

Chapter 2

Microorganisms: Friend and Foe

Algae

Algae are a diverse group of photosynthetic organisms found in aquatic environments. They range from microscopic phytoplankton to large seaweeds like kelp. Algae play a crucial role in ecosystems by producing oxygen, serving as a food source for marine life, and contributing to carbon cycling.

There are different types of algae, including:

1. **Green algae (Chlorophyta)**: Found in freshwater and marine environments, related to land plants.
2. **Red algae (Rhodophyta)**: Mostly marine, important for coral reef formation (e.g., coralline algae).
3. **Brown algae (Phaeophyta)**: Includes large seaweeds like kelp, common in cold ocean waters.
4. **Diatoms**: A type of microalgae with silica cell walls, important in marine food chains.
5. **Blue-green algae (Cyanobacteria)**: Technically bacteria but photosynthetic, some species can produce harmful toxins.

Algae have various uses, from biofuels and food supplements (spirulina, nori) to wastewater treatment and carbon sequestration.

Here are some examples of different types of algae:

1. **Green Algae (Chlorophyta)**

- **Chlorella** – Used in health supplements and biofuel production.
- **Volvox** – A colonial freshwater algae.
- **Spirogyra** – Filamentous algae found in ponds and streams.

2. **Red Algae (Rhodophyta)**

- **Porphyra (Nori)** – Used in sushi wraps.
- **Coralline algae** – Helps build coral reefs by depositing calcium carbonate.

3. **Brown Algae (Phaeophyta)**

- **Macrocystis (Giant Kelp)** – Forms underwater kelp forests.
- **Sargassum** – Free-floating seaweed found in the Sargasso Sea.
- **Fucus (Rockweed)** – Found along rocky coastlines.

4. **Diatoms (Bacillariophyceae)**

- **Navicula** – A common freshwater and marine diatom.
- **Thalassiosira** – Important in ocean food webs.

5. Blue-Green Algae (Cyanobacteria)

- **Anabaena** – Forms toxic blooms in freshwater.
- **Nostoc** – Forms gelatinous colonies and fixes nitrogen.
- **Microcystis** – Produces harmful toxins in polluted water bodies.

Chapter 4

Combustion and Flame

Compressed Natural Gas (CNG)

CNG is a cleaner and more efficient fuel used in automobiles. Here's why it is useful:

1. **Environmentally Friendly** <
 - Produces **lower emissions** than petrol and diesel (less CO₂, NO_x, and particulate matter).
 - Helps reduce **air pollution** and supports a greener environment.
2. **Cost-Effective** =
 - CNG is **cheaper** than petrol and diesel in many countries.
 - Provides **better mileage**, making it more economical for long-term use.
3. **Higher Efficiency & Performance** =
 - CNG burns more cleanly, reducing engine wear and maintenance costs.
 - Increases engine life compared to diesel engines.
4. **Safe Fuel Option** =
 - CNG has a **higher ignition temperature** than petrol, making it less likely to catch fire.
 - Lighter than air, so in case of leakage, it disperses quickly instead of accumulating.
5. **Government Incentives** <
 - Many governments promote CNG by offering **subsidies and tax benefits**.
 - CNG-powered public transport is encouraged to reduce pollution.

Uses of CNG in Automobiles are as follows:

1. **CNG Cars** – Many manufacturers produce CNG variants of popular car models.
2. **Public Transport** – Buses, taxis, and auto-rickshaws commonly use CNG.
3. **Commercial Vehicles** – Trucks and delivery vans use CNG for cost savings.
4. **Dual Fuel Vehicles** – Some vehicles run on both petrol and CNG, providing flexibility.

Burning of green leaves and dry leaves

The ease with which a substance catches fire depends on factors such as moisture content, ignition temperature, and combustion properties. In the case of green leaves and dry leaves, the primary reason for their difference in flammability is the presence of water in green leaves.

1. High Moisture Content in Green Leaves

Green leaves contain a large amount of water, sometimes up to 50-80% of their weight. When an attempt is made to burn green leaves, the following challenges arise:

- **Evaporation of Water:** Before combustion can occur, the heat applied to the green leaves is first used to evaporate the water present in them. This process absorbs a significant amount of energy, reducing the heat available for ignition.
- **Lower Temperature:** Due to the continuous loss of heat through water evaporation, the green leaves do not reach their ignition temperature easily. This makes them difficult to burn.

2. Lack of Proper Combustible Material in Green Leaves

- Green leaves contain chlorophyll, organic compounds, and a high amount of sap, which makes them relatively resistant to burning.
- The presence of water prevents the breakdown of these organic compounds into flammable gases, further inhibiting combustion.

