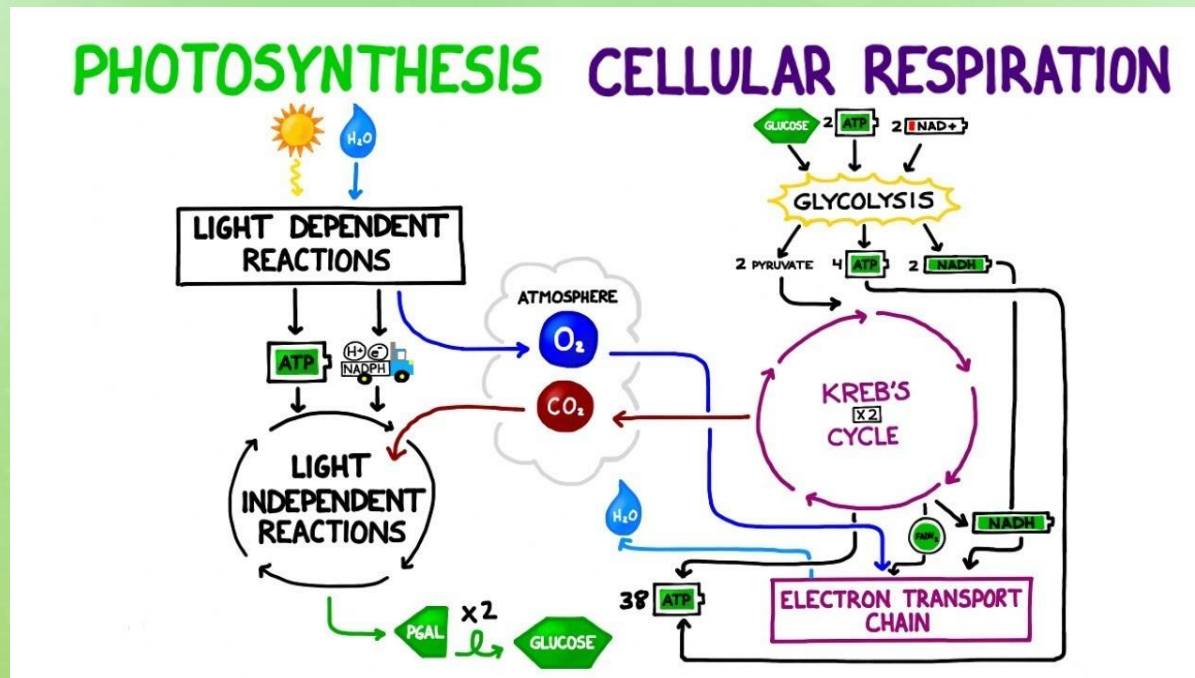
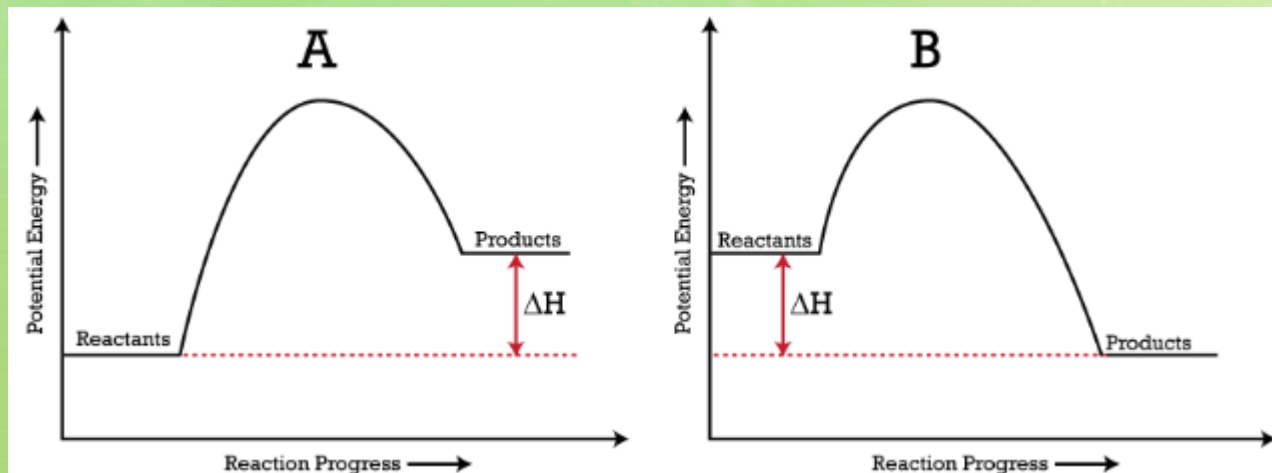


