Describe the concept and process of succession in a named habitat.
Some Definitions:

- Primary succession: The gradual establishment, through stages, of a climax ecosystem, that has not been occupied/colonised before.
- Secondary succession: The re-establishment, through stages, of a climax ecosystem, that has been cleared by natural or human means.
Some Definitions:

- **Sere**: Another name for succession. A set of stages of evolution of an ecosystem.
- **Pioneer stage**: First stage in a sere which is dominated by opportunist species.
- **Climax stage**: Final stage in a sere where all species are in balance.
Lithosere:
- The evolution of bare ground to forest.
Primary succession

- 1. colonisation of an exposed rock
- -----weathering (heat, water, freezing)—break ----into smaller pieces.
- Pioneer Species---Lichens—cling with root like rhizoids---secrete acids---dissolves rocks----die----remains are added to soil
- Soil accumulation
- Mosses often follow lichens and shade them----causing the lichens to die----more organic matter is added.

Mosses are replaced by Ferns, Grasses and Shrubs and eventually Trees

Roots of all these plants will break the rock apart ----adding to the soil formation
Hydrosere:

- Describe the changes that you see.

**Hydrosere:**

- The gradual conversion of ponds and lakes to forest ecosystems.
- With time ponds and lakes are gradually filled with eroded sediments.
- The sediments moves in the shorelines and eventually fills in the lake.
- The plant sequence is as follows: lake plants, reeds, grasses, shrubs, & trees.
Psammosere:

- The gradual conversion of sandy beaches and desert margins to forest.
- Wind moves sand into dunes.
- Organic material, seeds, and moisture are blown in behind the dune.
- Hardy salt tolerant grasses and vines establish themselves trapping more soil.
- Plant succession follows the lithosere.
Psammosere:
Halosere:

- The gradual conversion or reclamation of a salt flat to forest.
- Salt resistant grass species move in.
Halosere:

- Grass traps organic matter and seeds
- Soil quality (nutrients) are improved.
Halosere:

- Plant cover traps moisture, causing salt to seep into the ground.
- Plant succession follows the lithosere.
Changes in Energy Flow

- Trophic levels increase from 2 to 4-5. More trophic levels transfer more energy.
- Food webs become more complex.
- The total productivity of an ecosystem increases.
- Biomass and biodiversity is maximized in a climax ecosystem.
- **Gross production-**
  - Is the amount of organic matter produced by photosynthesis in plants.

- **Net Production-**
  - Is the part of GP not used in plant respiration.

- **Biomass-**
  - Organic mass in an ecosystem.
  - measured in g, kg, tonnes
- Gross production - Respiration = Net Production
- GP - R = NP
- If a plant gross production is 2 kg over a month and 0.95 kg is lost thru respiration. What is the NP?

In plants an average NP is about half of the GP.
Changes in Productivity

Figure 23.13  Changes in gross ($P_g$) and net ($P_n$) production, respiration ($R$) and biomass ($B$) through succession.
Effects of living Organisms on the abiotic env. with reference to the changes occurring during Primary succession.

- Lichens and mosses — acid — soil formation
- continued by other species
- Living Organisms — die, decay — decomposer use OM for respiration — release minerals — soil
- Kind of soil, temp, amt. of water, mineral holding capacity, process of decomposing — long term process
- More minerals accumulate — plant growth — less erosion
- Plants — wind break — reduce erosion
- Plants — shade — water holding capacity — less erosion
  (Damp soil)
Abiotic Changes

- pH: 8 → 5.5
- N: increases
- C: increases
- Exchangeable ions decrease

Figure 23.11 Changes in soil parameters through succession. (a & b) Decline in pH and exchangeable ions in soils from glacial foreland successions reflecting progressive leaching of originally fresh morainic material (after Crocker & Major 1955, Stork 1963, and White 1973). Increases in soil organic matter in (c) primary and (d) secondary succession (after Crocker & Major 1955, Stork 1963, White 1973, and Maris 1980), and in total soil nitrogen, (e & f) (after Crocker & Major 1955 and Olson 1958).
Abiotic Factors stabilize

- Ion Exchange Capacity: is the ability of soil to exchange or release soil ions into groundwater.
- Poor soil will have a high ion exchange capacity and will not protect groundwater.
- Rich soil will have a low ion exchange capacity and will filter infiltrating water.
Nature of climax communities.