3. Dry Leaves Have Low Moisture Content

- Dry leaves have lost most of their water content due to evaporation. As a result, they do not require additional heat to remove moisture before combustion begins.
- When exposed to fire, the dry organic matter in the leaves, such as cellulose and lignin, ignites quickly and sustains combustion.

4. Increased Surface Area and Air Spaces in Dry Leaves

- Dry leaves are lightweight and loosely packed, allowing oxygen to circulate easily between them.
- Since combustion requires oxygen, this increased airflow supports rapid burning.

So we can say Green leaves are difficult to burn because they contain a high amount of water, which absorbs heat energy and prevents the leaves from reaching their ignition temperature. In contrast, dry leaves have little to no moisture, allowing them to catch fire quickly and burn efficiently.

Zone of the Flame Used by a Goldsmith for Melting Gold and Silver

A goldsmith uses the **outermost (non-luminous) zone of the flame** for melting gold and silver. This is because it is the **hottest part of the flame**, providing a high and consistent temperature necessary for melting metals efficiently.

Structure of a Flame

A typical candle or gas flame consists of three distinct zones:

1. **Innermost Zone (Dark Zone)**
 - This is the **coolest** part of the flame.

- It consists of **unburnt fuel (wax, gas, etc.) and air**.
- No combustion occurs in this region.
- **Not suitable for melting metals** due to its low temperature.
- 2. **Middle Zone (Luminous Zone, Yellow Zone)**
 - This part of the flame is **moderately hot** but still not the hottest.
 - It appears yellow due to **incomplete combustion** of fuel, leading to the presence of carbon particles.
 - Since unburnt carbon particles are present, this zone produces **soot**, which can blacken objects and is **not suitable for melting metals**.
- 3. **Outermost Zone (Non-Luminous Zone, Blue Zone)**
 - This is the **hottest part of the flame**, with **complete combustion** occurring.
 - It appears **blue** due to complete oxidation of fuel.
 - It is **rich in oxygen**, ensuring a clean and efficient burn.
 - This zone provides **maximum heat** and is **free from soot**, making it ideal for melting metals.

Why Does a Goldsmith Use the Outermost Zone?

1. **Highest Temperature**
 - The outermost zone reaches temperatures of **over 1200°C**, which is sufficient to melt metals like gold (melting point **1064°C**) and silver (melting point **961°C**).
2. **Complete Combustion**
 - This zone undergoes **complete combustion**, producing a steady, strong heat required for metalworking.
3. **No Soot Deposition**
 - Since combustion is complete, there are **no unburnt carbon particles** to deposit soot on the metal, ensuring a **clean melting process**.
4. **Efficient and Even Heating**
 - The **blue flame provides uniform heating**, preventing uneven melting, which is crucial for shaping jewelry.

Calorific Value of Fuel

The **calorific value** of a fuel is the **amount of heat energy** released when **one kilogram (kg) of the fuel is completely burned** in the presence of oxygen. It is measured in **kilojoules per kilogram (kJ/kg)**.

Units of Calorific Value:

- **Kilojoule per kilogram (kJ/kg)** – for solid and liquid fuels
- **Kilojoule per liter (kJ/L)** – for liquid fuels
- **Kilojoule per cubic meter (kJ/m³)** – for gaseous fuels

Formula:

Calorific Value = Total heat produced (in kJ) / Mass of fuel burnt (in kg)

Calorific Value of Common Fuels:

Fuel	Calorific Value (kJ/kg or kJ/m³)
Wood	17,000 – 22,000 kJ/kg
Coal	25,000 – 33,000 kJ/kg
Petrol	45,000 kJ/kg
Diesel	45,000 kJ/kg
Kerosene	46,000 kJ/kg
LPG (Liquefied Petroleum Gas)	50,000 kJ/kg
CNG (Compressed Natural Gas)	48,000 – 50,000 kJ/kg
Hydrogen Gas	1,50,000 kJ/kg
Biogas	35,000 – 40,000 kJ/m ³

Importance of Calorific Value:

1. **Determines Fuel Efficiency:** Higher calorific value means more energy is released per unit mass, making the fuel more efficient.
2. **Selection of Fuel:** Fuels with higher calorific values are preferred for industrial and domestic purposes.
3. **Environmental Impact:** Fuels with high calorific value but lower carbon emissions (like hydrogen) are preferred for sustainability.
4. **Cost-effectiveness:** Higher calorific value means less fuel is needed to generate the same amount of heat, reducing overall fuel costs.

Conclusion:

The calorific value is a key parameter in choosing the right fuel for various applications. Fuels like **hydrogen, LPG, and CNG** have high calorific values, making them efficient choices for energy production.

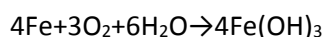
Can the Process of Rusting Be Called Combustion?