Energy Transformations

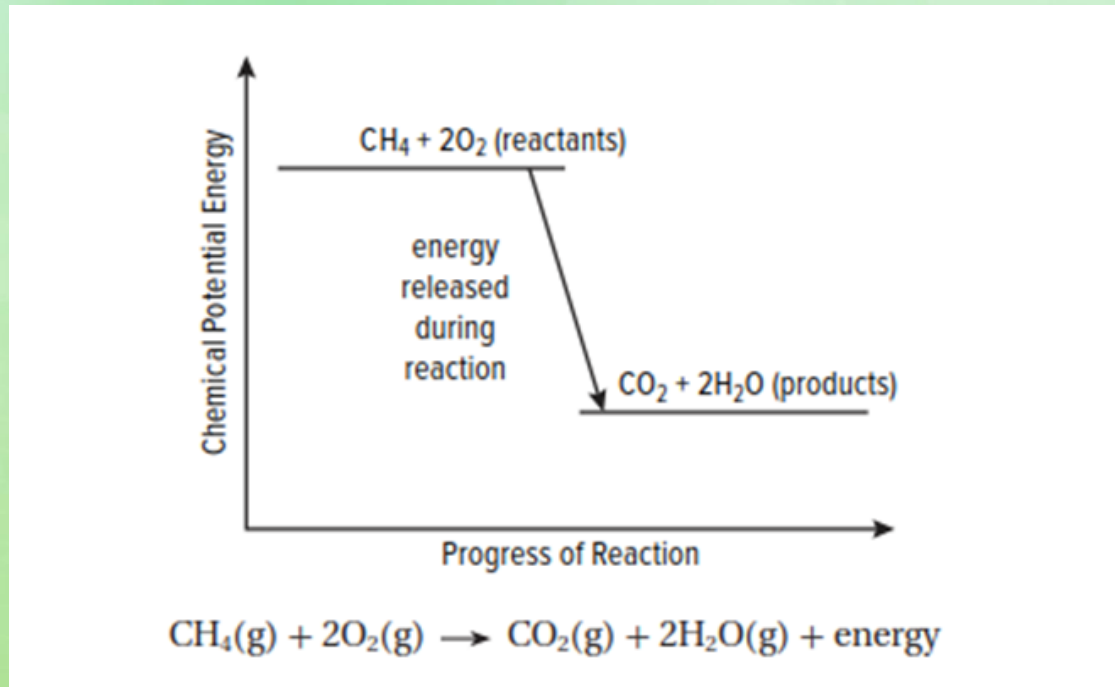


Energy is transformed in chemical reactions

- RECALL:
- The amount of energy transformed depends on the chemical bonds in the compounds of the chemical reactions.
- In an exothermic reaction, reactants have higher chemical potential energy than the products.
- In an endothermic reaction, reactants have lower chemical potential energy than the products.



Energy is transformed in chemical reactions



- 1. Are the reactants or the products higher in chemical potential energy?
- 2. Is energy released or absorbed in this reaction?
- 3. Is the reaction exothermic or endothermic?

