ZOO516 – ANIMAL FORM & FUNCTION I

MID TERM MOST IMPORTANT QUESTIONS

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GROUP LINK: https://chat.whatsapp.com/BjC6W0jZx8o9yaC2ISh1Gu

1. Differentiate between locomotion and movement.

Movement and locomotion are related but distinct biological concepts. Movement refers to any change in the position or posture of a part of an organism's body. It can occur in both plants and animals and includes actions such as the bending of a plant towards light or the contraction of muscles in humans. Locomotion, on the other hand, is a specific type of movement that results in the organism changing its position or location in the environment. It is generally observed in animals and involves actions like walking, running, flying, or swimming. While all locomotion is a form of movement, not all movement qualifies as locomotion.

2. Define ciliary movement.

Ciliary movement refers to the rhythmic, wave-like motion of cilia—tiny hair-like structures found on the surface of certain cells. This type of movement is used by some unicellular organisms, like *Paramecium*, for locomotion in aquatic environments. In multicellular organisms, including humans, ciliary movement helps in transporting substances across the surfaces of tissues; for example, in the respiratory tract, cilia move mucus and trapped particles out of the lungs to keep the airways clear.

3. Define sensory receptors in invertebrates.

Sensory receptors in invertebrates are specialized cells or structures that detect changes in the environment and help the organism respond to various stimuli such as light, temperature, chemicals, touch, and sound. These receptors are found in different parts of the body and are adapted to the specific needs of the invertebrate. For example, insects have compound eyes for vision, antennae for detecting chemicals and touch, and tympanal organs for sensing sound. These sensory receptors play a crucial role in helping invertebrates survive by guiding their behavior, feeding, mating, and escape responses.

4. How hearing processes in vertebrates?

Hearing in vertebrates is a complex process that involves the detection and interpretation of sound waves by specialized organs. The process begins when sound waves enter the outer ear (in animals that have them, like mammals) and travel through the ear canal to the eardrum, causing it to vibrate. These vibrations are then transmitted through a series of tiny bones in the middle ear (malleus, incus, and stapes in mammals), which amplify the sound.

The vibrations reach the inner ear, specifically the cochlea, a fluid-filled, spiral-shaped organ lined with tiny hair cells. As the fluid inside the cochlea moves, it causes these hair cells to bend, converting the mechanical vibrations into electrical signals. These signals are then transmitted via the auditory nerve to the brain, where they are interpreted as sound. While the structure of the ear can vary among different vertebrates (e.g., fish use their lateral line system and inner ear), the basic principle of converting sound waves into nerve signals remains consistent.

5. How glossopharyngeal and vagus nerves work?

The glossopharyngeal nerve (cranial nerve IX) and the vagus nerve (cranial nerve X) are important cranial nerves that perform both sensory and motor functions, primarily in the head, neck, and thoracic regions.

The glossopharyngeal nerve plays a key role in taste sensation from the back one-third of the tongue, monitoring blood pressure and oxygen levels through receptors in the carotid body, and controlling muscles involved in swallowing. It also helps stimulate saliva secretion from the parotid salivary gland.

The vagus nerve is one of the most important nerves in the parasympathetic nervous system. It helps regulate heart rate, control digestion, and relay sensory information from internal organs like the lungs, heart, and digestive tract. It also contributes to speech, swallowing, and reflex actions such as coughing.

6. Define synapse.

A synapse is the junction between two neurons or between a neuron and another cell (such as a muscle or gland cell), where the transmission of nerve impulses occurs. It consists of three main parts: the presynaptic neuron (which sends the signal), the synaptic cleft (a small gap between the cells), and the postsynaptic cell (which receives the signal). When an electrical impulse reaches the end of the presynaptic neuron, it triggers the release of neurotransmitters, which are chemical messengers. These neurotransmitters cross the synaptic cleft and bind to receptors on the postsynaptic cell, generating a response. Synapses are essential for communication within the nervous system and for processing information in the brain.

7. What is neuroblast?

A neuroblast is an immature, developing nerve cell (neuron) that originates from neural stem cells during early stages of the nervous system development. It is a type of precursor cell that will eventually mature into a fully functional neuron. Neuroblasts are formed during embryonic development and play a critical role in building the brain and spinal cord. They undergo processes such as migration, growth, and differentiation to become specific types of neurons, each with specialized functions. In some organisms, neuroblasts may also be present in limited regions of the adult brain, contributing to neurogenesis (the formation of new neurons).