- System is in relative equilibrium and stable.
- Open system in dynamic equilibrium
  - Matter and energy may cross system boundary.
  - Inputs are in proportion to outputs.
- System changes less thus keeping habitats intact over time.
Determining factors:

- Specialization encouraged as all niches are occupied.
- Species must enhance competitive abilities and take care of young.
- High nutrients available (but used) due to large amounts of biomass.
- High moisture available as forests capture their own transpiration and encourage rain.
Determining factors:

- Mineralized nutrients (N, P, +C) increases.
- Mineral cycling decreases as plants are adapted to maintaining themselves and not growing or establishing themselves.
- These nutrients become less available to plants as they adhere to soil particles or are stored as dead matter in ground.
- **Biome** - large geographical area that has certain kind of climate and sustains specific communities of plants and animals.
- **Biosphere** - total of all area where living things are found----deep oceans & lower atmosphere
Biomes defined by temperature and rainfall--climograph
<table>
<thead>
<tr>
<th>BIOME</th>
<th>Desert</th>
<th>Grassland</th>
<th>Shrub land</th>
<th>Temperate deciduous forest</th>
<th>Tropical rainforest</th>
<th>Tundra</th>
</tr>
</thead>
</table>
| Temperature | Summer: during the day 50°C  
Winter: at night -18°C | -30°C to 30°C       | Summer: hot and dry  
Winter: cool and moist | -30°C to 30°C          | 20 - 35 °C                  | Winter:  
-70°C to -10°C  
Summer: 3 - 15 °C |
| Precipitation | less than 300 mm/year | 500 - 900 mm/year | 200 - 1000 mm/year  | 500 - 1500 mm/year         | above 1500 mm/year        | 150 - 250 mm/year           |
| Comments on vegetation | • xerophytes are plants whose structure is adapted to conserving water  
• reduced leaves to reduce surface where transpiration could take place  
• photosynthesis takes place in the swollen stem  
• can store water | • grass and small herbs  
• trees do not grow well due to infrequent rain  
• frequent fires  
• grass tends to be taller if there is more rain  
• parts of plant above the ground dies during winter, roots grow new plant in spring | • frequent bushfire in the dry season  
• plants need to conserve water  
• small needle-like leaves to reduce surface area  
• thick waxy cuticle reduces transpiration  
• often adaptations to survive frequent fires | • trees drop leaves in autumn to reduce water loss in winter  
• leaves that stay on could be damaged by frost  
• in winter not much photosynthesis is possible due to lower light intensity | • high diversity of plants  
• high competition, e.g. for light so many trees grow straight up to reach light before being shaded by other plants  
• leaves high up will be exposed to a lot of heat and light so leaves are smaller to reduce transpiration and dark green to make most use of the light  
• only a small percentage of the light reaches the floor of the rainforest so not many plants can grow there and the ones that do have large leaves to catch most light  
• plants have adaptations to help water run off them quickly e.g. grooved leaves  
• plants called epiphytes may grow (high) on other plants to catch more light | • subsoil is permanently frozen, so no trees can grow here  
• in summer, waterlogged soil since it cannot drain because of the permafrost  
• very windy  
• plants are small and stunted: little water, short growing season |
Average amount of precipitation and temp/month

(a) Desert biome
Type: Desert
Place: Alice Springs, Australia

(b) Tropical Rainforest biome
Type: Tropical Rainforest
Place: Manaus, Brazil

(c) Tundra biome
Type: Tundra
Place: Barrow, Alaska