

**IDX G9 BIOLOGY S STUDY GUIDE**

**ISSUE 3**

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4.5 Aquatic Ecosystems

**Types of Aquatic Ecosystems**

- Freshwater Ecosystems

- Rivers and Streams: Flowing water, high oxygen levels, diverse organisms adapted to current.

- Lakes and Ponds: Standing water, different zones (littoral, limnetic, profundal), seasonal changes.

- Marine Ecosystems

- Intertidal Zone: Area between high and low tides, organisms adapted to changing conditions.

- Neritic Zone: Shallow ocean waters, high biodiversity, rich in nutrients.

- Oceanic Zone: Open ocean, vast, low nutrient levels in some areas.

**Abiotic Factors in Aquatic Ecosystems**

- Light: Penetration affects photosynthesis and varies with depth and water clarity.

- Temperature: Influences metabolism and distribution of organisms.

- Salinity: Affects osmosis in organisms, different levels in freshwater and marine ecosystems.

**Aquatic Organisms**

- Producers: Phytoplankton (in marine) and algae (in freshwater) are primary producers.

- Consumers

- Zooplankton feed on phytoplankton.

- Fish, crustaceans, and other larger animals are higher-level consumers.

- Decomposers: Bacteria and fungi break down dead organic matter.

5.1 How Populations Grow

**Population Characteristics**

- Population Size: Number of individuals in a population.

- Population Density: Number of individuals per unit area or volume.

- Dispersion: Patterns of how individuals are spaced in a population (clumped, uniform, random).

**Population Growth Models**

- Exponential Growth: Occurs when resources are unlimited and population size increases rapidly.

- Logistic Growth: Population growth slows as it reaches the carrying capacity of the environment due to limited resources.

**Factors Affecting Population Growth**

- Birth Rate: Number of births per unit time.

- Death Rate: Number of deaths per unit time.

- Immigration: Movement of individuals into a population.

- Emigration: Movement of individuals out of a population.

5.2 Limits to Growth

**Limiting Factors**

- Density-Dependent Factors

- Competition for resources (food, space, mates) increases as population density rises.

- Predation and parasitism can have a greater impact on dense populations.

- Disease spreads more easily in crowded populations.

- Density-Independent Factors

- Natural disasters (fires, floods, earthquakes) can reduce population size regardless of density.

- Harsh weather conditions can affect survival.

**Carrying Capacity**

- The maximum number of individuals an environment can support over a long period.

- Populations tend to stabilise around the carrying capacity.

5.3 Human Population Growth

**Historical Growth of the Human Population**

- Early Growth: Slow growth rate for most of human history due to high death rates (disease, famine, lack of medical knowledge).

- Accelerated Growth: During the Industrial Revolution, improvements in agriculture, medicine, and sanitation led to decreased death rates and increased population growth.

**Patterns of Human Population Growth**

- Developed Countries: Generally have lower birth rates and slower population growth, with some approaching zero population growth.

- Developing Countries: Higher birth rates, but death rates are decreasing, leading to rapid population growth.

**Factors Affecting Human Population Growth**

- Birth Rates

- Cultural and religious beliefs can influence family size.

- Access to education and employment opportunities for women can lower birth rates.

- Death Rates

- Advances in medical technology and healthcare have reduced mortality.

- Improved nutrition has increased life expectancy.

- Migration: The movement of people between countries and regions affects population distribution.