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# INTERACTIONS: Interactions Within Ecosystems

# CHAPTER ANALYSIS

**10 KEY CONCEPTS**

- Show an understanding of an ecosystem
- Recognise how adaptive traits and changes in environmental conditions can affect the survival of organisms
- Explain the importance of various physical factors like air, water, temperature, light, minerals and pH, to the life of organisms
- Show an understanding of the inter-relationship among the various organisms in a community
- Compare photosynthesis and respiration
- Compare respiration and breathing in terms of the roles they play in the interactions between living things and their environment
- Show an understanding of how respiration and photosynthesis are related to the flow of energy through food chains and food webs
- Describe how nutrients trapped in living organisms are recycled within the environment, through the actions of decomposers
- Infer the role of decomposers in recycling of nutrients in the environment
- Explain the importance of conserving the environment & the impact of human activity on the environment

**1 ADVANCED CONCEPTS**

- Show an awareness of how some cultures practice sustainable living through their interactions with the environment

KEY CONCEPT

# ECOSYSTEMS

# ECOSYSTEMS

## TERMS

- Population: A group of organisms of the same kind
- Community: Different populations living together in the same habitat
- Ecosystem: A community of organisms in a habitat that interact with one another and with their physical environment

## ENVIRONMENT

| | |
|---|---|
| **Physical environment** | Consists of all the non-living factors in a habitat<br>• Light<br>• Temperature<br>• Air<br>• Water |
| **Living environment** | Made up of all the organisms in a habitat |

### Adaptations to the environment

- Structural adaptations: features of an organism that help it to survive
    - Porcupine fish have spikes to protect itself against predators
- Behavioural adaptations: ways an organism behaves in order to survive
    - Clownfish hide in tentacles of sea anemone to prevent being eaten by predators

KEY CONCEPT

# INTERACTIONS WITH THE PHYSICAL ENVIRONMENT

# FACTORS

Factors of physical environments

- Light
- Temperature
- Water
- Air
- Minerals
- pH

**Light**

- Green plants need light to make food through photosynthesis
- Most animals need light to see so that they can move about (find food, avoid danger)
- FEATURES: water lilies have large leaves that float on the surface of water to trap as much sunlight as possible

**Temperature**

- Temperature affects the activities and functioning of organisms
- FEATURES: Animals living in cold climates (eg. Penguins) have thick fur to keep themselves warm

**Water**

- Water is crucial to an organism's survival
- Generally, more organisms are present where water is available
- FEATURES: cacti have thick stems to store water and waxy skin to reduce loss of water

# FACTORS

**Air**

- Plants need carbon dioxide from the air for photosynthesis; living things need oxygen for respiration
- FEATURES: guppies take in air near the water surface in a pond with little oxygen

**Minerals**

- Minerals are compounds that contain elements essential for healthy growth (eg. Nitrogen, phosphorus, potassium). They are used to make key substances such as chlorophyll, vitamins, and proteins
- Animals obtain minerals from the food they eat; plants obtain minerals from solutions in the soil

**pH**

- The pH value of solutions in soil, or water in ponds and the sea affects the kinds of organisms that live in these habitats

KEY CONCEPT

# INTERACTIONS WITH THE BIOTIC ENVIRONMENT

# INTERACTIONS

**Predator-prey relationship**

- Predators are well-adapted to catch and kill their prey
    - Have good senses, speed, strong jaws, claws, and beaks, camouflage
- Prey have important adaptations to protect them from predators
    - Hedgehogs have spikes, some frogs have poison