Rusting and combustion are both **oxidation processes**, meaning they involve the reaction of a substance with oxygen. However, despite their similarities, rusting **cannot be classified as combustion** due to key differences in reaction speed, heat production, and energy release.

1. Understanding Rusting

Rusting is a **slow chemical reaction** in which **iron** reacts with **oxygen** and **water (moisture)** in the environment, forming **hydrated iron oxide ($\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$)**, commonly known as **rust**.

Chemical Reaction of Rusting:



Characteristics of Rusting:

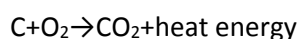
- **Slow process** – Takes days, weeks, or even months.
- **No visible flames or light** produced.
- **Minimal heat release** – The heat produced is so small that it is not noticeable.
- **Requires moisture (water)** along with oxygen.

2. Understanding Combustion

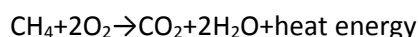
Combustion is a **rapid chemical reaction** of a substance (fuel) with **oxygen**, producing **heat, light, and sometimes flames**.

Examples of Combustion Reactions:

- **Burning of wood:**



- **Combustion of methane (natural gas):**



Characteristics of Combustion:

- **Fast and vigorous reaction** – Takes seconds or minutes.
- **High heat energy** is released, often with flames.
- **May produce light and sound** (like in explosions).
- **Does not require water**, only oxygen and fuel.

3. Key Differences Between Rusting and Combustion

Property	Rusting	Combustion
Reaction Speed	Very slow	Very fast
Energy Release	Negligible	Large amount of heat and light

Property	Rusting	Combustion
Presence of Flame	No flame	Usually produces flame
Heat Generation	Very little, unnoticeable	High amount of heat
Requirement of Water	Requires moisture (water)	Does not require water, only oxygen and fuel
Example	Rusting of iron	Burning of wood, petrol, LPG

4. Conclusion: Why Rusting is NOT Combustion

Rusting and combustion both involve oxidation, but rusting is a **slow and low-energy process**, whereas combustion is a **rapid and high-energy reaction** that produces **heat and light**. Since rusting does not generate significant heat, light, or flames, it **cannot be classified as combustion**. Instead, rusting is a form of **slow oxidation or corrosion**.

Chapter 5

Conservation of Plants and Animals

Effects of Deforestation

Deforestation refers to the large-scale removal of trees and forests, often for agriculture, urbanization, or industrial purposes. Deforestation has far-reaching consequences that impact ecosystems, communities, and the planet as a whole. Below are the effects on specific areas:

(a) Effects on Wild Animals

- **Loss of Habitat:** Forests are home to **millions of species**; deforestation destroys their natural habitats, leading to extinction.
- **Food Shortages:** Many herbivores depend on plants, and without forests, their food sources decline, affecting the food chain.
- **Human-Wildlife Conflict:** With fewer forests, animals venture into human settlements in search of food, leading to conflicts and attacks.
- **Decline in Biodiversity:** Many species, including tigers, elephants, and birds, face extinction due to habitat destruction.

(b) Effects on the Environment

- **Climate Change:** Trees absorb **carbon dioxide (CO₂)**; cutting them down increases greenhouse gases, causing global warming.
- **Soil Erosion:** Tree roots bind soil together; without them, soil gets washed away, leading to infertile land and landslides.
- **Disrupted Water Cycle:** Trees play a vital role in **rainfall patterns**. Deforestation reduces precipitation and increases drought risks.

- **Air Pollution:** Fewer trees mean **less oxygen** production and more CO₂ in the air, worsening pollution levels.
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(c) Effects on Villages (Rural Areas)

- **Reduced Agricultural Yield:** Soil erosion and irregular rainfall reduce **crop productivity**, leading to food shortages.
 - **Water Scarcity:** Loss of forests reduces groundwater levels, making water sources scarce for farmers and rural communities.
 - **Increase in Natural Disasters:** Villages near deforested areas face **floods and droughts** more frequently.
 - **Loss of Livelihoods:** Many villagers depend on forests for wood, medicinal plants, and fruits; deforestation impacts their income.
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(d) Effects on Cities (Urban Areas)

- **Increased Air Pollution:** With fewer trees to absorb pollutants, cities experience **higher levels of air pollution and respiratory diseases**.
 - **Rising Temperatures (Urban Heat Islands):** Deforestation contributes to **higher temperatures in cities**, making summers hotter.
 - **Water Shortages:** Rivers and lakes that supply water to cities are affected by **deforestation in surrounding areas**.
 - **Increased Flooding:** Without forests to absorb rainwater, **urban areas become prone to flash floods**.
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(e) Effects on Earth

