

**Class: 12th**

**Subject: Biology**

**Chapter 26: Some Major Ecosystems**

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 **Important MCQs:**

**1. Weather refers to:**

- (a) Long-term changes in atmosphere
- (b) Short-term fluctuations in temperature, humidity, wind etc.
- (c) Average rainfall of a region
- (d) Changes in the seasons

**2. Climate refers to:**

- (a) Daily temperature of a place
- (b) Short-term weather pattern

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(c) Long-term pattern of weather in a particular region

(d) Sudden rainfall and storms

**3. Hydrospheric ecosystem is a:**

(a) System on land

(b) System in air

(c) System in water where living and non-living components interact

(d) System in mountains

**4. Approximately what percentage of Earth's surface is covered by oceans and seas?**

(a) 50%

(b) 60%

(c) 71%

(d) 90%

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**5. Fresh water ecosystems cover about:**

- (a) 50%
- (b) 20%
- (c) 10%
- (d) Less than 1%

**6. In aquatic ecosystems, temperature changes:**

- (a) Rapidly like air
- (b) Very slowly, making it moderate
- (c) Not at all
- (d) Extremely

**7. Water absorbs:**

- (a) No light energy
- (b) Only blue light

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(c) A considerable amount of light energy

(d) Only red light

**8. At the depth of 600 feet or more, there is:**

(a) High light intensity

(b) No oxygen

(c) Very little light left for photosynthesis

(d) High temperature

**9. Nutrients in aquatic ecosystems are mostly concentrated:**

(a) Near the surface

(b) In middle layers

(c) Near the bottom sediments

(d) On shorelines

**10. The two main factors determining aquatic life are:**

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(a) Energy and nutrients ✓

(b) Water and sunlight

(c) Salinity and minerals

(d) Depth and color

**11. Productivity of aquatic ecosystem is measured by:**

(a) Amount of rainfall

(b) CO<sub>2</sub> consumption and O<sub>2</sub> evolution in photosynthesis ✓

(c) Water clarity

(d) Fish population

**12. The productivity of aquatic ecosystem depends mainly on:**

(a) Salinity and pressure

(b) Light and nutrients ✓

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(c) Temperature only

(d) Depth only

**13. Freshwater lakes differ in:**

(a) Size, depth, and nutrient content

(b) Salinity only

(c) Wind pattern

(d) Temperature only



**14. Life zones in lakes are divided based on:**

(a) Wind and current

(b) Access to light and nutrients

(c) Salinity level

(d) Depth only

**15. The shallow near-shore zone of a lake is called:**

- 
- (a) Limnetic zone
  - (b) Profundal zone
  - (c) Littoral zone
  - (d) Marine zone

**16. Plants in the littoral zone get:**

- (a) Less light and nutrients
- (b) Abundant light and nutrients
- (c) No anchorage
- (d) Limited oxygen

**17. "Phytoplankton" are:**

- (a) Drifting plants that perform photosynthesis
- (b) Tiny animals in water
- (c) Decomposers

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(d) Fungi and bacteria only

**18. "Zooplankton" are:**

(a) Photosynthetic protista

**(b) Drifting animals such as protozoa and tiny crustaceans**

(c) Water plants

(d) Algae

**19. The open water region of a lake with enough light for photosynthesis is called:**

(a) Littoral zone

**(b) Limnetic zone**

(c) Profundal zone

(d) Deep zone

**20. In the profundal zone:**

- 
- (a) Light supports photosynthesis
  - (b) Only algae survive
  - (c) Light is insufficient, and organisms depend on detritus
  - (d) Plankton population is highest

**21. The process of eutrophication refers to:**

- (a) Lack of nutrients in water
- (b) Addition of nutrients to water bodies
- (c) Removal of oxygen from water
- (d) Reduction of plant growth

**22. Human activities accelerate eutrophication mainly through:**

- (a) Industrial gases
- (b) Nutrients from farm feedlots and sewage

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(c) Deforestation

(d) Pesticides only

**23. Which nutrients are responsible for excessive growth of algae in water?**

(a) Sulphates and chlorides

(b) Phosphates and nitrates

(c) Sodium and potassium

(d) Magnesium and calcium

**24. The overgrowth of blue-green algae on the lake surface is called:**

(a) Bloom

(b) Pollution

(c) Sedimentation

(d) Stratification

**25. When algae cover the surface, submerged plants die mainly due to:**

- (a) Lack of carbon dioxide
- (b) Lack of sunlight**
- (c) Lack of space
- (d) High temperature

**26. Decomposition of dead plants in polluted lakes causes:**

- (a) Increase in oxygen
- (b) Decrease in oxygen due to bacterial activity**
- (c) Increase in fish population
- (d) Stabilization of ecosystem

