PENANG SANGAM HIGH SCHOOL

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LESSON NOTES

WEEK 17

Year/Level: 13A/B **Subject:** BIOLOGY

Strand	2 Living Together
Sub Strand	2.1 Organisms And The Environment
Content Learning Outcome	• Describe with examples the different types of biological timing. • Define different rhythmic processes that result in season, time and environment

Environment	Biotic and abiotic surrounding of an organism or population.
Ecological niche	A role of and position of a species in its environment: how it meets its need for food and shelter, how it survives and how it reproduces.
Habitat	The area or natural environment in which an organism or population lives.
Population	A group of organism which lives in a particular geographical area at any given time and have the capability to interbreed.
Community	A group of organisms or populations living and interacting with one another in a particular environment.
Gause's Exclusion Principle	States that two species that compete for the exact same limiting resources cannot stably coexist.
Zeitgeber	Any external or environmental agent such as light and temperature that synchronises an organisms biological rhythms to the earths.
Entrainment	The process by which the internal clock becomes reset by rhythmic environmental influences. It allows: • Organisms to adjust to seasonal changes in the time of dawn or dusk. For example, as the day lengthen the diurnal animals would become active while nocturnal animal become active at night. • Migratory organisms to continually update their clock which would otherwise get out of the phase.

BIOLOGICAL TIMING

- Biological timing is the responses of organisms in harmony with cyclical changes in the environment. Organisms synchronise its activities to these rhythms:

o Exogenous: A rhythm that is control by the external, environmental stimuli detected by the organisms.
o Endogenous: A rhythm that is controlled by an internal biological clock.
o Combination: of both endogenous and exogenous.

Biological Clocks

- An internal timing system which continues without external time cues, and controls the time of activities of plants and animals.
- The biological clock in animals is found in the hypothalamus of the brain and are:

- Sensitive to environmental cues
- Can be stopped and reset
- very accurate
- inherited

- Biological clock control certain regularly, repeated, rhythmic, cyclic, or periodic occurrences like:

1. Daily cycle (circadian rhythms)

Linked to the day – night cycle which responds to the revolution of the earth on its own axis. For example, blooming of various flowers at particular times of the day and activity of animals at different times of the day.

o Diurnal – active during the day, inactive at night
o Nocturnal – active at night, inactive during the day
o Crepuscular – active at dawn and dusk
o Arrhythmic – no regular pattern – tend to be found where changes in the microclimate are negligible

2. Lunar cycle (circamonthly rhythm)

- Linked to the rotation of the moon around the earth. For example:
- Entry of young salmon into saltwater from fresh water during new moon.
- Ability of some animals to synchronise their behaviour with the phases of the moon.
- The spawning behaviour of some marine worms synchronised by the moon so that the egg and sperm are released at the same time.
- Changes associated with tidal patterns are considered as circamonthly (lunar)
- Grunion fish also work on circamonthly method of spawning.

3. **Annual cycle (circannual rhythm)**

Linked to seasonal changes in the environment occurring due to tilting of the earth which rotates around the sun. Examples are:

a) **Migration**: some birds migrate to warmer latitudes as winter approaches and back to temperate lands in spring.

b) **Dormancy**: refers to the state of reduced metabolic activity that many organisms enter; either while facing environmental stress or when likely to face such stress.

i) **Dormancy in plants:** period in which a plant stops growing in order to survive inhospitable conditions such as water shortage and freezing temperatures. For example, frangipani plant, *Plumeria rubra* sheds its leaves annually and displays its stark branches.

ii) **Hibernation:** refers to a lengthy period of inactivity (sleeping) in animals.
Animals undergoing hibernation phase will have a lower body temperature, slower breathing and conserves food by living off fat deposits. This prevents damage from low temperatures. For example:

- Some animals sheds fur in summer and grows thick warm covering fur in winter.
- Bats huddle together in a protected place such as closed cave.
- Turtles- reduce their heart rate.

iii) **Brumation:** is a term used for the hibernation-like state that cold-blooded animals such as reptiles undergo during cold weather. However, it differs from hibernation in the metabolic processes involved.

iv) **Aestivation/Estivation**- a form of hibernation that animals resort to in order to help avoid damage from high temperatures. Aestivators are snails, earthworms, bees, toads, lizards, crocodiles etc.

Activity:

1. Define the term biological timing.

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2. Differentiate between estivation and brumation with an appropriate example of each.

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