Read pg 220
With a partner answer Question #1-
Inferring on pg 221



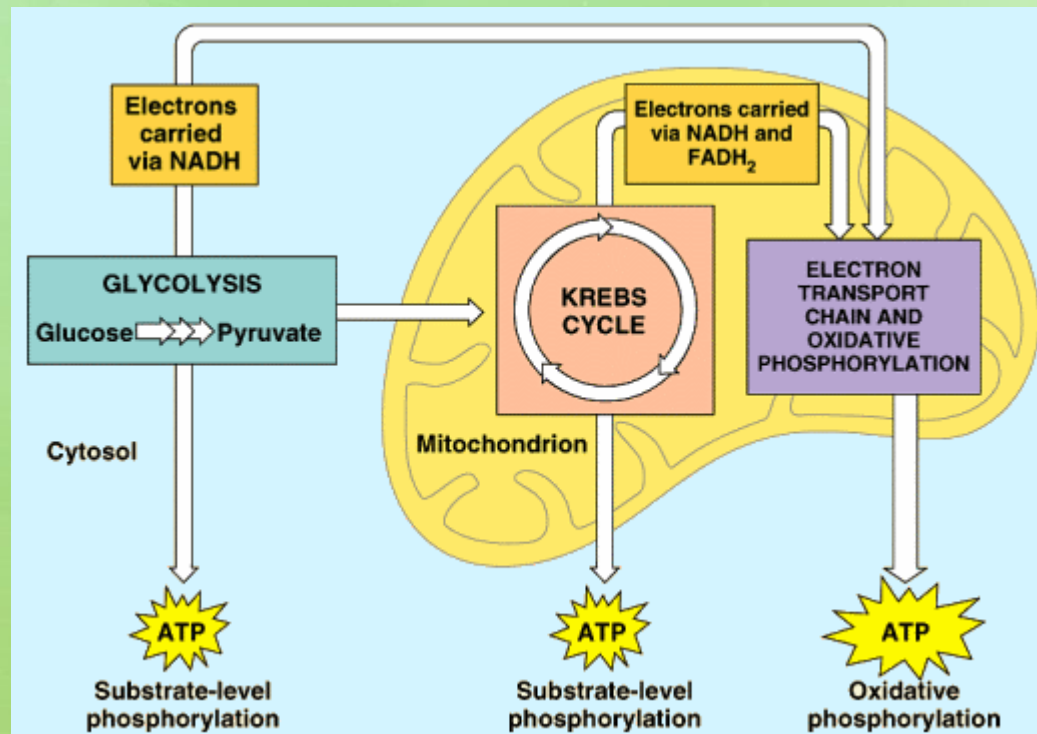
Chemical Reactions in Animals and Plants

- All living things transform chemical potential energy to carry out life's processes.
- Specifically, plants and animals carry out *cellular respiration* to produce energy in the form of ATP (adenosine triphosphate) for life processes.
- The amount of energy released during CR is comparable to the combustion of methane.
 - However your body does not burn or combust because the overall reaction takes place in small controlled steps

Cellular Respiration



- Takes place in the mitochondria



Chemical Reactions in Animals and Plants (cont'd)

