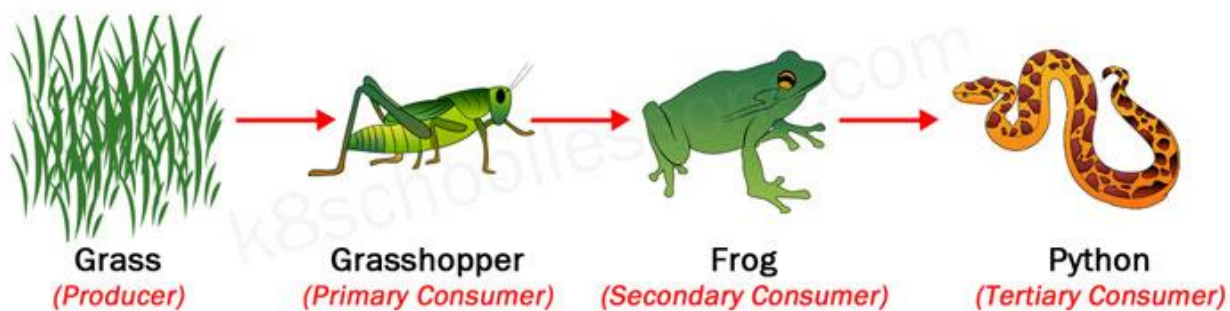


## Organisms and their Environment

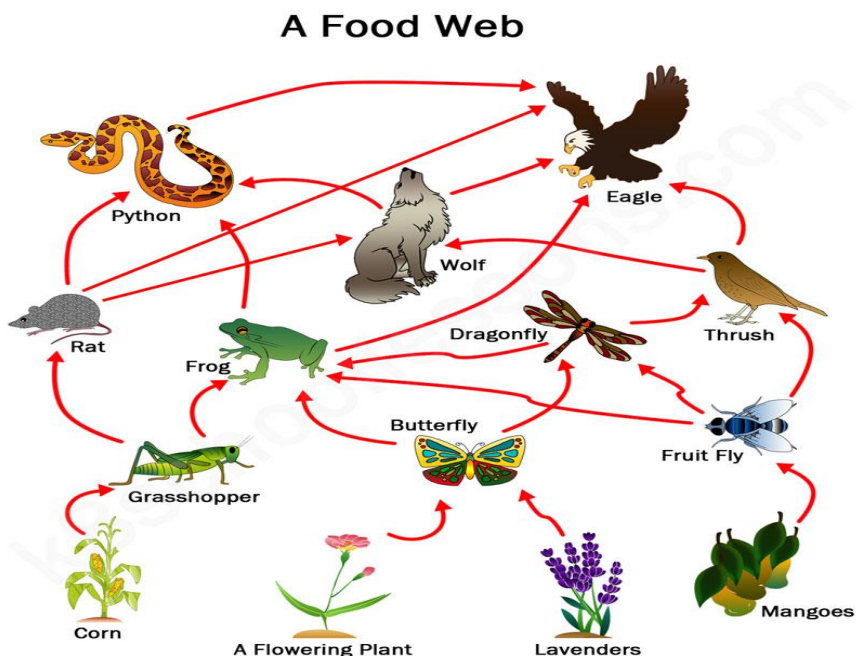
(IGCSE Biology Syllabus 2016-2018)

### Food Chains and Food Webs

- The **sun** is the **principal source of energy** input to biological systems
- Energy flow is **not a cycle**, it starts from the sun and then that energy is harnessed by plants which are eaten by animals which are eaten by other animals
- At each step, **energy is lost** to the environment
- **Food chain**: a chart showing the flow of energy from one organism to the next beginning with a producer (energy is transferred between organisms by ingestion)

