Brainiacs Biology Olympiad Preliminary Round Sample Exam Paper 3

Category II – grades 9 and 10

Easy Questions (5 Questions)

Q1.

Chromosomes are structures made of tightly coiled DNA and proteins. They are found in the nucleus and carry genetic information.
Indicate if each of the following is true or false:
A. Humans have 23 pairs of chromosomes in their cells.
B. Genes are located on chromosomes.
C. All chromosomes in humans are identical.
D. Chromosomes are only present in prokaryotic cells.

Answers:
A. True
B. True
C. False (Chromosomes vary in size and gene composition.)
D. False (Chromosomes are present in eukaryotic cells, not prokaryotic cells.)

Q2.

The nervous system helps the body respond to stimuli from the environment. It includes the brain, spinal cord, and nerves.
Indicate if each of the following is true or false:
A. Sensory neurons carry signals from the brain to muscles.
B. The spinal cord connects the brain to the rest of the body.
C. Reflex actions do not involve the brain.
D. The nervous system only controls voluntary actions.

Answers:
A. False (Sensory neurons carry signals to the brain.)
B. True
C. True
D. False (The nervous system controls both voluntary and involuntary actions.)

Q3.

Microorganisms, such as bacteria and fungi, are essential for many biological processes. They play a role in both beneficial and harmful activities.
Indicate if each of the following is true or false:
A. Bacteria are involved in the production of antibiotics.
B. Viruses are beneficial because they decompose organic matter.
C. Fungi are important for breaking down dead plants and animals.
D. Proper hygiene helps prevent diseases caused by harmful microorganisms.

Answers:
A. True
B. False (Viruses cannot decompose organic matter.)

C. True
D. True

Q4.

The process of water and nutrient transport in plants is carried out by specialized tissues. These include xylem and phloem.
Indicate if each of the following is true or false:
A. Xylem transports water from roots to leaves.
B. Phloem transports food in only one direction.
C. Transpiration helps move water through the xylem.
D. Nutrients are absorbed by roots and transported to other parts of the plant.

Answers:
A. True
B. False (Phloem moves food in both directions.)
C. True
D. True

Q5.

Energy flow in ecosystems is a one-way process, starting with producers. Producers convert solar energy into chemical energy, which is transferred to other organisms.
Indicate if each of the following is true or false:
A. Producers are at the base of the food chain.
B. Consumers depend directly on the sun for energy.
C. Decomposers recycle nutrients back into the ecosystem.
D. Energy is lost as heat at each trophic level.

Answers:
A. True
B. False (Consumers rely on producers for energy.)
C. True
D. True

Normal Questions (10 Questions)

Q6.

DNA and genes are fundamental to genetics, determining hereditary traits in organisms. Each gene is a segment of DNA that codes for a specific protein.
Indicate if each of the following is true or false:
A. Genes are located on chromosomes within the nucleus.
B. DNA consists of four bases: adenine, thymine, cytosine, and guanine.
C. Every organism has the same number of chromosomes.
D. DNA replication occurs during cell division.

Answers:
A. True
B. True
C. False (Different organisms have different chromosome numbers.)
D. True

Q7.

Gregor Mendel is known as the father of genetics. He used pea plants to study how traits are inherited through generations.
Indicate if each of the following is true or false:
A. Mendel discovered that traits are inherited independently of one another.
B. Recessive traits are expressed only when both alleles are recessive.
C. Mendel's experiments focused on the inheritance of DNA molecules.
D. Dominant traits always mask recessive traits in heterozygous individuals.

Answers:
A. True
B. True
C. False (Mendel studied traits, not DNA.)
D. True

Q8.

The digestive system is responsible for breaking down food and absorbing nutrients. Different organs play specific roles in this process.
Indicate if each of the following is true or false:
A. The stomach produces bile, which helps digest fats.
B. The small intestine absorbs most of the nutrients from food.
C. Enzymes in the digestive system break down carbohydrates, proteins, and fats.
D. The large intestine absorbs water from undigested food.

Answers:
A. False (The liver produces bile.)
B. True
C. True
D. True

Q9.

Microorganisms have diverse characteristics and play essential roles in daily life. They can be found almost everywhere, including extreme environments.
Indicate if each of the following is true or false:
A. Viruses are living organisms because they can reproduce independently.
B. Bacteria can be beneficial, such as in the production of yogurt and cheese.
C. Fungi are microorganisms that decompose organic matter.
D. Proper hygiene practices can reduce the spread of harmful microorganisms.

Answers:
A. False (Viruses require a host to reproduce.)
B. True
C. True
D. True

Q10.

The human respiratory system ensures the exchange of gases in the body. Oxygen is absorbed into the blood, and carbon dioxide is removed during exhalation.
Indicate if each of the following is true or false:
A. The alveoli in the lungs are the site of gas exchange.
B. Oxygen is transported in the blood by white blood cells.
C. The diaphragm contracts during inhalation, allowing the lungs to expand.
D. Carbon dioxide is a waste product exhaled during respiration.

Answers:
A. True
B. False (Oxygen is transported by red blood cells.)
C. True
D. True

Q11.

Plants rely on vascular tissues to transport water, nutrients, and food throughout their structures. These tissues include xylem and phloem.
Indicate if each of the following is true or false:
A. Xylem carries water and minerals from roots to leaves.
B. Phloem transports food in one direction only.
C. Transpiration plays a role in moving water through the xylem.
D. Phloem moves food from leaves to other parts of the plant.

Answers:
A. True
B. False (Phloem moves food in both directions.)
C. True
D. True

Q12.

