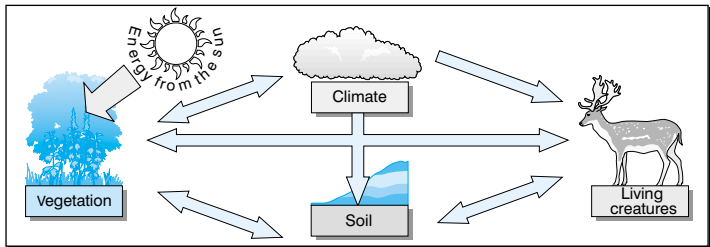


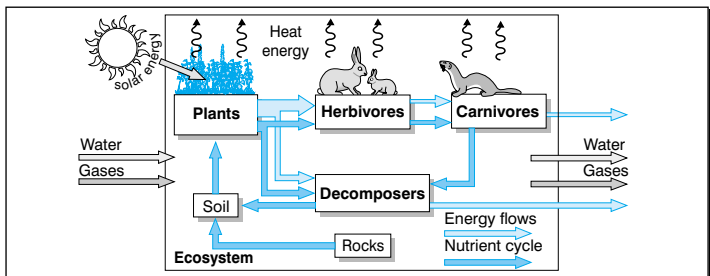
THE ECOSYSTEM CONCEPT (1)

- An **ecosystem** is the relationship between **living** and **non-living things**. The living parts of an ecosystem are the animals and plants. The non-living things include rocks, climate, soil and water. They are linked together by a series of **energy** and **nutrient flows**.



Ecosystems

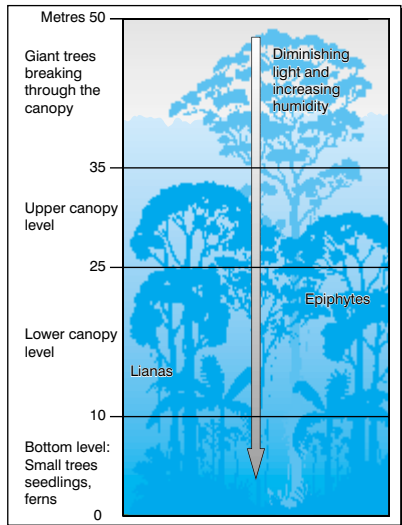
- **Energy** is transferred from animals to plants through a **food chain**. The chain has a number of **trophic levels**. Green plants or **primary producers** occupy trophic level one, **herbivores** occupy trophic level two, and **carnivores** trophic level three. Humans are mostly at the top of the food chain. There is a decrease in the number of individuals in each successive trophic level. Ecosystems cycle **mineral nutrients** such as nitrogen, phosphorous and potassium through a series of stages.



Energy and nutrient flows

Rainforests

- The **tropical rainforest** is an important ecosystem. Rainforests occur in the Equatorial lowlands, in the Amazonian and Zaire basins, and in parts of Indonesia and Malaysia. The rainforests have enormous **biomass** and **biodiversity**. A year long growing season with a constant temperature of 25–30°C and rainfall of 1,500–5,000 mm per year provide ideal growing conditions.
- The rainforest has a definite structure. **Emergents** reach 50 metres height, with the **main canopy** reaching about 35 metres. There is relatively little undergrowth, apart from flowering plants, grasses and ferns. **Lianas** and **epiphytes** hang from trees. There are many different species, but they do not occur in pure strands. The trees are **deciduous** but the forest always appears green.
- The rainforest is adapted to its climate. Trees have thick, leathery leaves to protect them against sunlight. The drip tips of the leaves shed water easily. The trees are tall and shallow rooted and have buttress roots for added support.
- Rainforests are the main source of tropical hardwoods. The forests are being cleared rapidly, causing a loss of habitat. This may contribute to global warming. Rainforests are also an important source of wealth for many LEDCs.



Structure of the rainforest

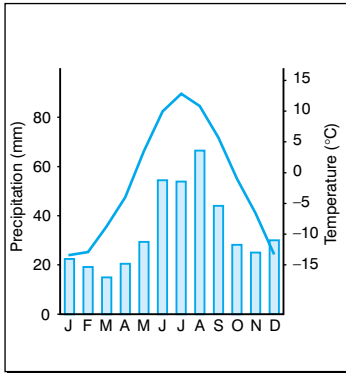
Mediterranean vegetation

- **Mediterranean climate** is found on the western sides of continents between 30° and 40° North and South, e.g. southern Europe, central Chile, South Africa, south and west Australia, and the north island of New Zealand. Summers are hot and dry, with an average temperature of 25–30°C. Winters are mild and wet with temperatures averaging 8–12°C.
- The natural forest vegetation of Mediterranean areas has been replaced by humans. The vegetation is mainly scrub called **garrigue**, **chapparel** or **macquis**. This consists of sweet smelling plants such as gorse, heather, rosemary and lavender. The vegetation has developed characteristics which allow it to survive the long summer drought. Long roots tap underground water, and the thick waxy leaves reduce transpiration. Bulbs and tubers flower in spring when there is still moisture. Cacti store water in the plant tissue.