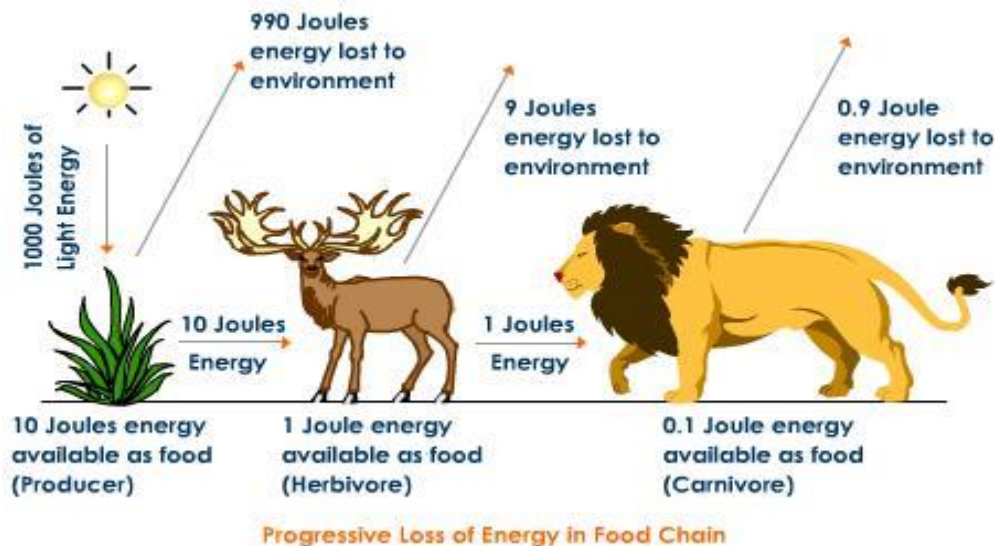


- **Food web**: showing the transfer of energy from one organism to the next, beginning with a producer



Producer	An organism that makes its own organic nutrients, usually using energy from sunlight, through photosynthesis
Consumer	An organism that gets its energy by feeding on other organisms
Herbivore	An animal that gets its energy by eating plants
Carnivore	An animal that gets its energy by eating other animals
Decomposer (saprophyte)	An organism that gets its energy from dead or waste organic matter
Ecosystem	A unit containing all of the organisms and their environment, interacting together, in a given area, e.g. decomposing log or a lake
Trophic level	Position of an organism in a food chain, food web, or pyramid of biomass, numbers of energy
<ul style="list-style-type: none"> <li>- Primary consumer</li> <li>- Secondary consumer</li> <li>- Tertiary consumer</li> </ul>	Eat vegetables Eat meat Eat a predatory animal

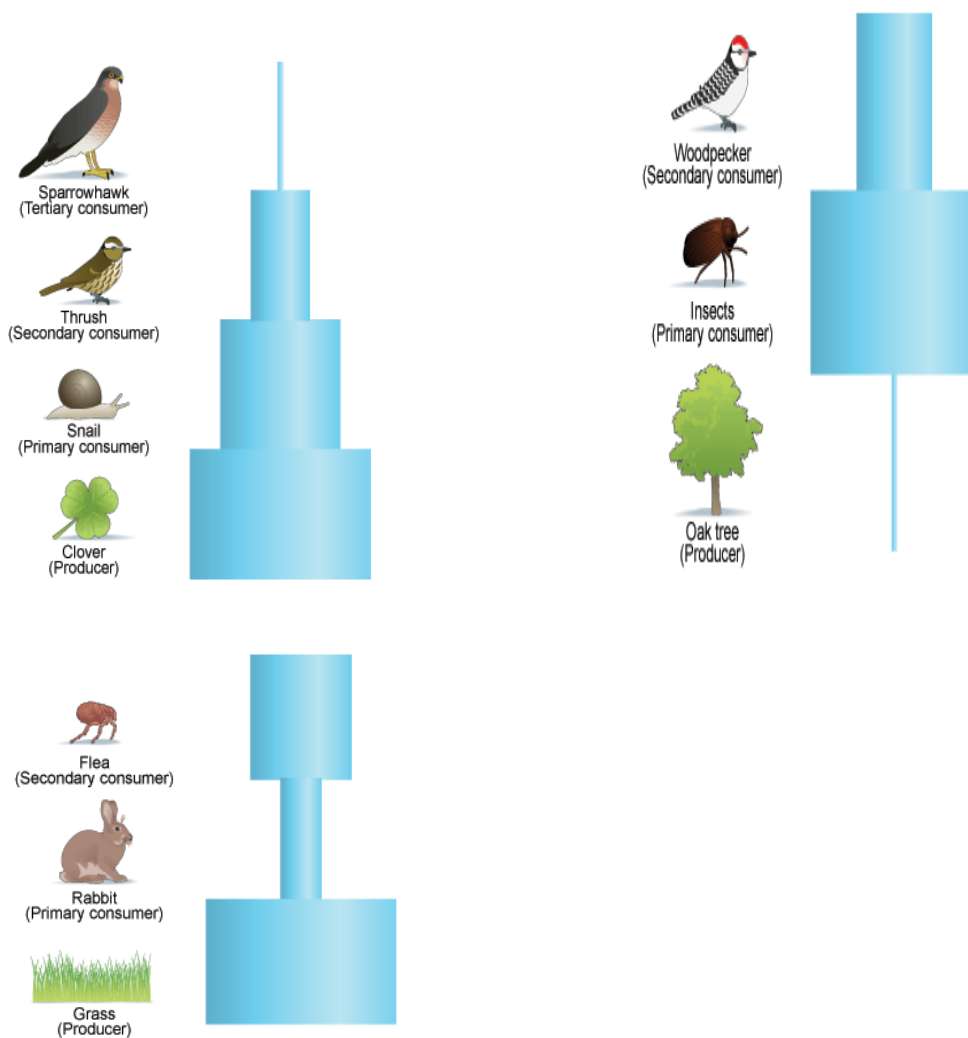
- Food chains usually have fewer than five trophic levels, because energy transfer is insufficient:



- At each level, heat is lost by respiration
- **Human eating plants is more efficient than humans eating animals** as we need only a couple of vegetables to have one meal, but to have meat we must feed the animal a lot of plant material in order to get meat
- In the process of raising an animal, plants lose energy to environment, then animal loses energy to environment and does not use up all the plant material so it is very inefficient

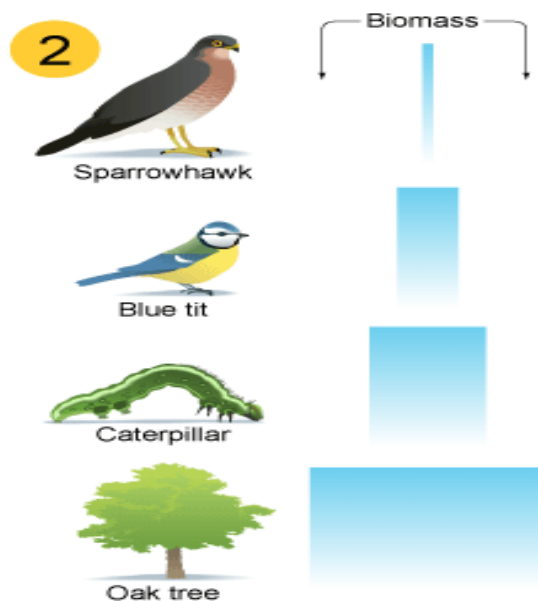
### Pyramid of numbers

- Shows numbers of each organism in a food chain

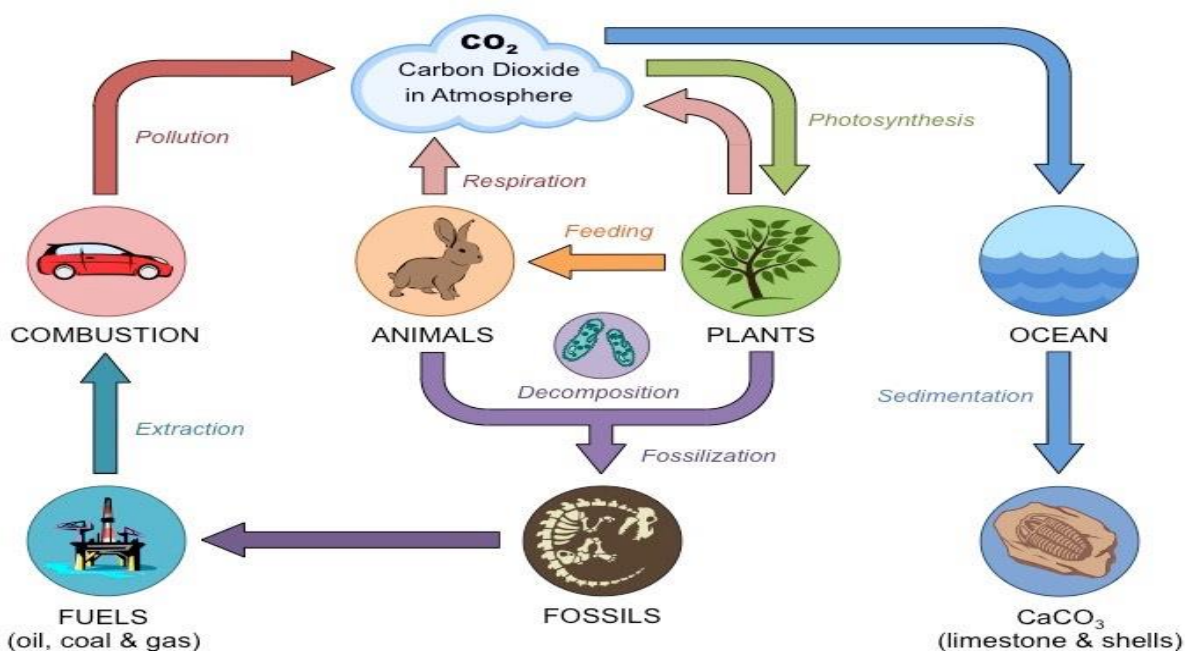


### Pyramid of Biomass

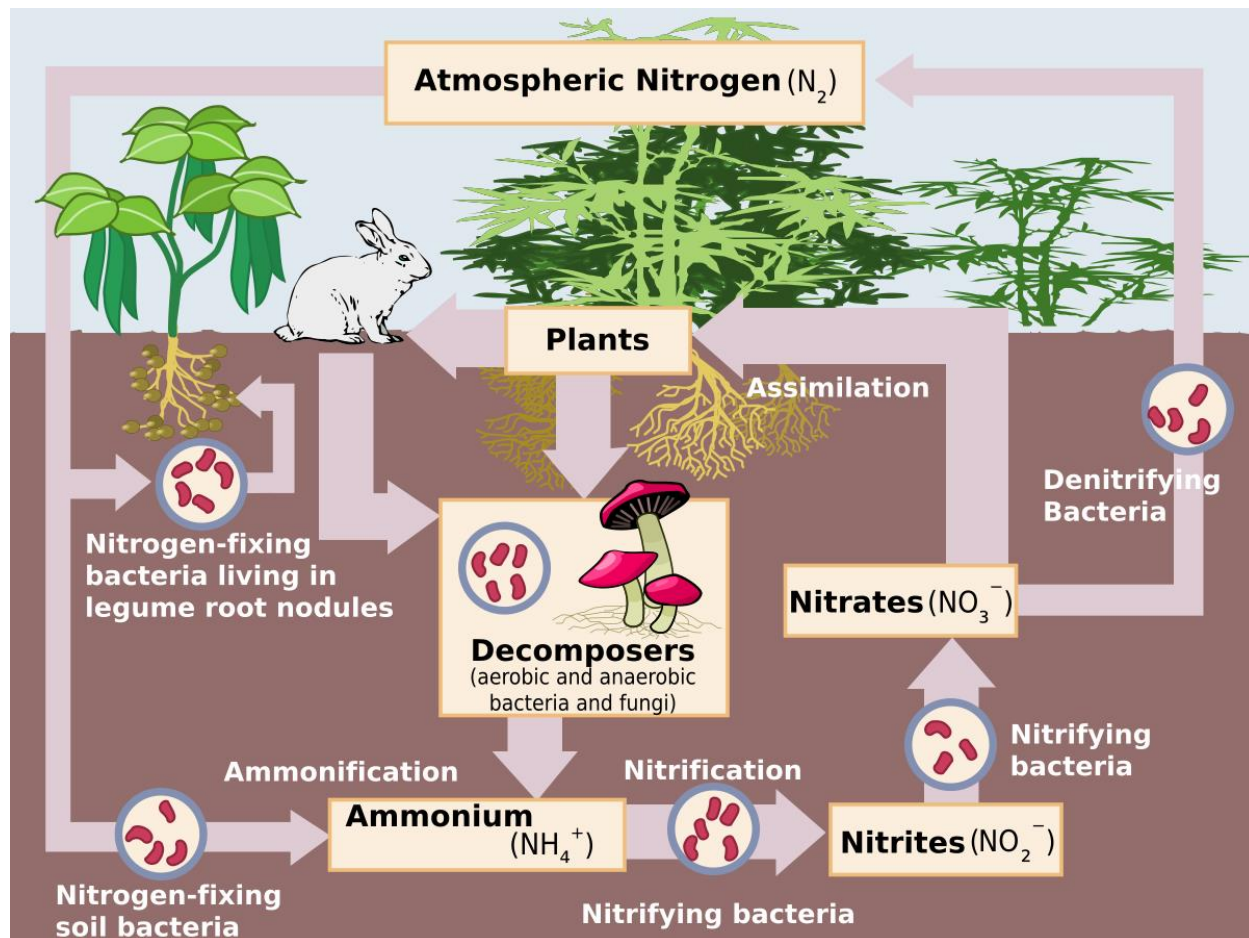
- Pyramid which shows the biomass (number of individuals x their individual mass)