8. Name branches of trigeminal nerve.

The trigeminal nerve (cranial nerve V) has three main branches**:**

1. ***Ophthalmic nerve (V1)*** – Supplies sensation to the forehead, scalp, upper eyelid, and nose.
2. ***Maxillary nerve (V2)*** – Supplies sensation to the lower eyelid, upper lip, cheeks, and upper teeth.
3. ***Mandibular nerve (V3)*** – Supplies sensation to the lower jaw, lower teeth, chin, and also controls the muscles used for chewing (mastication).

9. Differentiate between ciliary and flagella movement.

Ciliary and flagellar movements are both types of locomotion involving hair-like structures, but they differ in structure, motion, and function:

Ciliary movement involves cilia, which are short, numerous, hair-like projections on the surface of a cell. They beat in a coordinated**,** wave-like pattern, often in a back-and-forth or sweeping motion. This type of movement is common in organisms like *Paramecium,* and in human tissues such as the respiratory tract, where cilia help move mucus and debris.

Flagellar movement involves flagella, which are longer and usually fewer in number (often one or two per cell). Flagella move in a whip-like or undulating motion to propel the cell forward, as seen in sperm cells or in single-celled organisms like *Euglena*.

10. Describe the flowchart of Nervous System.

The nervous system is divided into two main parts: the central nervous system (CNS) and the peripheral nervous system (PNS). The CNS consists of the brain and spinal cord, which process and integrate information. The PNS connects the CNS to the rest of the body and is further divided into the somatic nervous system, which controls voluntary movements, and the autonomic nervous system, which regulates involuntary functions such as heartbeat and digestion. The autonomic nervous system is split into the sympathetic division, which prepares the body for stressful situations, and the parasympathetic division, which promotes relaxation and recovery. Together, these divisions coordinate the body's responses to internal and external stimuli.

11. Explain fish musculature.

Fish musculature is primarily composed of two main types of muscle arranged in distinct patterns that enable efficient movement in water. The most prominent muscles are the myotomes, which are segmented blocks of muscle tissue arranged along the sides of the fish's body in a zigzag or W-shaped pattern. These muscles are mainly striated muscles, responsible for powerful and rapid contractions that allow swimming. The myotomes are divided into two groups: epaxial muscles (located above the horizontal septum) and hypaxial muscles (below the horizontal septum). Epaxial muscles control upward and lateral movements, while hypaxial muscles aid in downward and lateral motions. Additionally, fish have smooth muscles in internal organs and cardiac muscle in the heart. This muscular arrangement enables fish to generate undulating movements, propelling themselves efficiently through the water.

12. Write a note on amoeboid movement.

Amoeboid movement is a type of locomotion commonly seen in amoebas and some other cells, such as white blood cells. It involves the cell extending parts of its body called pseudopodia (meaning “false feet”), which are temporary projections of the cell’s cytoplasm. The cell moves by pushing the cytoplasm forward into these pseudopodia, allowing it to crawl slowly over surfaces. This movement is controlled by the flow and reorganization of the cell’s internal fluid and cytoskeleton. Amoeboid movement is important not only for locomotion but also for processes like engulfing food particles through phagocytosis. It is a flexible and adaptive form of movement used by many single-celled organisms and some cells in multicellular organisms.

13. Define structure of spinal cord.

The spinal cord is a cylindrical, elongated structure made of nervous tissue that extends from the base of the brain (medulla oblongata) down through the vertebral column. It is protected by the vertebrae, meninges, and cerebrospinal fluid. The spinal cord is divided into segments, each giving rise to a pair of spinal nerves. Its internal structure consists of gray matter shaped like a butterfly or the letter "H" in the center, which contains nerve cell bodies and is responsible for processing information. Surrounding the gray matter is white matter, made up of myelinated nerve fibers that transmit signals between the brain and the rest of the body. The spinal cord functions as a major pathway for transmitting nerve impulses and also coordinates reflex actions.

14. Write physiological properties of muscles.

The physiological properties of muscles include excitability, contractility, extensibility, and elasticity. Excitability is the ability of muscle tissue to respond to a stimulus, usually from a nerve impulse. Contractility refers to the muscle’s ability to shorten and generate force when stimulated. Extensibility is the capacity of muscles to be stretched without being damaged, allowing them to lengthen during movement. Lastly, elasticity is the ability of muscle fibers to return to their original shape and length after being stretched or contracted. These properties work together to enable muscles to perform their essential roles in movement, posture, and maintaining body functions.