- **Global Warming:** Deforestation increases CO₂ levels, contributing to rising temperatures and melting ice caps.
 - **Loss of Natural Resources:** Wood, medicinal plants, and rare species are lost forever.
 - **Desertification:** Fertile lands turn into deserts, reducing the Earth's ability to support life.
 - **Disruption of Ecological Balance:** Deforestation disturbs natural **food chains and ecosystems**, leading to unpredictable changes.
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(f) Effects on the Next Generation

- **Poor Air Quality:** Future generations will struggle with **polluted air, leading to higher health risks**.
- **Scarcity of Natural Resources:** Essential resources like wood, water, and fertile land will become rare.
- **Climate Instability:** Unpredictable weather patterns, extreme heat, and rising sea levels will pose survival challenges.
- **Loss of Wildlife and Natural Beauty:** The next generation may never see species like tigers, elephants, or rainforests that once existed.

Deforestation is a **serious global issue** affecting wild animals, the environment, villages, cities, Earth, and future generations. To prevent irreversible damage, we must focus on **reforestation, afforestation, and sustainable living practices** to protect our planet.

What Will Happen If the Habitat of an Animal Is Disturbed?

A habitat provides animals with **food, water, shelter, and breeding grounds**. If it is disturbed, the following consequences occur:

1. **Loss of Shelter** – Animals lose their natural homes, making them vulnerable to predators and harsh weather conditions.
 2. **Food Shortages** – The destruction of plants and other food sources can lead to **starvation and malnutrition** among animals.
 3. **Migration and Human-Wildlife Conflict** – Animals move into human settlements in search of food, leading to **conflicts, crop damage, and attacks**.
 4. **Decline in Population and Extinction** – If animals cannot adapt, find food, or reproduce, their population **declines**, possibly leading to **extinction**.
 5. **Disruption of Ecosystem Balance** – Each species plays a role in maintaining ecological balance. If an animal disappears, it affects **predator-prey relationships** and plant growth cycles.
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What Will Happen If the Top Layer of Soil Is Exposed?

The top layer of soil, called **topsoil**, is the most **fertile** and rich in **nutrients, organic matter, and microorganisms** necessary for plant growth. If it is exposed, the following issues arise:

1. **Soil Erosion** – Wind and water easily carry away exposed soil, leading to **loss of fertile land**.
2. **Reduced Agricultural Productivity** – Crops struggle to grow as the soil loses **nutrients and moisture**.
3. **Increased Flooding** – Without vegetation, rainwater is not absorbed properly, leading to **runoff and floods**.
4. **Desertification** – Continuous loss of topsoil can turn fertile land into a **desert**, making it unsuitable for farming.
5. **Disruption of the Water Cycle** – Plants help retain water in the soil; without them, groundwater levels **decline**, causing **water shortages**.

Conserving Biodiversity

Biodiversity refers to the variety of life forms, including plants, animals, and microorganisms, in an ecosystem. Conserving biodiversity is essential for the following reasons:

1. **Maintains Ecological Balance** – Every species plays a role in the ecosystem, such as pollination, decomposition, and maintaining food chains.
2. **Supports Human Survival** – Biodiversity provides food, medicine, clean air, and water. Many life-saving drugs come from plants and animals.
3. **Prevents Climate Change** – Forests absorb **carbon dioxide (CO₂)**, reducing global warming.

4. **Protects Future Generations** – Conserving biodiversity ensures that future generations have access to natural resources.
 5. **Sustains Agriculture and Livelihoods** – Many crops and livestock depend on diverse ecosystems to thrive.
 6. **Promotes Economic Benefits** – Tourism, fisheries, and agriculture all rely on biodiversity for economic growth.
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Tribal communities

Tribal communities living in forests rely on them for their daily needs in various ways:

1. **Food Supply** – They gather fruits, nuts, roots, and hunt animals for sustenance.
2. **Shelter and Materials** – They use wood, leaves, and bamboo to build houses and tools.
3. **Medicinal Plants** – Many tribes use herbal remedies derived from plants for treating illnesses.
4. **Livelihoods** – Some sell forest products like honey, resin, and medicinal herbs.
5. **Cultural and Spiritual Connection** – Forests hold religious and cultural significance for many tribal groups.

Deforestation threatens their way of life, forcing them to migrate or struggle for survival.

Causes and Consequences of Deforestation

Causes of Deforestation

1. **Agricultural Expansion** – Forests are cleared for farming and livestock grazing.
2. **Urbanization & Infrastructure Development** – Roads, cities, and industries lead to large-scale deforestation.
3. **Logging for Timber & Paper** – Excessive cutting of trees for wood products reduces forest cover.
4. **Mining & Extraction Activities** – Digging for minerals and fossil fuels destroys forests.
5. **Forest Fires** – Natural or human-caused fires burn vast areas of forests.
6. **Overpopulation & Land Demand** – Growing human populations increase the demand for land, leading to deforestation.