### Carbon cycle

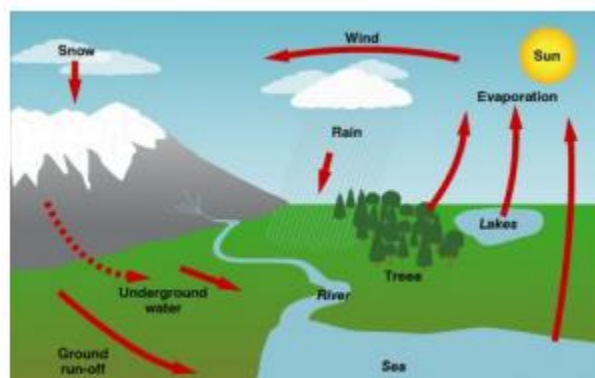


Nitrogen Cycle



- **Nitrogen fixing bacteria**: provide usable nitrogen for plants, these may exist in the root nodules where they live in symbiosis with the plants
- **Nitrogen fixation**: nitrogen in the atmosphere is converted into ammonia (lightning)
- **Nitrifying bacteria**: convert ammonium ion into nitrites then nitrates
- **Assimilation**: plants absorb nitrates and convert them into proteins
- **Denitrifying (denitrification)**: convert nitrates into atmospheric nitrogen

## Water Cycle



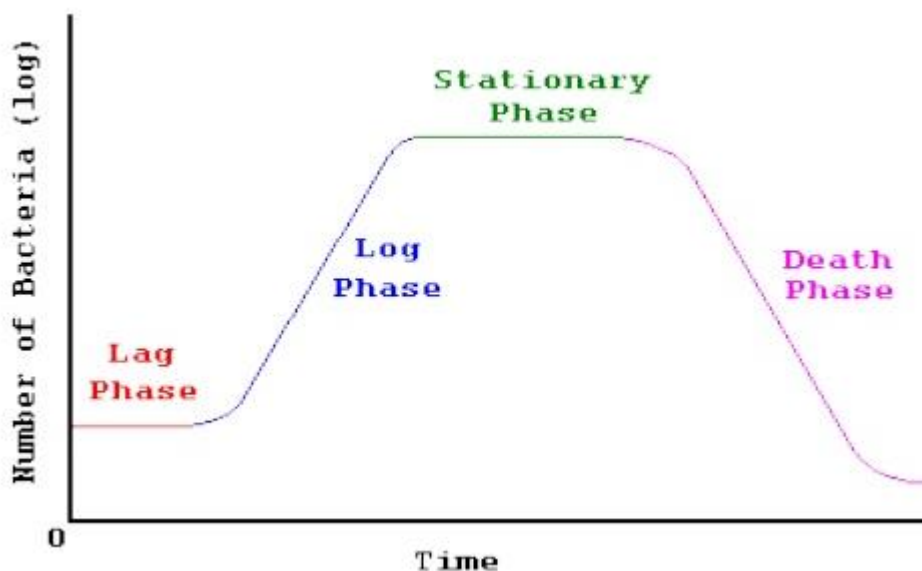
## Population

- **Population:** a group of organisms of one species, living in the same area at the same time
- **Community:** all of the populations of different species in an ecosystem
- **Ecosystem:** a unit containing the community of organisms and their environment, interacting together, e.g. lake

## Factors Affecting Rate of Population Growth

- **Food supply:** quantity and quality
- **Predation:** if predator population falls, the prey population will rise
- **Disease:** cause organisms to die so a high death rate partly cancels out birth rate → less population growth

## Growth Curve



- **Lag phase:** number of mature, reproducing individuals is low and they may be widely dispersed
- **Log phase/ exponential phase:** exponential growth occurs, the conditions are ideal and maximum growth rate is reached.
- **Stationary phase:** limiting factors slow growth → population has reached carrying capacity of its environment; mortality rate = birth rate
- **Death phase:** population decreases as bacteria die, this could be caused by lack of nutrients

## Human Population Growth

Factors favouring growth	Factors controlling growth
Lower infant mortality, higher life expectancy, better nutrition, better housing, better sanitation, medicine, vaccination	Disease, famine, war

- The human population is becoming stable due to:
  - Better education (particularly for women), so they work instead of getting married and having children
  - Better living conditions, fewer people die, fewer births needed
  - Cities, reduced need for physical labour on farms
  - Family planning

- But overall the population is still increasing
- **Social implications** of human growth:
  - Demands for roads as there is an increase number of cars
  - Greater expectation for a variety of foods all year round
  - Smaller families increase demand for housing
  - Greater demand for leisure and recreation space