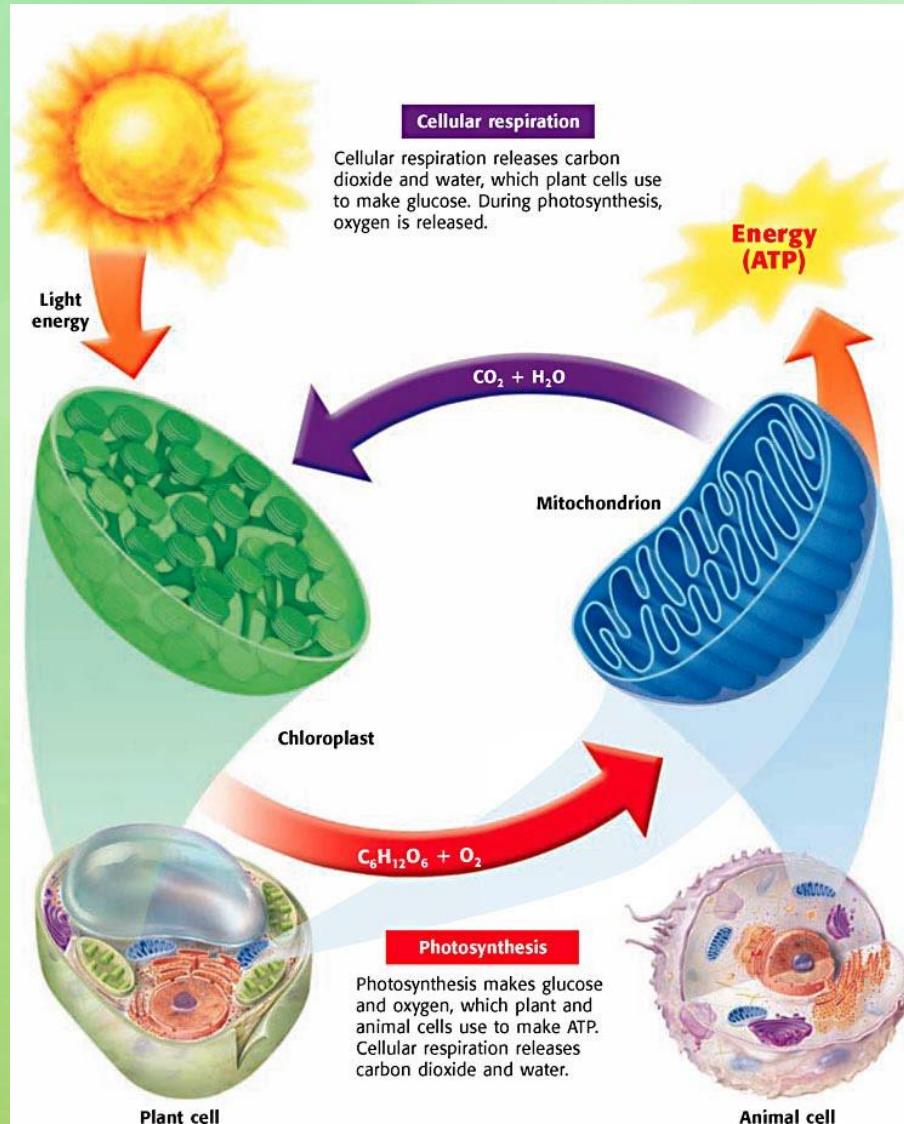
- Plants and algae capture the Sun's energy and combine carbon dioxide and water to produce glucose (sugar) and oxygen.
- This is the process of photosynthesis.



- Photosynthesis occurs in the chloroplasts through a series of reactions.
- Light energy is transformed into chemical potential energy stored in the glucose molecule.