Consequences of Deforestation

1. **Loss of Biodiversity** – Wildlife loses habitats, leading to species extinction.
2. **Climate Change & Global Warming** – Fewer trees mean more CO₂ in the atmosphere, accelerating global warming.
3. **Soil Erosion & Desertification** – The absence of tree roots leads to soil loss and decreased fertility.
4. **Water Scarcity** – Trees play a crucial role in the water cycle; their removal reduces rainfall and groundwater levels.
5. **Natural Disasters** – Floods and landslides increase due to lack of vegetation.
6. **Disruption of Indigenous Lives** – Tribal communities depending on forests lose their homes and resources.

Cutting Trees for Factories and Shelter

With rapid industrialization and urbanization, forests are being cleared to meet the growing demand for factories, infrastructure, and housing. While development is necessary for economic growth, the large-scale cutting of trees raises serious environmental and social concerns.

Arguments in Favour of Cutting Trees

1. **Economic Development** – Industries, factories and infrastructure projects create jobs and boost the economy.
2. **Urban Expansion** – Growing populations need housing, roads and public facilities.
3. **Agricultural Growth** – Clearing forests provides land for farming and food production.
4. **Resource Utilization** – Timber is used for construction, paper and various industrial applications.

Arguments Against Cutting Trees

1. **Environmental Damage** – Deforestation leads to **climate change, loss of biodiversity, and disruption of ecosystems.**
2. **Soil Erosion & Desertification** – Without trees, **soil loses fertility** and becomes prone to erosion.
3. **Water Scarcity** – Trees help maintain the **water cycle**; cutting them reduces rainfall and lowers groundwater levels.
4. **Natural Disasters** – Deforestation increases the risk of **floods, droughts, and landslides.**
5. **Loss of Tribal and Wildlife Habitats** – Indigenous communities and animals lose their homes and resources.

Sustainable Alternatives

1. **Afforestation & Reforestation** – Planting more trees to replace those cut.
2. **Sustainable Logging** – Controlled and planned tree cutting to minimize damage.
3. **Vertical Expansion of Cities** – Building upwards instead of spreading over forest land.
4. **Eco-friendly Construction** – Using alternative materials like bamboo, recycled wood, and metal.
5. **Strict Government Policies** – Implementing regulations to control deforestation and promote conservation.

Conclusion

While urbanization and industrialization are important, **indiscriminate deforestation is not justified.** Sustainable practices should be adopted to balance **development with environmental conservation.** Governments, industries, and individuals must work together to protect forests while meeting human needs responsibly.

Maintaining green wealth

Maintaining green wealth is essential for a sustainable environment and a healthier planet. Everyone can play a role in conserving nature and promoting greenery in their surroundings. Below are some ways to contribute:

1. Planting and Protecting Trees

- Participate in **tree plantation drives** in schools, parks, and public spaces.
- Take care of planted trees by **watering and protecting** them from damage.
- Encourage **urban forestry** by planting trees along roadsides and in empty spaces.

2. Reducing Deforestation

- Use **less paper** and opt for digital alternatives to reduce tree cutting.
- Choose **eco-friendly products** made from sustainable or recycled materials.
- Support policies and organizations that work toward **forest conservation**.

3. Waste Management and Composting

- Practice **waste segregation** to promote recycling and reduce landfill waste.
- Use **composting** to convert organic waste into nutrient-rich fertilizer for plants.
- Reduce the use of **plastic bags and non-biodegradable waste** that harm the environment.

4. Water and Air Conservation

- Avoid **water wastage** to maintain groundwater levels essential for plant life.
- Support **clean energy sources** like solar or wind power to reduce air pollution.
- Promote the use of **public transport, bicycles, or walking** to minimize air pollution.

5. Creating and Maintaining Green Spaces

- Develop **home gardens, terrace gardens, or vertical gardens** to enhance greenery.
- Keep parks and gardens **clean and litter-free**.
- Encourage local authorities to maintain and expand **green belts** in cities.

6. Raising Awareness and Educating Others

- Conduct awareness programs on the importance of **green wealth**.
- Use **social media, workshops, and community meetings** to promote sustainability.
- Involve schools and youth in **eco-friendly activities** like tree planting and clean-up drives.

Why is Killing of Snakes, Frogs, and Lizards Harmful to Our Ecosystem?

Snakes, frogs, and lizards play a crucial role in maintaining the ecological balance. Their elimination can lead to serious environmental consequences.

1. Disruption of the Food Chain

- These animals are **natural predators** that help control insect and rodent populations.
- Removing them disturbs the balance, leading to an **increase in pests**, which can harm crops and spread diseases.