**27. Acid rain is mainly caused by:**

- (a) Burning of fossil fuels**

(b) Evaporation of seawater

(c) Photosynthesis

(d) Forest growth

**28. The ecosystem present on land or soil is called:**

(a) Hydrospheric ecosystem

(b) Lithospheric or terrestrial ecosystem

(c) Atmospheric ecosystem

(d) Aquatic ecosystem

**29. In terrestrial ecosystems, the most limited and unevenly distributed factor is:**

(a) Light

(b) Water

(c) Nutrients

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(d) Air

**30. Which factor remains almost uniform in terrestrial ecosystems?**

(a) Temperature

(b) Air composition ( $O_2$  &  $CO_2$ )

(c) Humidity

(d) Water availability

**31. Plants and animals developed supporting tissues to:**

(a) Store food

(b) Resist gravity on land

(c) Absorb more oxygen

(d) Increase body temperature

**32. Plants conserve water by developing:**

- 
- (a) Green leaves
  - (b) Bark and thick cuticle**
  - (c) Thorns only
  - (d) Hollow stems

**33. Which of the following is not a type of terrestrial ecosystem?**

- (a) Forest ecosystem
- (b) Grassland ecosystem
- (c) Aquatic ecosystem**
- (d) Desert ecosystem



**34. Coniferous forests located at high altitude are called:**

- (a) Boreal forests
- (b) Alpine forests**

- 
- (c) Tropical forests
  - (d) Temperate forests

**35. The coniferous forests located at high latitude are called:**

- (a) Alpine forests
- (b) Boreal forests
- (c) Tropical forests
- (d) Deciduous forests



**36. In Pakistan, grassland ecosystems are found mainly in:**

- (a) Murree and Swat
- (b) Gilgit, Kashmir, Waziristan, Lower Chitral, North Kallat
- (c) Bahawalpur and Rahim Yar Khan
- (d) Karachi and Gwadar

**37. Grasslands of North America are called:**

- (a) Pampas
- (b) Savannas
- (c) Prairies
- (d) Taiga

**38. Grasslands in tropical climates with woody trees are known as:**

- (a) Prairies
- (b) Savannah
- (c) Pampas
- (d) Desert



**39. Average annual rainfall in temperate grasslands is:**

- (a) 25–50 mm
- (b) 250–750 mm

(c) 1000–1500 mm

(d) 2000 mm

**40. Grasslands occur in regions where rainfall is:**

(a) More than forest areas

(b) Between that of forests and deserts

(c) Less than deserts

(d) Constant throughout the year

**41. The main plant species of grassland are:**

(a) Trees and shrubs

(b) Graminoids (grasses and grass-like plants)

(c) Ferns and mosses

(d) Cacti and succulents

**42. Layering in grasslands means:**

- 
- (a) Growth of trees in different rows
  - (b) Arrangement of grasses in height-based layers**
  - (c) Formation of soil layers
  - (d) Seasonal leaf fall

**43. Soil of grasslands is generally:**

- (a) Moist and fertile
- (b) Impermeable with excessive salinity**
- (c) Sandy and poor
- (d) Covered with humus only

**44. Dominant animals in grassland ecosystem are:**

- (a) Carnivores
- (b) Herbivores**
- (c) Amphibians

(d) Marine animals

**45. Which of the following animals are common in grasslands?**

(a) Frogs and fishes

(b) Zebras, wild horses, bison

(c) Whales and dolphins

(d) Camels and owls

**46. Overgrazing in grasslands causes:**

(a) Soil fertility increase

(b) Reduction in herbage and soil erosion

(c) Growth of tall trees

(d) Increased rainfall

**47. Conversion of grassland into desert is called:**

(a) Deforestation

(b) Desertification

(c) Erosion

(d) Leaching

**48. Rainfall in deserts is usually:**

(a) 50–100 cm

(b) Less than 25–50 cm

(c) 200–400 cm

(d) More than 1000 mm

**49. Desert plants conserve water mainly by:**

(a) Broad leaves

(b) Waxy coating and thick stems

(c) Roots above soil

(d) Shedding bark

**50. Which of the following animals is adapted to desert life?**

(a) Camel and lizard

(b) Frog and fish

(c) Wolf and deer

(d) Elephant and tiger

**51. The process of spreading deserts due to human activities is called:**

(a) Reforestation

(b) Desertification

(c) Fertilization

(d) Afforestation

**52. The tundra biome is found mostly:**

- (a) Near the equator
- (b) Near the Arctic region**
- (c) In tropical rainforests
- (d) In deserts

**53. Vegetation of tundra consists mostly of:**

- (a) Tall trees
- (b) Small perennial flowers and dwarf willows**
- (c) Thick forests
- (d) Cacti and shrubs

