

UNIVERSITY OF FORESTRY

ENTRANCE TEST

Part 1: Read the text below. Then read the ten questions which follow, choose the best answer (a, b or c) to each question:

Why Giraffes Really Have Long Necks

The giraffe is the tallest land mammal alive, its long legs and neck contributing to its impressive stature. Males can be up to 5.5 m tall, females a little less.

In the wild, these beautiful creatures stretch their necks beyond those of antelope, kudu and even elephants to strip leaves from the untouched upper reaches of trees.

The French zoologist Jean-Baptiste Lamarck is usually credited as the first person to suggest that long necks have evolved in giraffes because they allow them to get to the parts other herbivores cannot reach. As the giraffe lives "in places where the soil is nearly always arid and barren, it is obliged to browse on the leaves of trees and to make constant efforts to reach them," he wrote in his 1809 book *Philosophie Zoologique*. "From this habit long maintained in all its race, it has resulted that the animal's fore-legs have become longer than its hind legs, and that its neck is lengthened." In short, giraffes' long necks are the result of generation upon generation of repeated stretching and inheritance.

The English naturalist Charles Darwin also thought the giraffe's extraordinary legs and neck must have something to do with foraging. "The giraffe, by its lofty stature, much elongated neck, fore-legs, head and tongue, has its whole frame beautifully adapted for browsing on the higher branches of trees," he wrote in *On the Origin of Species* in 1859.

17 But Darwin *did not buy Lamarck's ideas* on how evolutionary change came about. Instead he argued that the giraffe's neck results from repeated "natural selection". Long-necked giraffes were more likely to survive hard times than their short-necked rivals.

It has since become clear that Darwin was largely correct about how evolution works, and that Lamarck got it wrong. So, it is important to understand the difference between Lamarckian and Darwinian mechanisms of evolution.

However, it is a bit of a shame that the giraffe is used to illustrate the point. For a start, Lamarck made only a single, passing mention of giraffes in all his many writings. Yet it is this we remember him for - rather than the prescience of his ideas on evolution, which hugely influenced Darwin, or the many other contributions he made. In addition, the idea pushed by both Lamarck and Darwin - that giraffes' long necks evolved to help them feed - may not be the whole story.

In 1996, zoologists Robert Simmons and Lue Scheepers set out several challenges to **30** what has become known as the "competing *browsers*" hypothesis. "During the dry season (when feeding competition should be most intense) giraffe generally feed from low shrubs, not tall trees," they wrote in *The American Naturalist*. What's more, giraffes feed most often and faster with their necks bent. There is also the question of why giraffes have been around 2m taller than any of their competition for over 1 million years. Surely, that is overkill. The alternative, suggested Simmons and Scheepers, is that long necks have been sexually selected. This idea has become known as the "necks-for-sex" hypothesis.

37 Male giraffes often fight for access to females, a ritual referred to as "*necking*". The rivals stand flank to flank, then start to whack each other with their heads. In an extreme case, reported in the 1960s, one male punctured his opponent's neck just below the ear. The impact splintered a vertebra and a shard of bone entered the luckless giraffe's spinal column, killing him. The largest males usually win these battles and do most of the breeding, says zoologist Anne Innis Dagg of the University of Waterloo in Ontario, Canada, who has been studying giraffes since the 1950s.

"The other giraffes don't get much breeding opportunity." There is also evidence that females are more receptive to advances from larger males.

However, in the last 10 years evidence has emerged that weakens the necks-for-sex hypothesis. In particular, a 2013 investigation found no evidence that males have longer necks for their body mass than do females. In other words, there is no obvious sexual dimorphism in neck length. As a result, the authors concluded that the "competing browsers" hypothesis "is the more likely explanation for tallness in giraffes". Meanwhile, other researchers have found direct evidence for the competing browsers hypothesis. By erecting fences around Acacia trees in South Africa, Elissa Cameron and Johan du Toit were able to reveal the impact that smaller competitors like steenbok, impala and kudu have on food availability. "Giraffes gain a foraging advantage by browsing above the reach of smaller browsers," they wrote in *The American Naturalist* in 2007. This was "the first experimental evidence that the giraffe's extremely elongated body form is naturally selected in response to competition from smaller browsing species."

