



Aquatic insects 343E; for 3rd year students

Answer the questions

AQ1- Write briefly on the following (select three only)

(15 marks)

- **Insect respiration siphons**

Respiratory Siphon is a cuticular modification around the spiracle function as gills carrying O₂ directly into the tracheal system. Air-tubes are present in aquatic bugs (Hemiptera) and flies (Diptera) restricting their activity to water surface. Although many aquatic insects live underwater, they get air straight from the surface through hollow breathing tubes (sometimes called siphons) that work on the same principle as a diver's snorkel. In mosquito larvae, for example, the siphon tube is an extension of the posterior spiracles. An opening at the end of the siphon is guarded by a ring of closely spaced hairs with a waterproof coating. At the air-water interface, these hairs break the surface tension of the water and maintain an open airway. When the insect dives, water pressure pushes the hairs close together so they seal off the opening and keep water out. Water scorpions (Hemiptera: Nepidae) and rat-tailed maggots (larvae of a Syrphid fly) are two more examples of aquatic insects that have snorkel-like breathing tubes. The mosquito larva of *Mansonia* gets its oxygen from aquatic plants by using a special device, which is part of the respiratory siphon to penetrate into the air tissues of the aquatic plants.

- **Natural factors that influence dissolved oxygen**

The headwaters of a river are very important to the overall health of the entire river, because this is the source of food and nutrients carried downriver. In forested areas, leaves and wood from overhanging trees and shrubs provide food energy. Consequently, you will find many collectors and shredders in these types of areas. In areas not shaded by trees and shrubs, such as prairies, deserts, and mountains, algae and aquatic plants are the main source of energy. You will find that grazers dominate this type of environment. As the river widens and deepens, sunlight is a limiting factor. Rooted vascular plants may grow along the shoreline and algae may grow on rocks. Collector organisms will be found in this area, filtering out particles suspended in the water and gathering fine particles that have settled to the bottom.

- **Phantom midge adaptation**

The phantom midge (glassworm) **Chaoborus** sp. (Chaoboridae) is normally regarded as the only planktonic insect and is abundant in many eutrophic (nutrient-rich) ponds and lakes. The tracheal system in these larvae is reduced to kidney-shaped air sacs that function solely as hydrostatic organs, and the larvae slowly descend or rise by adjusting the volume of the air sacs. The larvae avoid predation by being almost transparent, and they have prehensile antennae that are used as accessory mouthparts to impale zooplankton. The only other group of insects that may be considered to be planktonic are the early chironomid instars, which have been reported in the open-water column. Phantom midges (Family Chaoboridae) are unique due to their feeding method. The antennae of phantom midge larvae are modified into a grasping organ, which captures food, such as small insect larvae and crustaceans like *Daphnia* and mosquito larvae. The antennae impale or crush the prey and then bring it to the larval mouth, or stylet.

- **Water strider bugs adaptation**

Most aquatic insects are sensitive to water ripples to detect predators or prey. Some even create their own ripples on the water surface and process the returning "echoes" to detect prey. Many, such as the whirligig beetle, also create ripples to find mates and communicate

with each other. The water strider uses its front legs as sensors for the vibrations produced by the ripples in the water

AQ2- Give the reasons for three only from the following

(9 marks)

- **Mansonia mosquitoes are unique in their respiration method.**

The mosquito larva of *Mansonia* gets its oxygen from aquatic plants by using a special device, which is part of the respiratory siphon to penetrate into the air tissues of the aquatic plants. The pupa of *Mansonia uniformis*. Like the larvae, the pupa has modified trumpets for piercing plant materials to gain their oxygen. They normally only rest on the water surface like this just before emerging. The eggs of *Mansonia* also are laid in a raft usually attached to plant material

- **Whirligig beetles and Water strider prefer calm water habitats.**

(Look at Ripple effect phenomena)

Ripple effect phenomena

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- **Stonefly nymph is more common in algae areas.**

Scrapers like stonefly nymph are most commonly found in parts of streams where sunlight can reach the bottom to allow algal growth. Often, sunny parts of streams are faster parts; so many scrapers have evolved mechanisms that allow them to stay attached to rocks in fast currents. They have mouthparts adapted to graze or scrape materials from rock surfaces and organic substrates. These mouthparts work like a sharp blade to remove the outermost layer of algae, which is attached very tightly but is very nutritious for those insects equipped to remove it.