**54. Common animals of tundra are:**

- (a) Camel and lion
- (b) Wolves, snowy owls, arctic foxes**
- (c) Leopards and elephants

(d) Monkeys and deer

**55. The tundra ecosystem is very fragile because:**

(a) It has dense forests

(b) It has a short growing season

(c) It has high rainfall

(d) It is rich in nutrients

## **Q2: Exercise Short questions**

**1. Define productivity of an ecosystem.**

 **Answer:**

- Productivity of an ecosystem is the rate at which energy is stored or organic matter is produced by producers (plants) through photosynthesis.
- It is usually measured by the consumption of  $\text{CO}_2$  and release of  $\text{O}_2$  during photosynthesis.

**2. List four adaptations in plants and animals for terrestrial ecosystem.**

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👉 **Answer:**

Four major adaptations for living on land are:

1. Supporting tissues – vascular bundles in plants and skeleton in animals for standing against gravity.
2. Conservation of water – through bark in plants and skin in animals.
3. Temperature regulation – by maintaining homeostasis.
4. Efficient gas exchange – through stomata in plants and lungs in animals.

**3. Name three zones in lake ecosystem.**

👉 **Answer:**

The three main zones in a lake ecosystem are:

1. Littoral Zone – near the shore, with abundant light and nutrients.
2. Limnetic Zone – open water region where light supports photosynthesis.

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3. Profundal Zone – deep water region where light is insufficient.

**4. How many biomes are present in the world? Name only five of them.**

👉 **Answer:**

There are six major biomes in the world.

Five of them are:

1. Forest biome
2. Grassland biome
3. Desert biome
4. Tundra biome
5. Aquatic biome

**5. Give the names of some major ecosystems on land in Pakistan.**

👉 **Answer:**



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Major terrestrial (land) ecosystems in Pakistan include:

1. Temperate deciduous forests – Shogran and Neelum Valley
2. Coniferous alpine and boreal forests – Kaghan, Malam Jabba, Dir, Chilas
3. Grasslands – Gilgit, Kashmir, Waziristan, Lower Chitral, North Kallat
4. Deserts – Thar and Cholistan
5. Tundra – Mountains of Karakoram and Hindukush

### **Important Short Questions:**

**1. What is the difference between weather and climate?**

 **Answer:**

- Weather refers to short-term changes in temperature, humidity, wind, and rainfall over hours or days.
- Climate refers to long-term patterns of weather in a region over many years.

**2. Define aquatic or hydrospheric ecosystem.**

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👉 **Answer:**

An aquatic or hydrospheric ecosystem is a system in water where living and non-living components exchange materials and transfer energy within the water.

**3. What percentage of Earth's surface is covered by salt water and fresh water ecosystems?**

👉 **Answer:**

- Salt-water (oceans and seas): about 71% of Earth's surface.
- Fresh water ecosystems: less than 1% of Earth's surface.

**4. Why is the temperature in aquatic ecosystems more moderate than on land?**

👉 **Answer:**

Because water changes its temperature more slowly than air, so it provides a stable and moderate environment for aquatic life.

**5. Why does light decrease with depth in water?**

👉 **Answer:**

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Although water looks transparent, it absorbs a considerable amount of light energy, so light intensity decreases rapidly with increasing depth.

**6. Where are most of the nutrients found in an aquatic ecosystem?**

👉 **Answer:**

Most nutrients are concentrated near the bottom sediments of water bodies, where light is often too low for photosynthesis.

**7. What factors determine the quantity and type of life in an aquatic ecosystem?**

👉 **Answer:**

The availability of energy (light) and nutrients are the main factors that determine the type and quantity of life in aquatic ecosystems.

**8. What determines the productivity of an aquatic ecosystem?**

👉 **Answer:**

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The productivity depends on light intensity and nutrient availability, which affect the rate of photosynthesis.

**9. Name the three main life zones in a lake ecosystem.**

👉 **Answer:**

**The three zones are:**

1. Littoral Zone – near shore, shallow, well-lit area.
2. Limnetic Zone – open water area where light supports photosynthesis.
3. Profundal Zone – deep region with little or no light.

**10. What are phytoplankton and zooplankton?**

👉 **Answer:**

- **Phytoplankton:** “Drifting plants” – photosynthetic organisms like algae and bacteria.
- **Zooplankton:** “Drifting animals” – small animals like protozoa and crustaceans.

**11. What is eutrophication?**

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👉 **Answer:**

Eutrophication is the process in which a water body becomes enriched with nutrients (like nitrates and phosphates), causing excessive growth of algae and depletion of oxygen, which harms aquatic life.