These studies suggest that Darwin was right all along. But the necks-for-sex supporters have not given up, and it may turn out that there is some merit in both explanations. Either way, there could well be further twists to this story.

1. Jean-Baptiste Lamarck is considered to be

- a) the only zoologist suggesting why giraffes have long necks
- b) the first zoologist explaining the concept of elongated neck of giraffes
- c) the only one speaking about the extraordinary long neck of giraffes

2. According to Charles Darwin

- a) Lamarckian mechanism of evolution fully corresponded to his theory
- b) Lamarck's ideas were absolutely correct
- c) Lamarck's ideas were entirely different

3. In **line 17**, "did not buy Lamarck's ideas" means:

- a) did not accept
- b) did not understand
- c) did not know

4. In **line 30** "browsers" means:

- a) animals that feed mainly on high-growing vegetation
- b) animals that feed mainly on grass vegetation
- c) animals that feed mainly on low shrubs

5. According to the "necks-for-sex" hypothesis:

- a) giraffe necks evolved over time to gain the advantage of being able to reach the leaves of tall trees
- b) giraffe necks may attract predators more easily and may slow down escaping
- c) giraffe necks evolved as a weapon that allows males to battle each other to gain dominance for mating with females

6. Which of the following statements is true?
- a) During the dry season the giraffes tend to feed mainly from shrubs
 - b) During the dry season the giraffes tend to feed mainly from tall trees
 - c) both statements
7. In **line 37** "necking" means:
- a) A behavior when male giraffes use their necks to attract females
 - b) A behavior when male giraffes use their necks as weapons in combat
 - c) A behavior when male giraffes use their necks to reach tall trees
8. Which of the following statements is not true:
- a) generally, female giraffes are attracted mainly by larger males
 - b) the size of male giraffes is of no importance for mating with females
 - c) larger male giraffes usually win the battles
9. The purpose of this text is:
- a) to make wide audience informed about the contradictory theories of wild animals.
 - b) to make wide audience informed about the evolution of species.
 - c) to make wide audience informed about the most popular hypotheses referred to the tallest species on Earth.
10. Which of the competing hypotheses is more like to be true according to the latest studies?
- a) the "competing browsers" hypothesis
 - b) the "necks-for-sex" hypothesis
 - c) none of the above

Part 2. Read the following questions, choose the correct answer (a, b, c, or d) to each question

11. Which of the following substances are ordinarily found in cell membrane structure?
- a) phospholipids
 - b) saccharides
 - c) globular proteins
 - d) water and organic solvents
12. Which chromosome set determines male gender in mammals?
- a) XX
 - b) YY
 - c) XY
 - d) none of them

13. Taking the pollen from one rose flower and using it to pollinate a flower on a different rose plant is an example of what?

- a) selective breeding
- b) mutation
- c) genetic engineering
- d) none of the above

14. Where in a cell are the genes found?

- a) they make up the chromosomes
- b) they make up the cell wall
- c) they are floating around in the cytoplasm
- d) they are contained in the cell membrane

15. Which of the following characteristics is NOT associated with neuronal cell?

- a) lack of a nucleus
- b) dendrites
- c) axon
- d) cell body

16. Which of the following functions is characteristic for muscle cells?

- a) contraction
- b) covering
- c) innervation
- d) supporting

17. Which of the following characteristics do the new daughter cells have after mitosis?

- a) haploid number of chromosomes
- b) diploid number of chromosomes
- c) tetraploid number of chromosomes
- d) none of the listed

18. Which of these statements is incorrect?

- a) somatic cells are diploid,
- b) during meiosis prophase 1, the cell is haploid
- c) during meiosis prophase 2, the cell is haploid

d) the result of mitosis is 2 somatic cells, which are diploid.