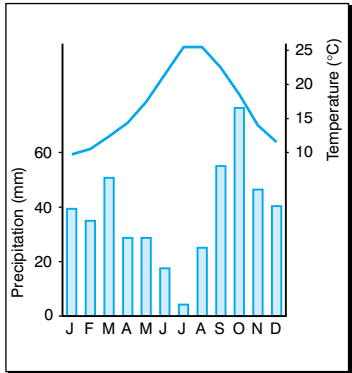
Coniferous forest

- The areas of northern Canada, Scandinavia and Russia between 50 and 66°N are covered with **coniferous forest** (taiga). The forest is dominated by conifers such as pine, spruce, fir and larch. They are the world's main source of **softwood**. Most countries in these areas have developed a **sustainable management plan** for their timber resources and have an active replanting programme.
- The trees can survive the extreme climate. The growing season is short with six months below freezing. The total precipitation is low, mainly falling in the summer. Most of the precipitation is 'locked up' in snow. The vegetation has adapted to this climate. Conifers keep their leaves all the year around and **photosynthesise** as soon as the temperature reaches 6°C. The needle shaped leaves reduce moisture loss. The cone shaped nature of the trees allows snow to slip off easily without damaging the leaves.

THE ECOSYSTEM CONCEPT (4)

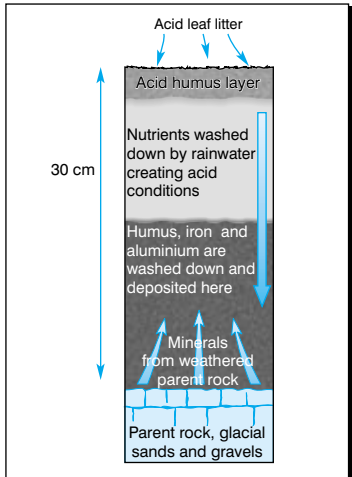


Climate graph for Inari (69°N), Finland



Climate graph for Mallorca (39°N), Spain

- Soils under coniferous forests are shallow and acidic. The minerals are leached out by rainwater. Low temperatures mean that fallen needles do not decompose easily. The soils therefore lack humus.
- Soils are poor and regeneration of forests is very slow. Environmental concerns are very important in this ecosystem.



Podsol soil profile

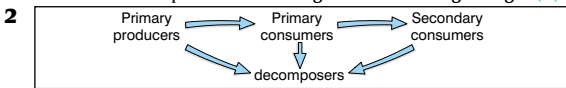
The ecosystem concept (1–4)

- 1** What is an ecosystem? (1)
- 2** Draw a diagram to show the relationship between primary producers, primary consumers, secondary consumers and decomposers. (1)
- 3** What is a biome? (1)
- 4** What is biomass? (1)
- 5** Why do rainforests always appear green? (1)
- 6** Why is there so little undergrowth in a rainforest? (1)
- 7** Name a crop grown commercially in Mediterranean areas that can survive the summer drought. (1)
- 8** What type of vegetation would you expect at a location experiencing the following temperature and precipitation figures? (1)

J	F	M	A	M	J	J	A	S	O	N	D	
25	24	23	21	17	15	12	11	13	18	21	23	°C
4	6	15	28	43	48	60	65	54	37	19	8	mm

- 9** What is a podsol? (1)
- 10** How does the needle shape of conifer leaves help to reduce moisture loss? (1)
- 11** Why are there rarely more than four or five trophic levels in a food chain? (2)
- 12** What are the stages in a nutrient cycle? (4)
- 13** Why is commercial forestry often not sustainable in rainforest areas? (2)
- 14** Why do rainforests have such a rich biodiversity? (2)

1 The relationship between living and non-living things. (1)



(1)

3 A natural vegetation zone at a global scale. (1)

Rainforest, Mediterranean vegetation and coniferous forests are all biomes.

4 The total mass of all the organisms in a particular ecosystem.

(1) Rainforest has a biomass of 11,000 tonnes/hectare.

5 The trees do not lose their leaves all at the same time. (1)

Equatorial regions do not have definite seasons.

6 The dense canopy prevents a lot of light reaching the forest floor. (1)

Light is important for plant growth.

7 Olives or grapes. (1) Olives have waxy leaves. Vines have long roots to tap underground water.

8 Mediterranean. (1) This is a Southern hemisphere location.

The warmest and driest months are from October to March.

9 The type of soil found beneath coniferous forests. (1)

10 The smaller surface area means that there are fewer pores on the surface of the leaf through which moisture can be lost. (1) The correct name for these pores is stomata.

11 There is a reduction of energy (1) from one trophic level to the next. (1)

12 Weathering of rocks releases mineral nutrients into the soil. (1)

Plants take up these minerals through their roots. (1)

Herbivores eat plants and carnivores eat herbivores so that the nutrients are passed along the food chain. (1) When plants and animals die, decomposers release the nutrients back into the soil. (1) This can be shown very clearly in a diagram.

13 It represents one of the few sources of income in these areas. (1) Exploiting valuable tropical hardwoods destroys much of the forest's biodiversity. (1)

14 There are great variations in different parts of the rainforest ecosystem. (1) The main parts are the emergents, the canopy and the forest floor. (1) Each part has its own microclimate.

TOTAL