**Mutualism**

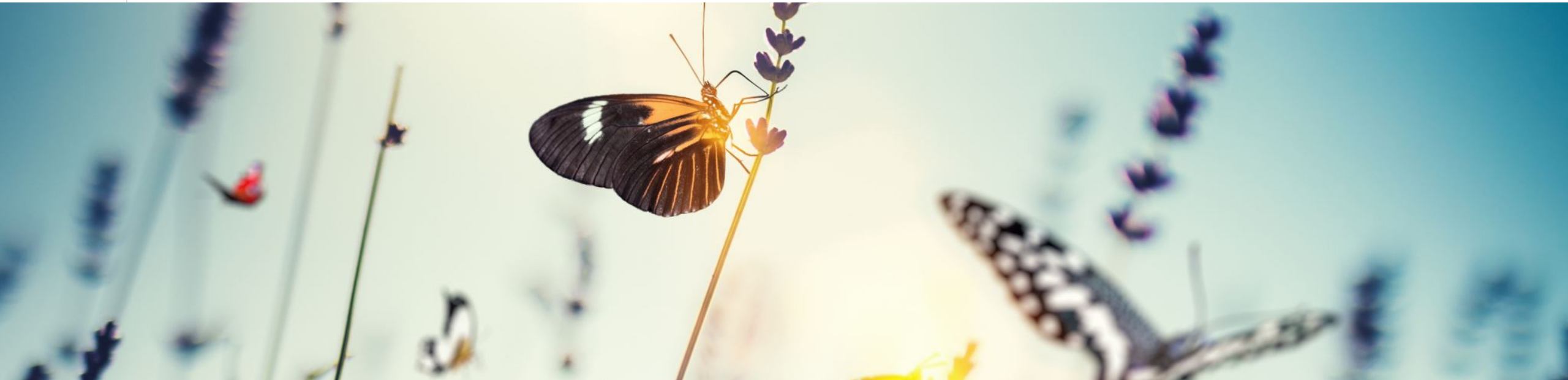
- A relationship between two organisms in which both organisms benefit
- Eg. Sharks and remora fish: the fish feed off parasites on the shark's skin and the shark protects them from other predators

**Parasitism**

- A relationship in which one organism benefits while the other is harmed
- Eg. Bracket fungus grows on trees, and is a parasite as it takes water and minerals from the tree but does nothing to help it live

KEY CONCEPT

# ENERGY FLOW



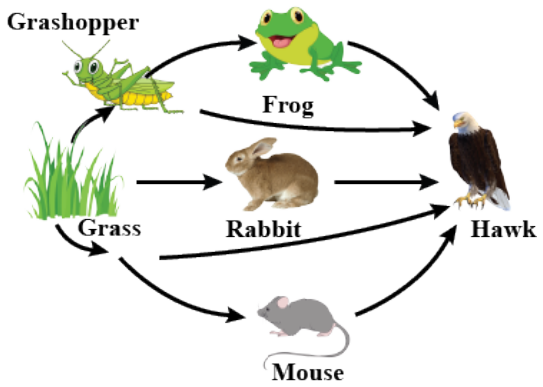
# ENERGY FLOW

- The source of energy in an ecosystem is the sun
- Energy from the sun enters an ecosystem when it is trapped in the leaves of green plants during photosynthesis
- The energy stored in plants is transferred to animals when they eat plants. The energy is released in the animals through respiration

## FOOD CHAINS

**Producers** (green plants) → **Primary Consumers** (animals that eat only plants) → **Secondary consumers** (animals that eat other primary consumers)