**12. How do human activities accelerate eutrophication?**

👉 **Answer:**

Humans accelerate eutrophication by adding fertilizers, sewage, and detergents into water bodies. These substances increase nutrients that promote algal bloom and pollution.

**13. What happens when phytoplankton grow excessively in polluted lakes?**

👉 **Answer:**

Excessive growth of phytoplankton forms a thick scum on the water surface, blocking sunlight, killing submerged plants, and reducing oxygen for fish and other organisms.

**14. What is the effect of burning fossil fuels on freshwater lakes?**

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👉 **Answer:**

Burning fossil fuels produces acidic gases that dissolve in rainwater and create acid rain, which lowers the pH of lakes and makes them unsuitable for most aquatic organisms.

**15. Define terrestrial or lithospheric ecosystem.**

👉 **Answer:**

A terrestrial or lithospheric ecosystem is an ecosystem present on land or soil, where organisms depend on light, air, temperature, and soil nutrients for survival.

**16. What are the main factors that influence life in terrestrial ecosystems?**

👉 **Answer:**

**The main factors are:**

1. Temperature
2. Air composition
3. Availability of water

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4. Light and nutrients in soil.

**17. Name two important adaptations of plants and animals for terrestrial life.**

👉 **Answer:**

1. Supporting tissues (vascular bundles in plants, skeleton in animals)
2. Conservation of water through bark in plants and skin in animals.

**18. Name the four main divisions of terrestrial ecosystems.**

👉 **Answer:**

**The four main terrestrial ecosystems are:**

1. Forest ecosystem
2. Grassland ecosystem
3. Desert ecosystem
4. Tundra ecosystem

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### 19. What are the sub-types of forest ecosystem?

👉 **Answer:**

Forest ecosystem is subdivided into:

1. Tropical rain forests
2. Temperate deciduous forests
3. Coniferous alpine and boreal forests

### 20. Name any four major terrestrial ecosystems found in Pakistan.

👉 **Answer:**

1. Temperate deciduous forests – Shogran, Neelum Valley
2. Coniferous alpine and boreal forests – Kaghan, Swat, Dir, Chilas
3. Grasslands – Gilgit, Kashmir, Waziristan
4. Deserts – Thar, Cholistan

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## 21. What is a grassland ecosystem?

**Answer:**

👉 A grassland ecosystem is a region dominated by grasses with very few or no trees, found in areas like Gilgit, Kashmir, and Waziristan.

## 22. What are temperate grasslands called?

**Answer:**

👉 Temperate grasslands are called Prairies, found in North America.

## 23. What are tropical grasslands called?

**Answer:**

👉 Tropical grasslands with scattered trees are called Savannas.

## 24. What is the average rainfall in grassland regions?

**Answer:**

👉 Grasslands receive about 250–750 mm rainfall annually, while tropical grasslands may receive up to 1500 mm.

## 25. Why are grasslands usually treeless?

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**Answer:**

👉 Grasslands are treeless due to low rainfall, droughts, and frequent fires that prevent tree growth.

**26. Name the dominant plant species in grasslands.**

**Answer:**

👉 The dominant species are graminoids (grasses) like Andropogon, Panicum, Stipa, and Sporobolus.

**27. Name two large herbivores commonly found in grasslands.**

**Answer:**

👉 Zebra, wild horse, and bison are common large herbivores of grasslands.

**28. What is the main cause of desertification in grasslands?**

**Answer:**

👉 Overgrazing by livestock causes soil erosion and leads to desertification.

**29. What is a desert ecosystem?**

**Answer:**

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👉 A desert ecosystem is a dry region with very little rainfall, sparse vegetation, and extreme temperatures.

### **30. What is the annual rainfall in deserts?**

**Answer:**

👉 Deserts receive less than 25–50 cm of rainfall per year or sometimes none at all.

### **31. How do desert plants conserve water?**

**Answer:**

👉 Desert plants have waxy coatings, fleshy stems, and deep or wide roots to store and reduce water loss.

### **32. How do desert animals survive heat?**

**Answer:**

👉 Desert animals are nocturnal and stay in burrows during the day to avoid extreme heat.

### **33. Name two large animals of the desert ecosystem.**

**Answer:**

👉 Camel and desert bighorn sheep are common large animals in deserts.

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### 34. What is the tundra ecosystem?

**Answer:**

👉 Tundra is a cold, treeless biome found near polar regions or high mountains like Karakoram and Hindu Kush.

### 35. Name two animals commonly found in tundra regions.

**Answer:**

👉 Arctic fox and snowy owl are commonly found in tundra regions.

