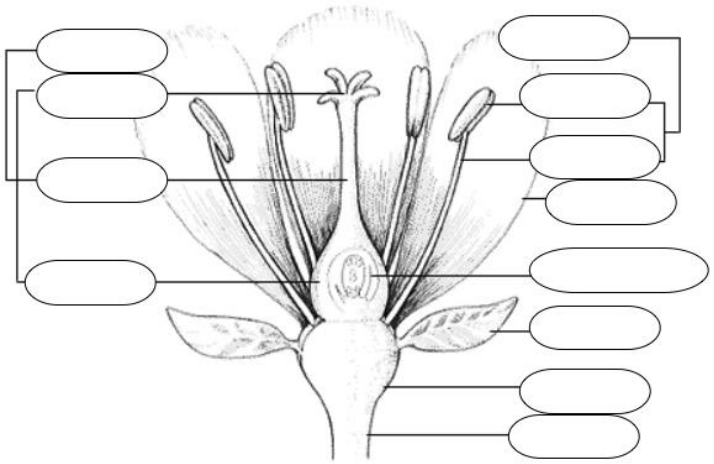
73. Sperm cells carry which of the following chromosomes?
    A. X chromosome
    B. Y chromosome
    C. Neither X or Y chromosomes
    D. Both X and Y chromosomes

74. Which specialized plant tissue transports dissolved sugars?
    A. Xylem
    B. Phloem
    C. Leaves
    D. Roots

75. Plants can convert the sugars made during photosynthesis into which insoluble stored form of energy?
    A. Protein
    B. Starch
    C. Fructose
    D. Cholesterol

Tie Breaker Question: Please answer the following.

Name as many parts of the flower as you can. Number the boxes and fill in the blanks below.



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