Photosynthesis and Cellular Respiration

- Complete the photosynthesis & CR worksheets



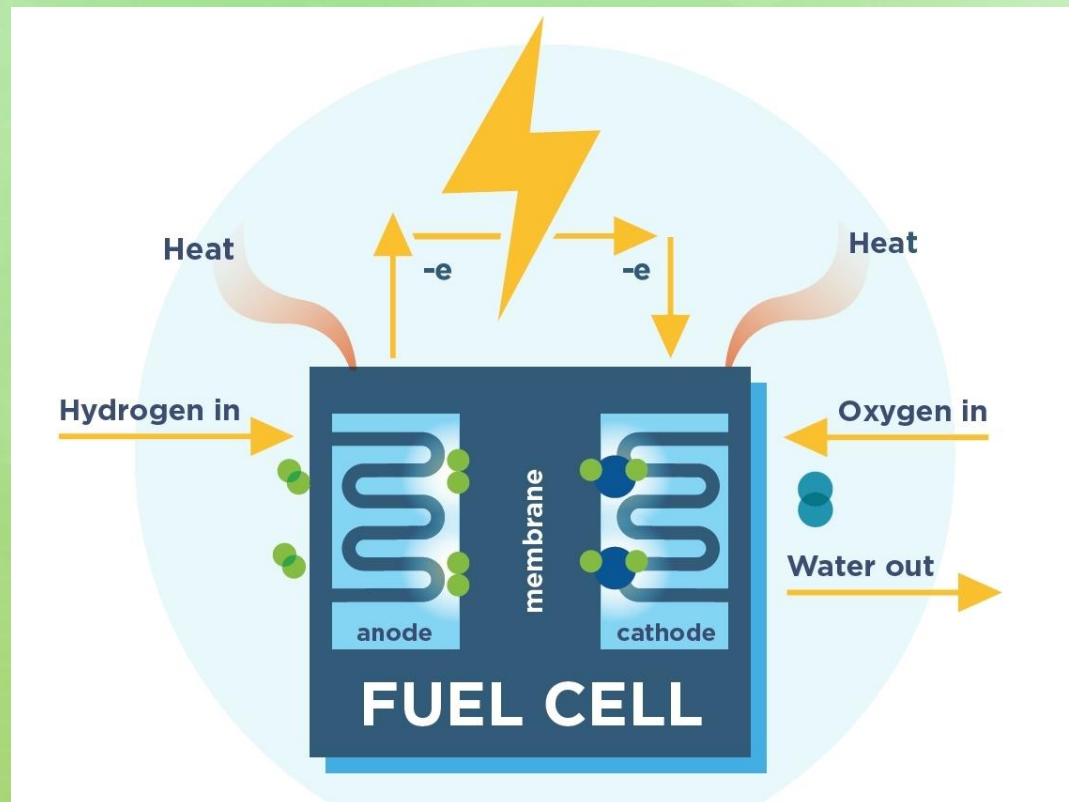
Energy Transformation and Fuels

- *Fossil fuels* contain large amounts of chemical potential energy.
 - Formed through sedimentation, pressure & heat over millions of years
 - Known as a “non renewable resource”
 - Coal, oil & gas
- Fossil fuels are now extracted and burned through combustion to produce energy
 - carbon dioxide is a by product
- Fossil fuels also contain contaminants such as sulfur and nitrogen that pollute the environment.



Fuel Cells

- *Fuel cells transform chemical energy into electrical energy when hydrogen reacts with oxygen.*
- *Emits fewer pollutants*



Discussion Questions

1. Where is chemical potential energy in molecules stored?
2. How is chemical potential energy transformed by living things?
3. Why is Carbon dioxide a negative byproduct of fossil fuel combustion?

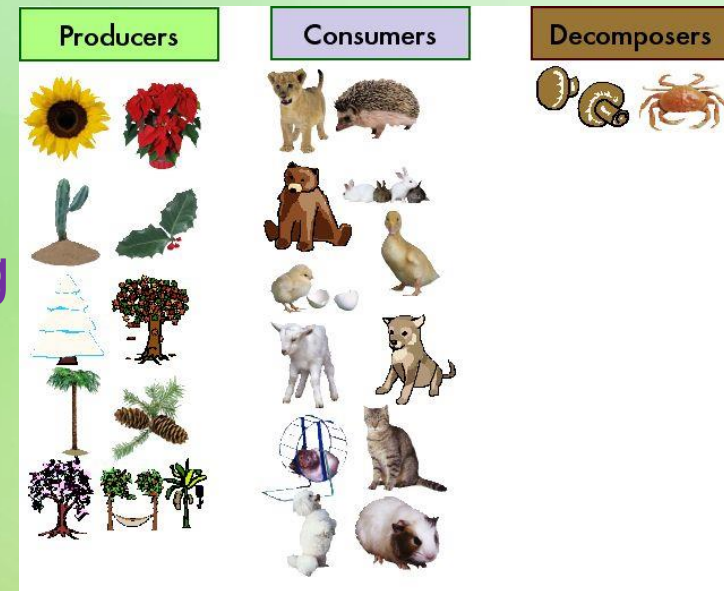
Energy Flow in Ecosystems

- Within an organism's niche, the organism interacts with the ecosystem by:
 - Obtaining food from the ecosystem
 - Contributing energy to the ecosystem



