- ATP
- Produced by all cells via **cell respiration**
- How it is made:
 - 1) Carbon compounds e.g. carbs & lipids are OXIDISED (reactions are EXO)
 - 2) Energy released is used in ENDO reactions to make ATP
 - Why ATP is needed instead of just using chemical energy from glucose etc:
 - Chemical energy in carbon compounds is not immediately usable by the cell, but the CE in ATP can be used directly for many different activities
- Why energy transformations are never 100% efficient (2nd law of thermodynamics)
 - 1) Not all energy from oxidation of carbon compounds in cell respiration is transferred to ATP
 - 2) Remainder is converted to heat
 - 3) Some heat also produced when ATP is used in cell activities (e.g. muscles warming up when they contract)

Heat Energy in Ecosystems

- **Energy conversions that living organisms can perform:** •
 - 1) Light energy chemical energy (in PS)
 - 2) Chemical energy kinetic energy (in muscle contraction)
 - 3) Chemical energy electrical energy (in nerve cells)
 - 4) Chemical energy heat energy (in heat-generating adipose tissue)
 - Can't convert HE into any other form of energy

Heat Losses from Ecosystems

- lotesale.co.uk Heat from cell respiration = living or an sms get warmer
 - > Useful in making cold b owned animals more active
 - > Birds & mar Dials increase rate the ageneration if necessary to maintain constant Doly temperature
- Why heat produced in living organisms is eventually lost to the abiotic environment:
 - LAWS OF THERMODYNAMICS = heat passes from hotter to cooler bodies
 - Therefore heat from living organisms is radiated into the (cooler) atmosphere

Explaining the length of food chains

- = Rarely more than **4 or 5** stages in a food chain
 - WHY? Energy flow along food chains & the energy losses that occur between trophic levels means that the amount of energy remaining after 4-5 stages wouldn't be enough to support another trophic level

Energy Losses & Ecosystems

- **BIOMASS** = total mass of a group of organisms, incl. cells, tissues, carbohydrates etc. •
 - Biomass has energy because carbon compounds have chemical energy
 - > The energy added to biomass by each successive trophic level is **less** (e.g. in secondary consumers, the amount of energy is always less per year per m² of ecosystem than in primary consumers)