- **Energy relationships are more abundant in lotic than lentic habitats**

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AQ3- Compare between the following with examples (select three only)

(12 marks)

Communities	Benthos	Nekton
Definition	Benthos is organisms associated with the bottom or solid-water interface). The majority of insects found in standing-water habitats belong to the benthos	Nekton is organisms that reside in the open water. They are distinguished from plankton by their directional mobility
Example	Chironomid larvae and caddies flies	Among the Heteroptera, nektonic species are in the Notonectidae (back swimmers), Corixidae (water boatman),.
	Lentic Substrate	Lotic Substrate

Definition	The word lentic is derived from the Latin lentus, meaning slow. Lentic environments include lakes, ponds, wetlands, and reservoirs. The slow-moving water found in lentic habitats may have higher temperatures and lower dissolved oxygen concentrations	Lotic refers to those systems dominated by running water. The term lotic has its origins in the Latin lotus, "to wash." such as rivers and streams. A Lotic Ecosystem has flowing waters. Examples include: creeks, streams, rivers, springs, brooks and channels
Example	Notonectidae (back swimmers), Corixidae (water boatman), and Belostomatidae (giant water bugs)	Stoneflies (Plecoptera) and The Diptera family Simuliidae
	Sprawlers	Clingers
Definition	Sprawlers are organisms that live on the bottom. They tend to be more mobile than clingers are, and lack specialized, permanent attachment structures. They have flattened bodies, well camouflaged, Many sprawlers are heavily ballasted with structures such as cases or shells that help them stay on the bottom.	Organisms that use claws or other means of attachment to hold onto the substrate. Representatives have behavioral and morphological (e.g., long, curved tarsal claws or gills arranged as a sucker) adaptations for attachment to surfaces in stream riffles and wave-swept rocky littoral zones of lakes
Example	(e.g., Odonata: Libellulidae).	(e.g., Trichoptera: and Diptera) if they hold onto plants we call them
	Piercers	Engulfers
Definition	Piercers who are suck out the liquefied insides of their victim. The mandibles are each curved over to form an almost closed groove along their inner surface. The prey is caught and pierced by the mandibles. Digestive juices are pumped down the groove. The food is made into a liquid.	Predator insects that swallow their prey whole or in parts. -They have a large pair of jaws with teeth on the end that fold under their mouthparts.
Example	The diving beetle larvae and the water bug	Stoneflies (Plecoptera) and dragonflies, as well as caddisflies. Dragonfly larvae,

AQ4- Give the term

(12 marks)

	The Statements	
1	A phenomenon that Whirligig beetles Water strider depend on in the predation process	Ripple effect
2	Natural container habitats and include tree holes, pitcher plants	Phytotelmata
3	Female lays a few eggs on the back of the male after mating	Belostomatinae
4	Insects that eat leaves and other organic matter that contain nourishing fungi, algae, and bacteria	Detritivores
5	Organisms that associated with the bottom	Benthos
6	Areas where the soil is saturated or inundated for at least part of the time.	Wetlands
7	Insects that obtain food by scraping algae and diatoms off rocks	Stone fly
8	Mouthparts that are designed to chew off pieces of soft vegetation, such as leaves, flowers, or twigs, and grind up this material	Shredders
9	Organisms are salt tolerant and can survive in marine ecosystems	Euryhaline
10	An area characterized by slower waters, higher mean monthly temperatures, turbid waters, and finer substrates	potomal zone
11	Insect communities characterized by the slender and light-weight body with long legs	Pleustontic
12	A special array of rigid, closely-spaced hydrophobic hairs that create "airspace" next to the body.	Plastron

Best wishes

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