Roles in an ecosystem

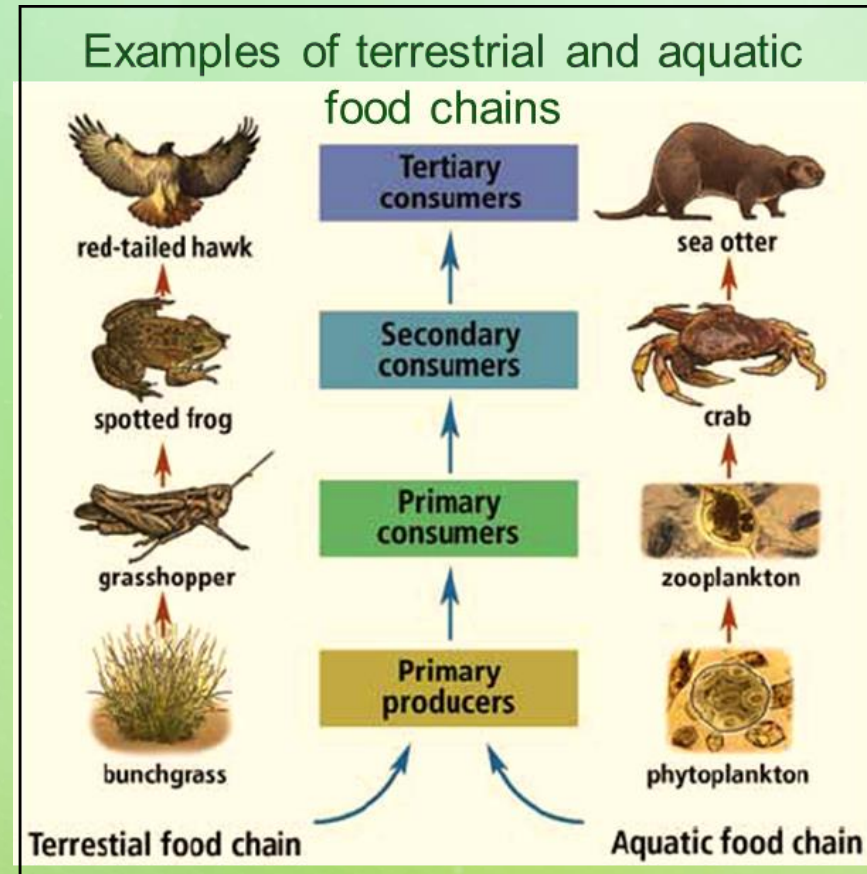
- Plants are called producers because they produce carbohydrates from carbon dioxide, water, and the Sun's energy.
- Consumers get their energy by feeding on producers or other consumers.
- Decomposition is the breakdown of wastes and dead organisms by organisms called decomposers through the process of biodegradation.