2. Increase in Pest Population

- **Frogs** eat mosquitoes and insects; without them, **mosquito-borne diseases** like malaria and dengue can rise.
- **Lizards** feed on cockroaches, spiders, and flies, helping maintain hygiene.
- **Snakes** control the population of rats and mice, which otherwise damage crops and spread infections.

3. Impact on Agriculture

- More pests mean **greater crop destruction**, leading to **lower food production and economic losses** for farmers.
- Farmers may use more **pesticides**, which harm soil quality and human health.

4. Loss of Biodiversity

- Snakes, frogs, and lizards are an essential part of the ecosystem. Their decline can trigger **extinction of other species** dependent on them.
- Predators that feed on these animals, such as hawks and owls, may also suffer due to **food shortages**.

5. Ecological Imbalance

- Killing these species disturbs **natural predator-prey relationships**, leading to unpredictable ecological consequences.
- This imbalance can cause **uncontrolled population growth** of pests and smaller creatures, harming the environment.

Biosphere Reserve

A **Biosphere Reserve** is a protected area that aims to conserve biodiversity while allowing sustainable human activities. These reserves help maintain **natural ecosystems**, protect endangered species, and promote research and education about environmental conservation.

Importance of Biosphere Reserves

Protects Biodiversity – Preserves endangered plants and animals.

Prevents Deforestation & Pollution – Controls human impact on the environment.

Supports Sustainable Development – Encourages eco-friendly activities like organic farming and ecotourism.

Promotes Research & Education – Helps scientists study ecosystems and develop conservation methods.

Maintains Ecological Balance – Prevents habitat destruction and climate change effects.

Examples of Biosphere Reserves in India

1. **Nilgiri Biosphere Reserve** (Tamil Nadu, Kerala, Karnataka) – Home to tigers, elephants, and rare plants.

2. **Sundarbans Biosphere Reserve** (West Bengal) – Known for **Royal Bengal Tigers** and mangrove forests.
3. **Gulf of Mannar Biosphere Reserve** (Tamil Nadu) – Rich in marine biodiversity like corals and sea turtles.
4. **Nanda Devi Biosphere Reserve** (Uttarakhand) – Famous for **snow leopards and alpine forests**.
5. **Pachmarhi Biosphere Reserve** (Madhya Pradesh) – Contains rare medicinal plants and tribal communities.

Forests: Rich Spots of Biodiversity

Yes, forests are called **rich spots of biodiversity** because they support a vast variety of plants, animals, and microorganisms. They provide food, shelter, and the right climatic conditions for numerous species to thrive. Forests are rich in biodiversity, the reasons for this are as follows:

1. Habitat for Diverse Species

- Forests are home to **more than 80% of terrestrial species**, including mammals, birds, insects, reptiles, and fungi.
- Tropical rainforests like the **Amazon and Sundarbans** have millions of plant and animal species.

2. Favorable Climate and Resources

- The dense vegetation **regulates temperature, humidity, and rainfall**, creating an ideal environment for species survival.
- Availability of **food sources, water, and oxygen** supports a wide range of organisms.

3. Complex Ecosystem and Food Chains

- Forests maintain **varied food chains and food webs**, ensuring ecological balance.
- They support herbivores (deer, elephants), carnivores (tigers, leopards), and decomposers (fungi, bacteria).

4. Genetic Diversity and Medicinal Plants

- Forests contain **thousands of medicinal plants** used for traditional and modern medicine.
- They preserve **genetic diversity**, helping species adapt to environmental changes.

5. Role in Climate Regulation and Oxygen Production

- Forests absorb **carbon dioxide (CO₂)** and produce **oxygen (O₂)**, making them vital for air purification.
- They help prevent **climate change and soil erosion**, indirectly protecting biodiversity.

How a Biosphere Reserve Helps Conserve Our Natural Heritage?

Biosphere reserves are like living laboratories for conservation. They help preserve our natural heritage in several ways:

- **Protecting Biodiversity:** They safeguard a wide array of plant and animal species, ensuring their survival for future generations.
- **Conserving Ecosystems:** They preserve entire ecosystems, including forests, wetlands, and grasslands, maintaining their natural functions and the services they provide.
- **Promoting Sustainable Development:** They encourage economic activities that are in harmony with nature, allowing local communities to thrive while protecting the environment.
- **Supporting Research and Education:** They provide opportunities for scientific research and environmental education, increasing our understanding of nature and promoting conservation awareness.
- **Preserving Cultural Heritage:** They often include areas inhabited by indigenous communities, recognizing and protecting their traditional knowledge and practices related to nature.