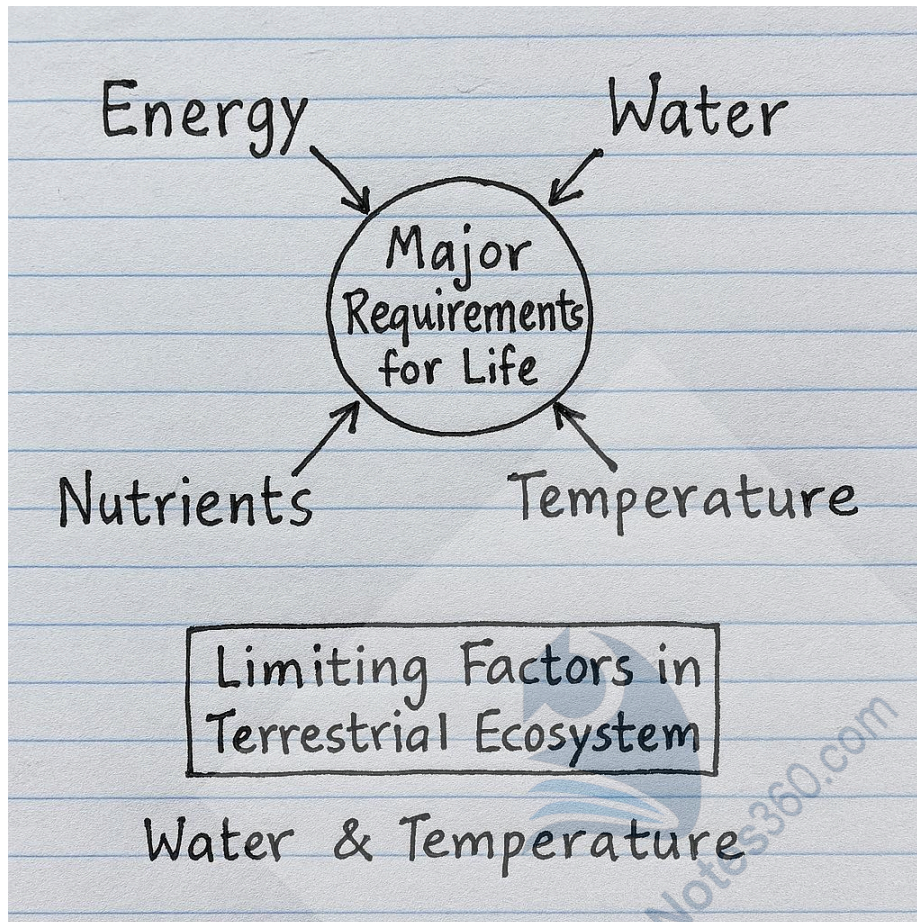
## 🔴 Q.4 Extensive Questions

🌟 Q1: What are the four major requirements for life? Which two are limiting in terrestrial ecosystem?

### ❖ Introduction:

All living organisms need some basic environmental conditions to survive, grow, and reproduce. These conditions are known as major requirements for life. Without them, life cannot exist or continue.

**Digram:**



## ⚡ Major Requirements for Life:

### 1. Nutrients (Food Elements):

- Nutrients provide raw materials for growth and energy.
- Plants obtain nutrients from the soil, while animals get them through their diet.
- Important nutrients include nitrogen, phosphorus, and potassium.

### 2. Energy (Mainly from Sunlight):

- 
- The sun is the ultimate source of energy for all ecosystems.
  - Plants capture solar energy through photosynthesis, which supports all life forms.

### 3. Water:

- Water is essential for all metabolic and biochemical reactions.
- It helps in the transport of nutrients and waste materials in living bodies.
- Aquatic organisms live directly in water, while terrestrial ones depend on rainfall or soil moisture.

### 4. Suitable Temperature:

- Temperature affects enzyme activity, growth, and reproduction.
- Each organism can survive only within a certain temperature range.

### **Limiting Factors in Terrestrial Ecosystem:**

In terrestrial (land) ecosystems, the two major limiting requirements are:

#### 1. Water:

- 
- Limited rainfall or drought conditions restrict the growth of plants and animals.
  - Deserts and dry regions show very low productivity due to lack of water.

## 2. Temperature:

- Extremely high or low temperatures make survival difficult.
- Organisms in deserts or polar areas face challenges due to temperature extremes.

### ◆ Summary:

- Life depends on four essential factors – nutrients, energy, water, and temperature.
- Among these, water and temperature act as limiting factors in terrestrial ecosystems because their shortage or excess directly affects the growth and distribution of living organisms on land.

★ Q2: List some adaptations of plants and animals for terrestrial ecosystem.