19. Which of the following cell organelles have proper DNA?

- a) ribosomes
- b) endoplasmic reticulum
- c) Golgi complex
- d) mitochondria

20. Which of the following is not part of the DNA strand?

- a) deoxyribose sugar
- b) phosphate
- c) Adenine
- d) Uracil

21. What dimensions do the living cells in the body vary on average?

- a) around 5-10 cm
- b) around 5-10 mm
- c) around 5-10 μm
- d) around 5-10 nm

22. Which of the following mammalian cells do NOT have a nucleus?

- a) oocytes
- b) chondrocytes
- c) erythrocytes
- d) macrophages

23. What is the chemical nature of the cell-produced enzymes?

- a) saccharides
- b) proteins
- c) lipids
- d) triglycerides

24. Which of the following samples is a template during the process of protein transcription?

- a) ribosomes
- b) mitochondria
- c) lysosomes
- d) DNA

25. Which of the following occurs during mitosis?

- a) The cell membrane pinches one cell into two.
- b) The chromosomes of the parent cell are copied.
- c) The parent cell takes in nutrients and doubles in size.
- d) The nucleus of the parent cell divides into two nuclei.

26. Which of the following structure-function pairs in the cell is incorrectly matched?

- a) mitochondria - cellular respiration
- b) lysosome - intracellular digestion
- c) peroxisome - sorting of proteins and lipids
- d) ribosome - protein synthesis

27. Which is the most important function of epithelial cells?

- a) excitation
- b) protection
- c) contraction
- d) conduction

28. Which of the following properties most accurately characterize the autotrophic organisms?

- a) receive water from the environment
- b) feed on fruit, vegetables and meat
- c) can synthesize organic compounds from inorganic sources
- d) emit carbon dioxide and urea into the environment

29. Which function is characteristic for lymphatic nodes?

- a) may contain erythrocytes
- b) may contain lymphocytes and macrophages
- c) may contain blood plasma
- d) may contain thrombocytes

30. Which of the following animal organs are part of the urinary system?

- a) sweat glands
- b) pancreas
- c) lymphatic nodules
- d) ureters

31. Which of the following functions is characteristic for lungs?

- a) supportive function
- b) gas exchange function
- c) water resistant function
- d) immobilizing function

32. Which of the hypophyseal hormones stimulate growth of the body?

- a) gonadotropic hormone
- b) somatotropic hormone
- c) glucocorticoid hormone
- d) oxytocin

33. Hyperglycemia is a sign of damage to which of the following organs?

- a) heart
- b) liver
- c) brain
- d) pancreas

34. Which of the following are energy foods?

- a) Carbohydrates and fats
- b) Proteins and mineral salts
- c) Vitamins and minerals
- d) Water and roughage

35. An organism with a weakened immune system is more sensitive to which of the following agents?

- a) physical efforts
- b) sports exercises
- c) viral infections
- d) mental activity

36. Which of the following functions does the skeleton of an organism have?
- a) supports the body
 - b) moves the body
 - c) protects the body against infection diseases
 - d) causes pathological processes in bodies
37. Which of the following organs are parts of the Central Nervous System?
- a) brain, spinal cord and nerves
 - b) brain and spinal cord
 - c) only nerves
 - d) skeleton skull
38. Which system does the salivary gland belong to?
- a) Immune system
 - b) Respiratory system
 - c) Urogenital system
 - d) Digestive system
39. Where does food pass through between the mouth and the stomach?
- a) The gullet
 - b) The rectum
 - c) The small intestine
 - d) The large intestine
40. Which of the following organs divides mammalian body into two cavities - thoracic and abdominal?
- a) diaphragm
 - b) heart
 - c) lungs
 - d) liver
41. Which of the following organs is responsible for the creation and maturation of blood cells?
- a) blood vessels
 - b) bone marrow
 - c) ovary
 - d) heart

42. Which of the following processes most fully characterize their continuous performance in the ecosystem?
- a) chlorination and oxidation
 - b) combustion of liquid fuels and gases
 - c) circulation of substances and energy flow
 - d) disease and healing
43. What is the reason for the destruction of the atmosphere ozone layer?
- a) using of alternatives sources of energy
 - b) natural solar radiation
 - c) air pollution with chemically active substances
 - d) the drying up of rivers
44. Which of the following reasons have a negative impact on the ecological equilibrium?
- a) the existence of natural reserves
 - b) the maintenance of botanical gardens
 - c) the creation of feeders for forest animals
 - d) the application of chemical poisons for pest control
45. What processes characterize the embryonic period of individual animal development?
- a) breathing with fully developed lungs
 - b) reducing the size of the body
 - c) formation of tissues, organs and organ systems
 - d) ovulation of oocytes
46. Which organisms are characterized by external fertilization?
- a) amoeba
 - b) amphibians
 - c) birds
 - d) mammals
47. How are the organisms inhabiting a common territory and interacting with each other called?
- a) biotope
 - b) population
 - c) biocoenosis
 - d) biosphere