Endemic species

Endemic species are plants and animals that are **found only in a specific geographical region** and nowhere else in the world. These species have adapted to the unique environmental conditions of their habitat and play a crucial role in maintaining ecological balance. **Endemic species** are found in a very specific, limited area. This makes them particularly vulnerable to extinction because:

- **Habitat Loss:** If their small habitat is destroyed or altered (due to deforestation, pollution, etc.), they have nowhere else to go.
- **Small Populations:** Endemic species often have small populations, making them less resilient to disease, environmental changes, or other threats.
- **Limited Genetic Diversity:** Small populations usually mean less genetic diversity, reducing their ability to adapt to changes.
- **Introduced Species:** Invasive species can easily outcompete or prey on endemic species, as they haven't evolved defences against these new threats.

Essentially, their restricted range and often small numbers put all their eggs in one basket, making them highly susceptible to any disturbance in their limited environment.

Forests and wildlife conservation

Forests and wildlife are conserved through a variety of strategies, including:

- **Protected Areas:** Establishing national parks, wildlife sanctuaries, and biosphere reserves to safeguard habitats and species.
- **Sustainable Forestry:** Implementing practices like selective logging and reforestation to ensure the long-term health and productivity of forests.
- **Anti-Poaching Measures:** Deploying rangers, using technology, and enacting strict laws to combat illegal hunting and wildlife trade.
- **Habitat Restoration:** Restoring degraded forests and other ecosystems to provide suitable habitats for wildlife.
- **Community Involvement:** Engaging local communities in conservation efforts, recognizing their traditional knowledge and providing alternative livelihoods.
- **Education and Awareness:** Raising public awareness about the importance of forests and wildlife through education programs and campaigns.
- **Research and Monitoring:** Conducting scientific research to understand ecosystems and species, and monitoring populations to track conservation progress.
- **International Cooperation:** Collaborating with other countries to address trans-boundary conservation issues and combat wildlife trafficking.

These combined efforts aim to protect biodiversity, maintain ecosystem functions, and ensure the survival of both forests and wildlife for future generations.

Chapter 7

Reaching the Age of Adolescence

Factors influence a person's growth

Many factors influence a person's growth, including:

- **Genetics:** Our genes play a significant role in determining our potential for growth, influencing factors like height, body composition, and even predisposition to certain health conditions.
- **Nutrition:** Adequate nutrition is essential for growth. A balanced diet rich in vitamins, minerals, and protein provides the building blocks for tissue development and overall growth.
- **Hormones:** Hormones, such as growth hormone, thyroid hormones, and sex hormones, play crucial roles in regulating growth processes, especially during childhood and adolescence.
- **Environment:** Environmental factors like access to healthcare, exposure to pollution, and socioeconomic status can impact growth. A safe and supportive environment promotes healthy development.
- **Physical Activity:** Regular physical activity and exercise stimulate growth hormone production and contribute to healthy bone and muscle development.
- **Sleep:** Sufficient sleep is vital for growth as growth hormone is primarily released during sleep.
- **Overall Health:** Chronic illnesses, injuries, or medical conditions can hinder growth and development.

It's important to note that these factors interact with each other, and their influence can vary across different stages of life.

Endocrine Glands Involved in the Regulation of Puberty and Their Functions

Puberty is controlled by the **endocrine system**, which releases hormones that regulate growth, sexual development, and other bodily changes. Several **endocrine glands** play a key role in this process:

1. Hypothalamus (Master Regulator)

- Located in the **brain**, it signals the **pituitary gland** to release puberty-related hormones.
- Secretes **Gonadotropin-Releasing Hormone (GnRH)**, which triggers the pituitary gland to produce sex hormones.

2. Pituitary Gland (Master Gland)

- Located at the base of the **brain**, it controls the function of other endocrine glands.
 - Releases:
 - **Follicle-Stimulating Hormone (FSH)** – Stimulates development of sperm in males and eggs in females.
 - **Luteinizing Hormone (LH)** – Triggers testosterone production in males and ovulation in females.
 - **Growth Hormone (GH)** – Stimulates overall body growth.
-

3. Gonads (Primary Sex Glands)

A. Testes (in Males) – Testosterone Production

- Located in the **scrotum**, responsible for producing **testosterone**.
- Functions:
 - Development of male reproductive organs (penis, testes).
 - Growth of **facial hair, deep voice, muscle mass**.
 - Production of **sperm**.

B. Ovaries (in Females) – Estrogen and Progesterone Production

- Located in the **pelvic region**, responsible for producing **estrogen and progesterone**.
 - Functions:
 - Development of female reproductive organs (uterus, ovaries, breasts).
 - Regulation of the **menstrual cycle**.
 - Growth of **wider hips, fat deposition, and softer skin**.
-

4. Adrenal Glands (Above the Kidneys) – Supporting Puberty ✂

- Produces **small amounts of sex hormones**.
 - Releases **adrenal androgens**, which contribute to **body hair growth** in both boys and girls.
-

5. Thyroid Gland (Neck Region) – Growth & Metabolism □

- Produces **Thyroxine (T4) and Triiodothyronine (T3)**.
- Regulates **metabolism, energy levels, and bone growth** during puberty.