15. How skeletal muscles are regulated?

Skeletal muscles are regulated primarily through the nervous system, specifically by motor neurons that transmit signals from the brain or spinal cord to the muscle fibers. When a motor neuron sends an electrical impulse, it reaches the neuromuscular junction, where it releases the neurotransmitter acetylcholine. This chemical binds to receptors on the muscle fiber’s membrane, triggering an action potential that causes the muscle to contract. The strength and duration of muscle contraction are controlled by the frequency of nerve impulses and the number of motor units activated. Additionally, feedback from sensory receptors in muscles helps coordinate and adjust muscle activity, ensuring smooth and precise movements.

16. Write importance of nervous system.

The nervous system is crucial because it controls and coordinates all the activities of the body, allowing organisms to respond quickly to internal and external changes. It processes sensory information from the environment, enabling perception of stimuli like touch, sound, and light. The nervous system also regulates vital functions such as breathing, heartbeat, and digestion through its control of involuntary actions. Moreover, it enables voluntary movements, thought processes, learning, memory, and emotions. Overall, the nervous system ensures survival by maintaining homeostasis and facilitating communication between different parts of the body.

17. What are tactile receptors?

Tactile receptors are specialized sensory receptors in the skin that detect touch, pressure, and vibration. They help organisms perceive physical sensations from their environment, allowing them to respond appropriately. Different types of tactile receptors respond to various stimuli—for example, Meissner's corpuscles detect light touch, Pacinian corpuscles sense deep pressure and vibration, and Merkel cells respond to sustained pressure. These receptors send signals to the nervous system, which processes the information and enables sensations such as texture, shape, and movement on the skin.

18. Define photoreceptors in Euglena.

Photoreceptors in Euglena are specialized light-sensitive structures that help the organism detect and respond to light. In Euglena, this function is mainly carried out by the eyespot (or stigma), which contains pigmented granules that filter light and work together with the flagellum to enable the organism to move toward or away from light sources—a behavior known as phototaxis. This ability allows Euglena to find optimal light conditions for photosynthesis, which is essential for its survival since it can produce food using light energy.

19. Write advantages of cartilage over bone.

- More flexible and elastic, allowing it to absorb shock and resist pressure.
- Lighter in weight compared to bone.
- Provides smooth surfaces at joints for easy and frictionless movement.
- Found in areas requiring flexibility, such as the nose, ears, and respiratory passages.
- Can sometimes grow and repair more easily than bone.
- Acts as a cushion between bones, reducing wear and tear.

20. How shell is formed in Coral?

The shell in corals is formed through the secretion of calcium carbonate ($CaCO_3$) by the coral polyps. These tiny animals extract calcium and carbonate ions from seawater and deposit them beneath their bodies to create a hard, protective exoskeleton. Over time, this calcium carbonate builds up layer by layer, forming the rigid coral skeleton or shell. This process not only protects the soft coral tissues but also contributes to the growth of coral reefs, which provide habitats for many marine organisms.

21. What are neuromast cells?

Neuromast cells are specialized sensory cells found in the lateral line system of fish and amphibians. They detect water movements and vibrations in the surrounding environment, helping the animal sense nearby objects, predators, or prey. Each neuromast consists of hair cells covered by a gelatinous structure called the cupula. When water moves, it bends the hair cells, generating nerve impulses that are sent to the brain. This sensory system is crucial for navigation, hunting, and avoiding danger in aquatic habitats.

22. Explain anatomy of human eye.

The human eye is a complex sensory organ responsible for vision. It is roughly spherical and protected by the bony orbit of the skull. The outermost layer is the sclera, a tough, white protective covering, with the transparent cornea at the front allowing light to enter. Behind the cornea is the aqueous humor, a clear fluid that nourishes the eye and maintains pressure. The iris, the colored part of the eye, surrounds the pupil, which controls the amount of light entering by adjusting its size. Behind the pupil lies the lens, a flexible, transparent structure that focuses light onto the retina at the back of the eye. The retina contains photoreceptor cells (rods and cones) that convert light into electrical signals. These signals travel through the optic nerve to the brain, where they are interpreted as images. The eye also contains the vitreous humor, a gel-like substance that maintains its shape. Together, these parts work to capture and process visual information.

23. Write a note on dermis of amphibians.

The dermis of amphibians is the inner layer of their skin, located beneath the outer epidermis. It is thicker and more developed compared to many other vertebrates and plays a crucial role in their survival. The dermis contains a network of collagen fibers, blood vessels, nerves, and specialized cells such as glands. These glands include mucous glands, which keep the skin moist and help in respiration, and poison glands, which provide defense against predators. The rich blood supply in the dermis also aids in cutaneous respiration, allowing amphibians to absorb oxygen directly through their skin. This layer provides flexibility, strength, and protection, making it vital for amphibians' adaptation to both aquatic and terrestrial environments.

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Regards,

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