4.2 ENERGY FLOW

Chemical energy flows through food chains in form of carbon compounds by means of feeding.

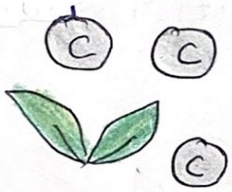
SUNLIGHT AND ECOSYSTEMS

- most living organisms → dependent on sunlight as it is the major source of energy.

Producers - directly dependent on sunlight

- make carbon compounds via photosynthesis.

Heterotrophs - indirectly dependent on light energy



- feed on producers to gain energy.
- use carbon compounds in their food as a source of energy

ENERGY CONVERSION

Producers - sunlight → chemical energy

- carbon compounds are released by cell respiration.
- available to heterotrophs

Large amounts of heat are lost to the environment.

ENERGY IN FOOD CHAINS

Food chain - shows the linear feeding relationships between species and communities.

The arrows indicate the energy flow.

Trophic level

The position an organism occupies within a feeding sequence is known as a trophic level.

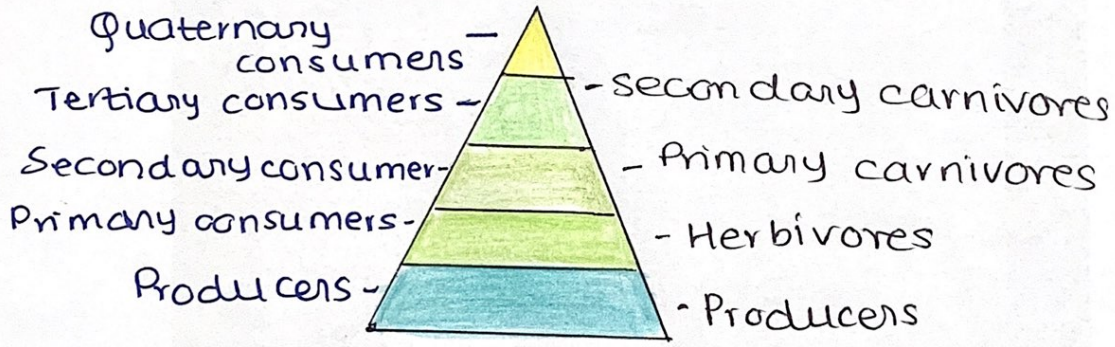
Producers - occupy the 1st trophic level

Primary consumers - occupy the 2nd trophic level

Secondary consumers. 3rd trophic level

PYRAMIDS OF ENERGY

Way to represent the flow of energy in a food chain or ecosystem.



- each level of the pyramid is a trophic level.

RESPIRATION AND ENERGY RELEASE

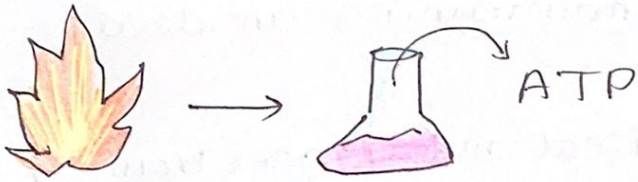
Energy is required for -

- synthesizing the necessary biomolecules
- active transport
- vesicle movement

This energy is released by cell respiration in the form of ATP.

carbon compounds are oxidized when cells produce ATP.

This is an exothermic reaction and it produces heat that is used by the endothermic reactions to produce ATP.



When cells respire, it transfers the chemical energy from glucose → ATP.

When ATP is used → Heat is produced.

Heat energy is released from the organism and is lost to the ecosystem.

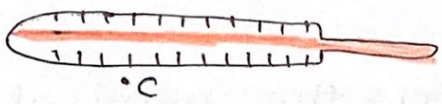
ENERGY CONVERSIONS IN ORGANISMS

- Light energy → Chemical energy - photosynthesis
- Chemical → Kinetic energy - muscle contraction
- Chemical → electrical - nerve impulses
- Chemical into heat energy.

Living organisms cannot convert heat energy into any form and there is a major loss of energy.

HEAT LOSSES FROM ECOSYSTEMS

- The heat produced is used to keep the living organisms alive by maintaining an ideal temperature.



Heat always goes from a warmer to a cooler body.
∴ it lost to the ecosystem.

Heat lost from organisms → abiotic environment → radiated to the atmosphere.

ENERGY LOSS BETWEEN TROPHIC LEVELS

Energy loss restricts the length of the food chains & the biomass of higher trophic level.

- organisms of a trophic level do not entirely consume the organisms of the previous trophic level.
- Not all parts of the food are ingested are digested and absorbed.

Only small amounts of energy is available to the next trophic level due to the energy loss.

10% of the total energy of an organism of the previous trophic levels is available to the consumer in the next trophic level.