### ❖ Answer:

#### Plants:

- 
1. Supporting tissues (woody stems, vascular bundles) – khud ko gravity ke khilaaf support karne ke liye.
  2. Water conservation (thick/waxy cuticle, reduced leaves, stomatal control) – transpiration kam karne ke liye.
  3. Root modifications (deep tap roots ya wide shallow roots) – paani aur nutrients hasil karne ke liye.
  4. Leaf modifications (needles, spines, hair) – evaporation kam karna aur herbivory se bachna.
  5. Storage organs (bulbs, fleshy stems) – paani aur food store karne ke liye.
  6. Temperature tolerance (antifreeze proteins, dormancy) – extreme thand ya garmi mein survive karne ke liye.

### **Animals:**

1. Water conservation (concentrated urine, dry feces) – body se paani ka zyada nuksan na ho.
2. Behavioral adaptations (nocturnal activity, sheltering, migration) – garmi ya sardiyan se bachne ke liye.

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3. Structural/support adaptations (skeleton, strong limbs) – zameen par chalne aur bhaagne ke liye.
  4. Thermoregulation (fur, fat layers, sweating, panting) – body temperature control.
  5. Respiratory/gas exchange adaptations (efficient lungs, tracheae) – oxygen aur CO<sub>2</sub> ka behtar istemal.
  6. Camouflage & protective coloration – predators se bachne ya shikar karne mein madad.

☀ **3. (a) Desert plants – adaptations to heat and drought**

❖ **Answer:**

1. Waxy cuticle / thick epidermis – paani ka evaporation kam ho jata hai.
2. Reduced leaves or spines (e.g., cactus) – leaf surface kam, transpiration kam.
3. Fleshy stems (succulents) – paani store karne ke liye.
4. CAM photosynthesis / stomata open at night – din mein stomata band rehkar paani bachaya jata hai.

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5. Deep tap roots ya wide shallow roots – underground paani ya surface runoff jaldi pakadne ke liye.

6. Dormancy / seed adaptations – anaaq (drought) mein growth ruk jana; bij (seeds) der tak survive karte hain.

7. Reflective or light-coloured surfaces / hairs – solar radiation kam absorb hoti hai.

☀ **3. (b) Desert animals – adaptations to heat and drought**

❖ **Answer:**

1. Nocturnal habit – din ki garmi se bachne ke liye raat mein active.

2. Burrowing / shade-seeking – din mein thanda shelter (burrows) mein chhup jana.

3. Concentrated urine / dry feces – paani ki bachat.

4. Metabolic water production – khurak se paani banake chalana (kuch chhote animals).

5. Fat storage in specific body parts (e.g., camel hump) – zaroorat par energy aur paani nikalna.

6. Large ears / vascularized extremities – extra heat dissipate karna (e.g., fennec fox).

7. Light coloration – solar heat kam absorb ho.

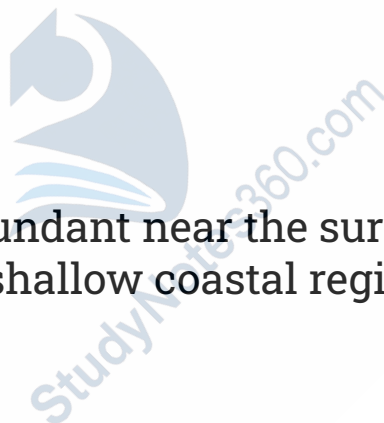
8. Estivation (summer dormancy) – bahut zyada garmi mein activities rok dena.