Representing Energy Flow and Loss in an ecosystem

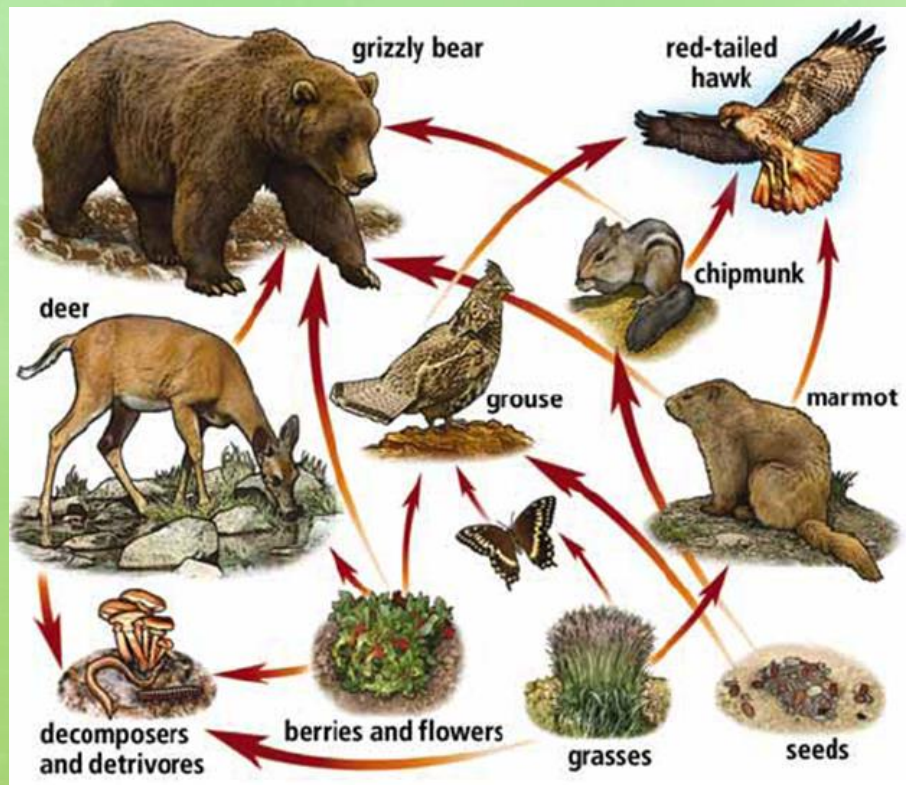
Food Chains

- Represent one pathway of energy in an ecosystem
- Each step in a food chain is a trophic level
 - Producers = 1st trophic level
 - Primary consumers = 2nd trophic level
 - Secondary consumers = 3rd trophic level
 - Tertiary consumers = 4th trophic level

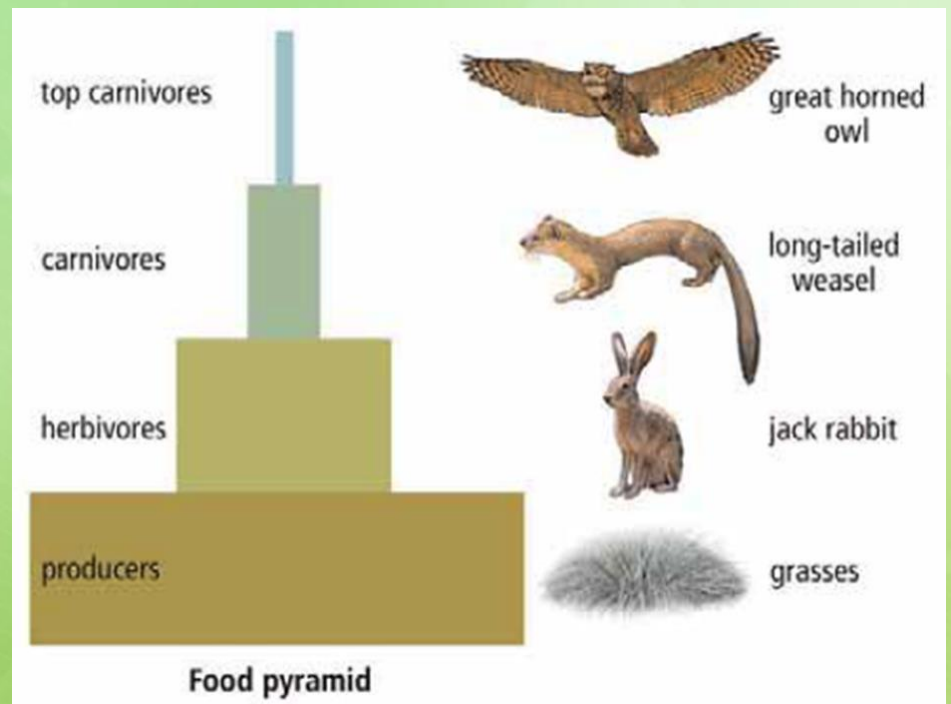
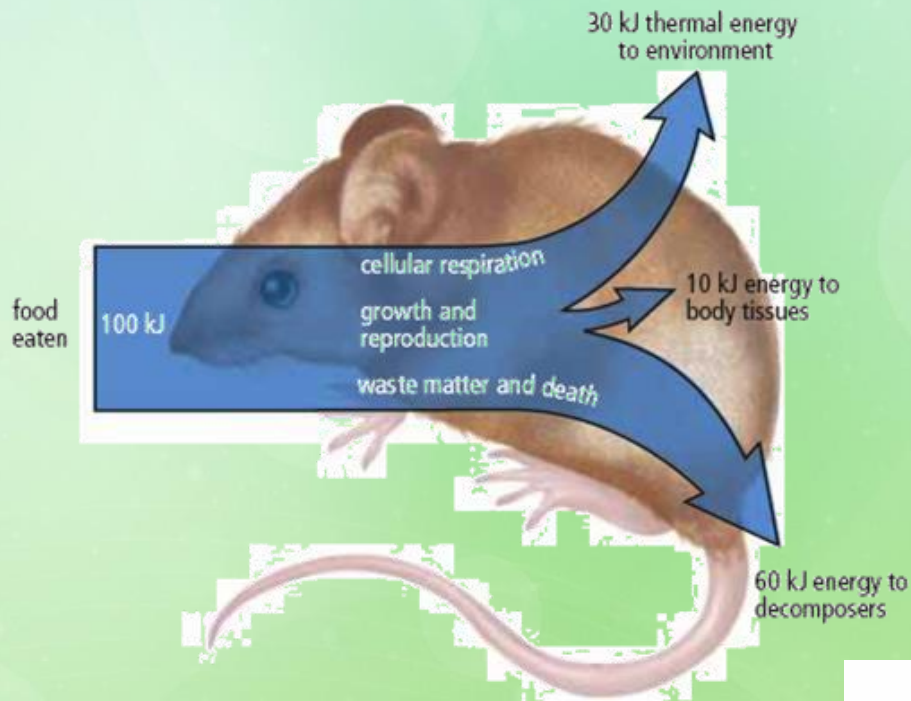