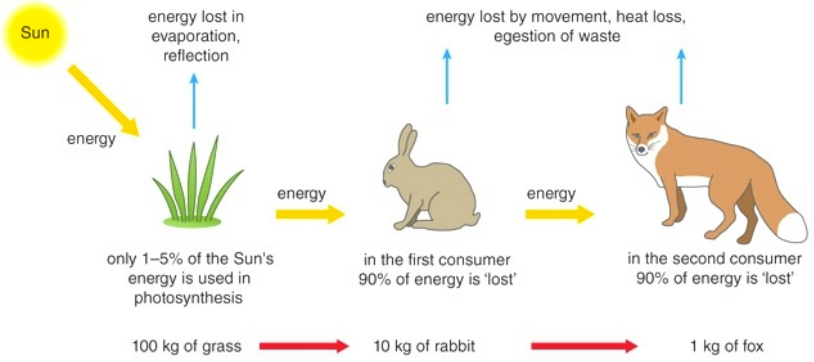
## FOOD WEBS



# ENERGY FLOW

## Energy loss

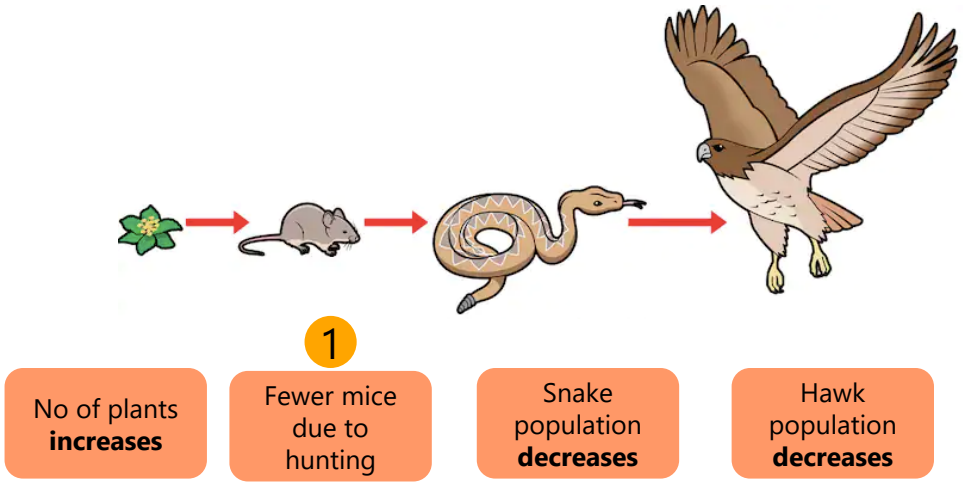
As energy passes along a food chain, the amount of energy transferred gradually decreases. This is because energy is lost to the environment at each link in the food chain.




## Upsetting the balance

Factors:

- Natural forces (weather, disease)
- Human activity (use of poisons, over-hunting, pollution)



KEY CONCEPT

# KEY PROCESSES

# KEY PROCESSES

## RESPIRATION VS BREATHING

| Respiration | Breathing |
|---|---|
| Release of energy from the food we eat | Exchange of oxygen and carbon dioxide between the organism and the environment |
| Takes place in every cell | Takes place in special organs (eg. Lungs) |

## PHOTOSYNTHESIS VS RESPIRATION

| Photosynthesis | Respiration |
|---|---|
| Takes place only in plants | Takes place in all organisms |
| Takes place in light | Takes place all the time |
| Requires energy (light) | Releases energy |
| Uses carbon dioxide and water | Uses oxygen |
| Makes carbohydrate molecules | Breaks down carbohydrate molecules |
| Oxygen given off | Carbon dioxide and water given off |
| Occurs only in cells with chlorophyll | Occurs in all cells |
| Carbon dioxide + water ↓ Glucose + oxygen | Glucose + oxygen ↓ Carbon dioxide + water + energy |

KEY CONCEPT

# RECYCLING OF NUTRIENTS


## DECOMPOSERS

Definition: Decomposers are organisms that feed on and break down dead plants and animals into simpler substances which are returned to the environment

**Examples**
- Bacteria
- Fungi

**Products**
- Carbon dioxide
    - Escapes from the soil into the air, and is used for photosynthesis in plants
- Minerals
    - Dissolve in water in the soil, absorbed by plant roots for growth

**Roles**
- They prevent the earth from being covered in dead matter and animal waste
- They enrich the soil with nutrients that plants need to grow
- They conserve natural resources (ensure nutrients are always available for plants)

**Scavengers**
Animals that feed on and break up dead organisms into smaller pieces
They **are not** decomposers, but the smaller pieces they produce help decomposes break down dead matter more quickly.
Eg. Vultures, earthworms

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