Brown Earth Soils

Zonal Soil
Introduction to Brown Earths

- zonal soil
- east of Ireland
- vary from acid brown earths to alkaline
- Fertile soil
- no distinct horizons - uniformly brown in colour
Factors affecting brown earths

1. Climate
   ○ cool temperate oceanic

2. Vegetation / Living organisms
   ○ deciduous woodland

3. Parent rock
   ○ sandstone (west cork)
   ○ limestone (midlands)
   ○ boulder clay (east of ireland)

4. Relief
Factor: Climate

- Cool temperate oceanic climate
- moderate climate
- Temperature range = 15 - 6 degrees
- Soil temperature always above 0 degrees
- lack of freezing temperatures means micro-organisms are active
  Plenty of biological activity
- Long growing season
- Rainfall up to an average of 1500mm / year
- **Processes: Humification & leaching**
- **Characteristics: Humus Content, Water, Colour**
Factor: Living Organisms/Vegetation

- Natural vegetation is deciduous woodland
- Oak, ash, birch, chestnut
- Lose leaves in autumn
- Adds rich organic matter to soil - humus
- Mild climate means micro-organisms are active for 9 months of the year
- Earthworms and other animals active
- Aerate and rotavate the soil
- Affects humus content and colour

**Processes:** Humification

**Characteristics:** Humus, Colour, Ph, Structure
Factor: Parent rock

- Parent material varies with location
- Acidic brown earth - cork
  - Sandstone parent rock
- Brown earths
  - East of Ireland
  - Parent material: glacial boulder clay
  - Midland - limestone
- Parent material affects pH and mineral content
  (acidic/alkaline, phosphorous)
- Processes: Weathering
- Characteristics: Ph, colour, texture, structure
Factor: Relief

- Brown earth form on gently sloping and low lands
- land is well drained & allows biological activity
- Thin soils on steep slopes due to gravity
- soil builds up at base of steep slopes
- temperature is higher in lowland areas - more biological activity
- Higher humus content in lowland areas
- south facing slopes (sunnier)
- **Processes: Humification & weathering**
- **Characteristics: Ph, colour, structure, humus content**
Process: Humification

- Humification happens throughout the year
- Cool temperate climate
- Decreases in winter and speeds up in summer
- Plenty of organic matter from deciduous woodland and dead animals
- Humification happens faster in lowland areas
- Makes the soil fertile
- Gives soil "brown" colour
Process: Leaching

- washing of nutrients into the soil in soluble form (phosphorous / potassium)
- Year round rainfall (1500mm / year)
- moderate leaching in brown earths
- spreads nutrients throughout the soil
- dissolves nutrients for plant consumption
- waterlogging can happen in low land areas leading to gley soils forming
Process: Weathering

- break down of rocks
  - mechanically, chemically, biologically
- provides mineral content of the soils
  - phosphorous, calcium, iron
- chemical weathering
  - acidic or alkaline
- mechanical weathering produces soil grains
  - gives rise to crumb structure
- biological weathering
  - trees and vegetation breaking down the rocks
Characteristics of brown earth

- **Colour**
  - pale brown to brown in colour
  - plenty of humus due to vegetation
  - leaching - spreads nutrients around the soil

- **Ph**
  - slightly acidic to alkaline
  - variations in parent material
  - temperate rainfall with moderate climate
  - good for living organisms
  - allow humification to happen year round
Characteristics of brown earths

- **humus content**
  - high humus content
  - plenty of organic matter
  - trees lose leaves
  - nutrients for the soil, e.g. potassium

- **Structure**
  - crumb structure
  - similar to bread crumbs
  - good for circulation of air and water
  - good for productivity of soil - farming
Characteristics of brown earths

- Texture (feel of the soil)
  - loam texture
    - equal amounts of sand, silt and clay
  - feels crumbly to touch
  - variety of parent material
    - sandstone, shale, limestone, alluvium (rivers)
  - rarely waterlogged
Characteristics of brown earth

- **Water content**
  - enough water to allow good growth
  - tend not to be waterlogged
  - depends on local relief
    - high ground may be wetter
    - low land areas may be waterlogged
    - gently sloping
  - moderate rainfall in east of ireland (800 - 1200mm)
  - important for humification
  - enables plants to dissolve nutrients, e.g. iron, phosphorous, potassium, calcium
Factors affecting latosols

1. Climate
   ● Equatorial (Rainforest)

2. Vegetation / Living organisms
   ● Rainforest - organic matter / Plenty of living organisms

3. Parent material
   ● river alluvium / limestone

4. Relief
   ● gentle slopes / flat land covered rainforest
Discuss how soil forming factors influence the development of soil. (80 marks)