Representing Energy Flow and Loss in an ecosystem

- Food Web
 - Represent interconnected food chains in an ecosystem
 - Arrows indicate the flow of energy and nutrients
 - The arrows eventually lead to a top consumer

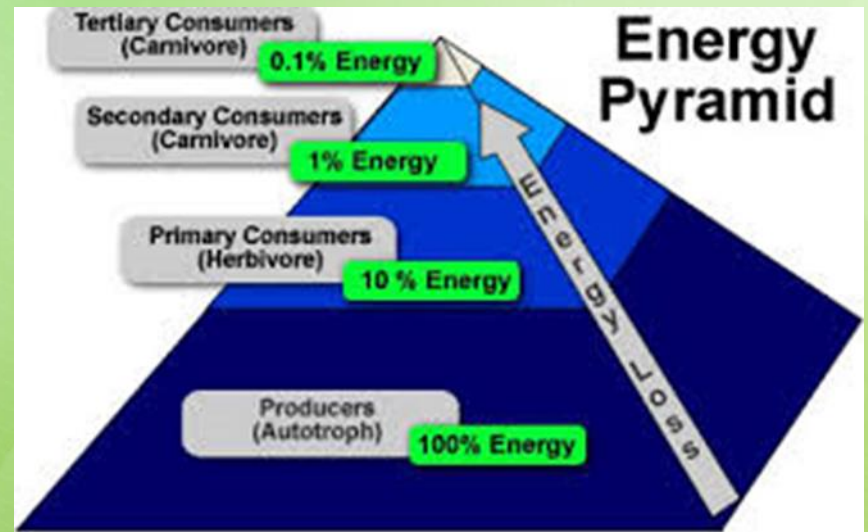


- Food Pyramids
 - Represent energy loss in an ecosystem
 - Energy enters at the producers, where there is a large amount of biomass (mass of living things) and therefore energy.
 - It takes large quantities of organisms in one level to meet the energy needs of the next level.
 - Each level loses large amounts of the energy it gathers through basic processes of living.
 - 80 – 90 percent of energy taken in by consumers is used in chemical reactions in the body and is lost as thermal energy.
 - There is very little energy left over for growth or increase in biomass.



Food Pyramids

- Each level in the energy pyramid = a loss of 90 percent of total energy available.
- Lower levels have much larger populations than upper levels.
- This shows the importance of maintaining large, biodiverse populations at the lowest levels of the food pyramid.



Question?

1. What type of energy transformations are occurring within food webs, food chains & food pyramids?
2. Where should the most biomass exist in a healthy ecosystem?
3. Why are there less top consumers than primary consumers in an ecosystem?

Time out

Modelling a local ecosystem