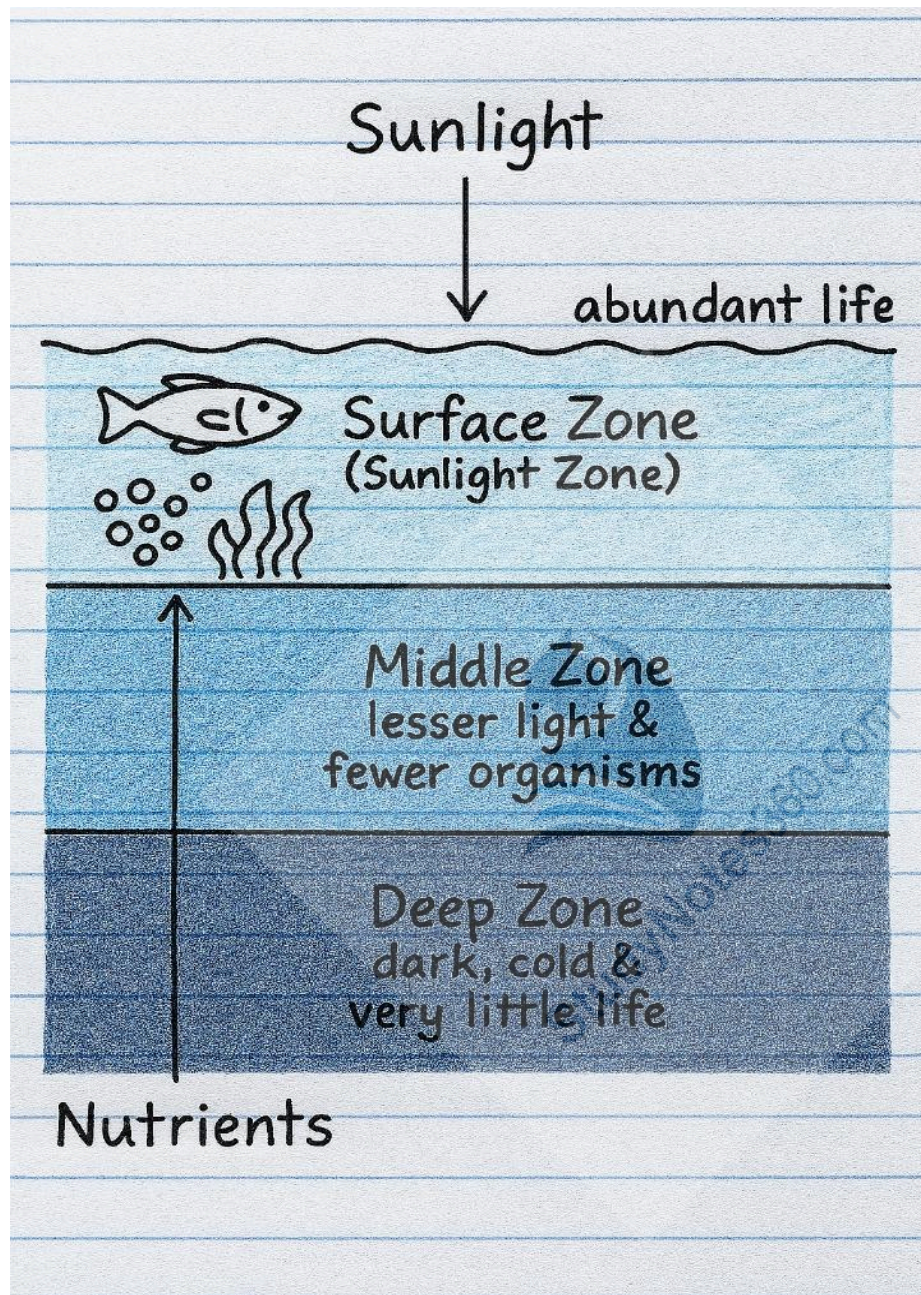
🌟 **Q4: Where is life in oceans (hydrospheric ecosystem) most abundant and why?**

❖ **Answer:**

Life in oceans is most abundant near the surface and along the continental shelves (shallow coastal regions).

**Digram:**





### Reasons:

1. Sunlight availability ☀️ – The upper layers of water receive sufficient sunlight that supports photosynthesis. This enables

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phytoplankton and algae to grow, which are the base of the food chain.

2. High nutrient concentration 🌱 – Near the shores and in shallow waters, nutrients from rivers and land runoff mix with seawater, supporting rich marine life.
3. Warm temperature 🌡️ – Surface water has moderate and favorable temperature suitable for most aquatic organisms.
4. Oxygen abundance 💧 – Photosynthesis and mixing of air from waves increase dissolved oxygen levels, which supports marine animals.
5. Sheltered habitats 🪸 – Coral reefs, rocky coasts, and seaweed beds provide shelter and breeding grounds for many marine species.