Ecosystems are complex interactions between living and non-living components. Organisms depend on abiotic factors like light, water, and temperature.
Indicate if each of the following is true or false:
A. Light is only important for producers in an ecosystem.
B. Temperature can influence the metabolic rates of organisms.
C. Water availability affects the survival of plants and animals.
D. Ecosystems can function without decomposers.

Answers:
A. False (Light affects other organisms indirectly.)
B. True
C. True
D. False (Decomposers recycle nutrients essential for ecosystem balance.)

Q13.

Blood composition includes plasma, red blood cells, white blood cells, and platelets. Each component has a specific role in maintaining homeostasis.
Indicate if each of the following is true or false:
A. Plasma transports nutrients, hormones, and waste products.
B. Red blood cells are responsible for immune defence.
C. Platelets play a role in blood clotting.
D. White blood cells fight infections.

Answers:
A. True
B. False (Red blood cells transport oxygen.)
C. True
D. True

Q14.

The nervous system allows organisms to sense and respond to their environment. It consists of neurons and various structures that coordinate actions.
Indicate if each of the following is true or false:
A. The brain processes sensory information and sends signals to muscles.
B. The spinal cord is not involved in reflex actions.
C. Sensory neurons carry signals from sensory organs to the brain.
D. Reflex actions are faster because they bypass the brain.

Answers:
A. True
B. False (The spinal cord is involved in reflex actions.)
C. True
D. True

Q15.

Population dynamics study changes in population size and composition over time. Factors like birth rate, death rate, and environmental conditions play crucial roles.
Indicate if each of the following is true or false:
A. A population increases when the birth rate exceeds the death rate.
B. Carrying capacity is the maximum number of individuals an environment can support.
C. Overpopulation has no effect on resource availability.
D. Changes in environmental conditions can limit population growth.

Answers:
A. True
B. True
C. False (Overpopulation depletes resources.)
D. True

Hard Questions (5 Questions)

Q16.

Experiment:
Students investigated the effect of different sugar concentrations on yeast respiration. They prepared three solutions with different sugar concentrations: low (5%), medium (10%), and high (20%). Equal amounts of yeast were added to each solution, and the carbon dioxide produced was measured over 30 minutes. Results showed the medium concentration produced the most carbon dioxide, while the low and high concentrations produced less.

Indicate if each of the following is true or false:
A. Yeast respired more efficiently at high sugar concentration, producing the most carbon dioxide.
B. High sugar concentration slowed yeast respiration because of osmotic stress on the cells.
C. Carbon dioxide production is a direct measure of the rate of yeast respiration.
D. Yeast can only perform aerobic respiration in the presence of sugar.

Answers:
A. False
B. True
C. True
D. False (Yeast can also perform anaerobic respiration.)

Q17.

Experiment:
A group of students tested the effect of different antibiotics on bacterial growth. They spread bacteria on an agar plate and placed antibiotic disks labelled A, B, and C. After 24 hours, they measured the zones of inhibition (clear areas) around each disk. Disk A showed the largest zone, disk B showed a moderate zone, and disk C had no clear zone.

Indicate if each of the following is true or false:
A. Disk A had the strongest antibiotic effect on the bacteria.
B. The lack of a clear zone around disk C suggests that the bacteria were resistant to that antibiotic.
C. The larger the zone of inhibition, the more effective the antibiotic is against the bacteria.
D. Antibiotics are effective against both bacteria and viruses.

Answers:
A. True
B. True
C. True
D. False (Antibiotics are effective only against bacteria.)

Q18.

Scenario:
Students studied the relationship between exercise and heart rate. They measured the resting heart rate of participants and then measured it again after 1 minute of jogging, 5 minutes of jogging, and 10 minutes of jogging. Results showed that heart rate increased steadily with exercise but returned to resting levels after 5 minutes of rest.

Indicate if each of the following is true or false:
A. The increase in heart rate during exercise is due to the body's need for more oxygen.
B. Heart rate returns to resting levels immediately after exercise.
C. The circulatory system works with the respiratory system to meet the body's increased oxygen demand.
D. Prolonged exercise does not affect the recovery time of heart rate.

Answers:
A. True
B. False (It takes some time for the heart rate to return to resting levels.)
C. True
D. False (Prolonged exercise can affect recovery time depending on fitness levels.)

Q19.

Experiment:
Students explored the impact of temperature on enzyme activity by using catalase, an enzyme that breaks down hydrogen peroxide into water and oxygen. They prepared test tubes with hydrogen peroxide and catalase, incubating them at 10°C, 37°C, and 60°C. They measured the oxygen released over 5 minutes. Results showed maximum oxygen release at 37°C, with minimal release at 10°C and none at 60°C.

Indicate if each of the following is true or false:
A. Enzyme activity was highest at 37°C, the optimal temperature for catalase.
B. Catalase was denatured at 60°C, resulting in no oxygen release.
C. Low temperatures increase enzyme activity, as seen at 10°C.
D. Enzymes are temperature-sensitive and function within specific temperature ranges.

Answers:
A. True
B. True
C. False (Low temperatures slow enzyme activity.)
D. True

Q20.

Scenario:
In a study of ecosystems, students monitored the effects of urban pollution on bird populations in three areas: a city, a suburban area, and a rural area. They recorded bird species diversity and numbers over a month. The city had the fewest species and individuals, the suburban area had moderate diversity, and the rural area had the highest diversity and population.

Indicate if each of the following is true or false:
A. Urban pollution likely reduces bird populations due to habitat destruction and poor air quality.

B. Suburban areas provide more resources and habitat diversity than rural areas.
C. Rural areas support higher bird diversity because they are less impacted by pollution and human activity.
D. The results suggest that environmental conservation can improve bird populations in urban areas.

Answers:
A. True
B. False (Suburban areas provide less diversity than rural areas.)
C. True
D. True