Some important question and answer

Q1. In the following situations identify the agent exerting the force and the object on which it acts. State the effect of the force in each case.

- Squeezing a piece of lemon between the fingers to extract its juice.
- Taking out paste from a toothpaste tube.

- (c) A load suspended from a spring while its other end is on a hook fixed to a wall.
 (d) An athlete making a high jump to clear the bar at a certain height.

Ans.

Agent exerting the force	Object on which the force acts	Effect of the force
(a) Fingers	Lemon	Change in shape (compression) and release of juice.
(b) Fingers (or hand)	Toothpaste tube	Change in shape (compression) of the tube, causing the paste to come out.
(c) Earth's gravity (acting on the load)	Spring	Change in shape (stretching or elongation) of the spring.
(d) Muscles (of the athlete's legs)	Athlete's body	Change in the athlete's state of motion (from stationary to moving upwards), and then a change in direction to clear the bar.

Q2. An inflated balloon was pressed against a wall after it has been rubbed with a piece of synthetic cloth. It was found that the balloon sticks to the wall. What force might be responsible for the attraction between the balloon and the wall?

Ans. The force responsible for the attraction between the rubbed balloon and the wall is static charge.

Q3. A blacksmith hammers a hot piece of iron while making a tool. How does the force due to hammering affect the piece of iron?

Ans. Hammering a hot piece of iron affects it primarily by changing its shape. The force from the hammer causes the hot, malleable iron to deform and take on the desired form of the tool.

Q4. Name the forces acting on a plastic bucket containing water held above ground level in your hand. Discuss why the forces acting on the bucket do not bring a change in its state of motion.

Ans. Two main forces act on the bucket of water:

- **Gravitational Force (Weight):** Pulling the bucket downwards.
 - **Muscular Force:** Your hand exerts an upward force on the bucket.
- The bucket doesn't move because these forces are balanced.

Q5. A rocket has been fired upwards to launch a satellite in its orbit. Name the two forces acting on the rocket immediately after leaving the launching pad.

Ans. Immediately after leaving the launch pad, the two main forces acting on the rocket are:

- The upward force produced by the rocket engines, propelling it upwards.
- The downward force due to Earth's gravity, pulling the rocket back towards the Earth.

Q6. When we press the bulb of a dropper with its nozzle kept in water, air in the dropper is seen to escape in the form of bubbles. Once we release the pressure on the bulb, water gets filled in the dropper. The rise of water in the dropper is due to
(a) pressure of water (b) gravity of the earth
(c) shape of rubber bulb (d) atmospheric pressure

Ans. (d) atmospheric pressure.

Q7. Give two examples where force changes the direction of motion.

Ans. A tennis player hitting a ball: The player's racket applies a force to the ball, changing its direction of motion. The ball was coming towards the player, but after being hit, it goes in a different direction.

A car turning a corner: The force exerted by the car's tires on the road allows the car to change its direction of motion. Without this force, the car would continue in a straight line.

Q8. What happens when the forces are applied on an object in the same direction?

Ans. When forces are applied to an object in the same direction, results in a greater acceleration or change in the object's motion in that same direction.

Q9. Explain the following :

(i) Force can change the shape of the object. How?

(ii) A sharp knife cuts better than a blunt knife. Why?

Ans. (i) That's because your hands are applying a force to the object. This force pushes the tiny particles that make up the object closer together or moves them around, and that changes the overall shape of the object

(ii) The knife's edges are made sharp. The small area of knife edge helps in exerting a large pressure even for smaller forces. It helps in cutting the vegetables easily.

Q10. Suppose your writing desk is tilted a little. A book kept on it starts sliding down. Show the direction of frictional force acting on it.

Ans. The frictional force acts up the slope, opposing the book's motion. It's trying to prevent the book from sliding down. Gravity is pulling the book downwards, but friction is resisting that pull, although not enough to completely stop the sliding in this case.

Q11. You spill a bucket of soapy water on a marble floor accidentally. Would it make it easier or more difficult for you to walk on the floor? Why?

Ans. It would make it more difficult to walk on the floor, and much more dangerous. Soapy water on a marble floor significantly reduces the friction between your shoes and the floor.

Q12. Explain why sliding friction is less than static friction.

Ans. When the box is at rest, the tiny bumps and grooves on the bottom of the box and the floor have time to settle into each other and "lock" together. This creates a strong resistance to motion (static friction). Once the box is moving, those bumps and grooves don't have as much time to interlock. They're constantly sliding past each other, so the resistance is less (sliding friction).

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