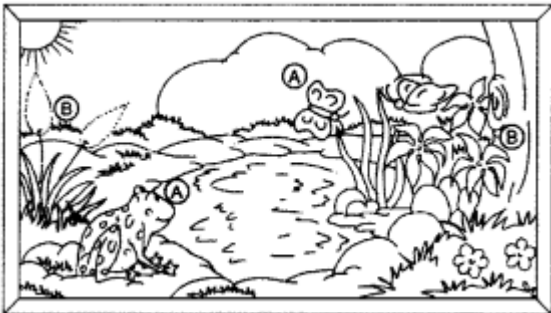
48. The site of photosynthesis in the cells of a leaf is:

- a) chloroplast
- b) mitochondria
- c) cytoplasm
- d) protoplasm

49. Which of the following is non- biodegradable?

- a) Wool
- b) Nylon
- c) Animal bones
- d) Tea leaves

50. An ecosystem is represented in the figure given above. This ecosystem will be self- sustaining if



- a) the organisms labelled A are equal in number to the organisms labelled B.
- b) the type of organisms represented by B are eliminated.
- c) the organisms labelled A outnumber the organisms labelled B.
- d) materials cycle between the organisms labelled A and the organisms labelled B.

TOPICS FOR THE ENTRANCE TEST

1. Types of tissues. Epithelial and connective tissue.
2. Muscle and nerve tissue.
3. Structure of bones and joints. Skull.
4. Bones and joints of the spine, chest and limbs.
5. Muscles. Muscle physiology.
6. Blood.
7. Immunity.
8. Heart and blood vessels. Cardiac activity and blood circulation.
9. Respiratory organs. Breathing.
10. Digestion. Digestion in the oral cavity.
11. Digestion in the stomach and intestines.
12. Organs of urinary system.
13. Skin.
14. Male reproductive system.
15. Female reproductive system.
16. Spinal cord.
17. Brain. Telencephalon.
18. Pituitary gland, thyroid gland, parathyroid glands.
19. Population - species, composition and structure.
20. Biocenoses (natural communities).
21. Interaction between populations in the biocenosis.
22. Ecosystems - structure and productivity. Substance cycle and energy flow in ecosystems.
23. Proteins. Polypeptide chains.
24. Structure and properties of proteins: primary, secondary, tertiary and quaternary structure; properties of proteins.
25. Biological catalyts - enzymes.
26. Nucleic acids. Deoxyribonucleic acids - structure, role in heredity.
27. Ribonucleic acids - structure, types, functions.
28. Eukaryotic cells – size, shape and structure.
29. Interactions between cells and environment - structure of the plasma membrane and transport across membranes.
30. Cellular uptake and secretion - lysosomes, Golgi complex, phagocytosis, pinocytosis, secretion.
31. Cell energy - mitochondria, chloroplasts.
32. Nucleus - definition, structure and function
33. Chromosomes
34. Photosynthesis. Light photosynthesis.
35. Dark stage of photosynthesis. Influence of various factors on photosynthesis.
36. Degradation of nutrients in the cell - glycolysis, Krebs cycle.
37. Biological oxidation.
38. Replication - DNA biosynthesis.

39. Transcription - RNA biosynthesis.
40. Translation - protein biosynthesis.
41. Cell division. Mitosis - essence and regulation.
42. Meiosis - essence, phases, meaning.
43. Monohybrid cross.
44. Dihybrid cross
45. Genes interaction.
46. Gender and genetics.
47. Related inheritance and crossing over.
48. Modification variability.
49. Genotypic variability.
50. Germ cell development.
51. Fertilization.
52. Embryonic development.
53. Postpartum period. Aging. Death.
54. Charles Darwin's theory of evolution
55. Evidence of evolution: paleontology.
56. Evidence for evolution: anatomy, embryology and molecular biology .
57. Modern theories of evolution. Microevolution and macroevolution
58. Human evolution.