◆ **Summary:**

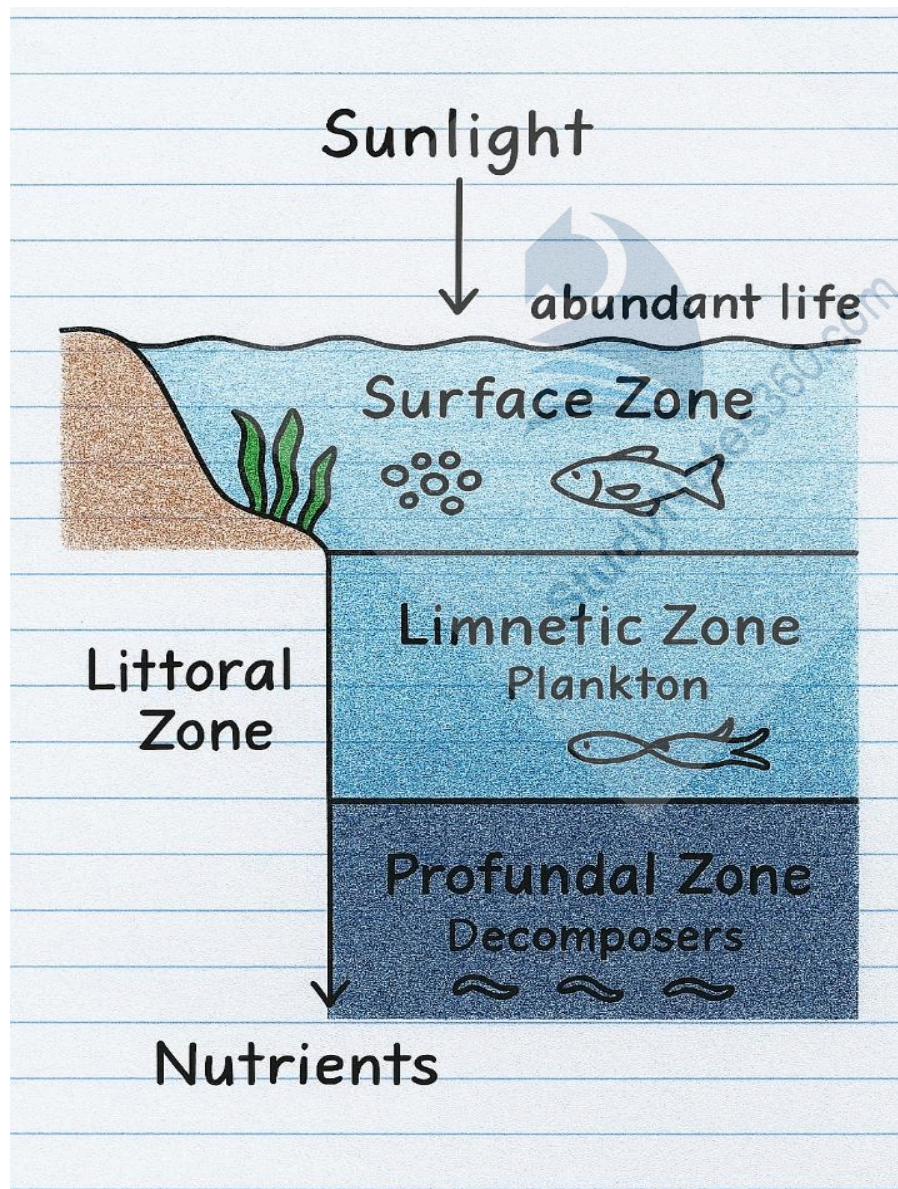
👉 Life in oceans is richest in sunlit, nutrient-rich shallow coastal zones because these areas provide ideal conditions for photosynthesis, food availability, and shelter.

🌟 **Q5: Distinguish between three different zones in the lake ecosystem**

❖ **Answer:**

A lake ecosystem is divided into three main zones depending on sunlight penetration, availability of nutrients, and types of organisms present. These zones support different kinds of life and have distinct ecological characteristics.

**Digram:**



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## 1. Littoral Zone (Near-Shore Zone)

- **Location:** Shallow water near the shore where sunlight can reach the bottom.
- **Plant Life:** Rooted aquatic plants like water lilies, submerged vascular plants, and algae.
- **Animal Life:** Includes invertebrates (snails, insect larvae, small crustaceans) and vertebrates (frogs, turtles, small fish).

**Importance:** Most productive zone because of abundant light and nutrients. Supports diverse life and traps sediments from streams, enriching the area.

## 2. Limnetic Zone (Open Water Zone)

- **Location:** Open water away from the shore, well-lit.
- **Plant Life:** Phytoplankton like cyanobacteria and algae, which are primary producers.
- **Animal Life:** Zooplankton (tiny crustaceans, protozoa) and fishes that feed on plankton.

**Importance:** Main zone for photosynthesis in the lake; supports mid-level consumers in the food chain.

## 3. Profundal Zone (Deep Zone)

- **Location:** Deep water where sunlight cannot penetrate.

- 
- **Plant Life:** No photosynthesis occurs; plants cannot grow here.
  - **Animal Life:** Decomposers (bacteria, fungi), detritus-feeding animals, and some fish adapted to low oxygen.

**Importance:** Recycles nutrients falling from above zones; supports detritus-based food chains.

◆ **Summary:**

- **Littoral Zone:** Shallow, nutrient-rich, highly diverse life.
- **Limnetic Zone:** Open, well-lit, plankton and fishes dominate.
- **Profundal Zone:** Deep, dark, low oxygen, decomposers thrive.

**Note:**

This chapter is designed to provide a solid foundation of knowledge, with the goal of deepening understanding and encouraging further exploration of the subject. The content has been carefully selected to support effective learning and inspire students to engage with the topic more deeply.

**Author:** Muhammad Asghar

**Purpose:** To contribute to education by offering insightful, valuable content that enhances learning and understanding.

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