**Topic 4.2 Energy Flow SKELETON NOTES**

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|  | **Statement** | **Guidance** |
| 4.2.U1 | Most ecosystems rely on a supply of energy from sunlight. |  |
| 4.2.U2 | Light energy is converted to chemical energy in carbon compounds by photosynthesis. |  |
| 4.2.U3 | Chemical energy in carbon compounds flows through food chains by means of feeding. | [Pyramids of number and biomass are not required. Students should be clear that biomass in terrestrial ecosystems diminishes with energy along food chains due to loss of carbon dioxide, water and other waste products, such as urea.] |
| 4.2.U4 | Energy released from carbon compounds by respiration is used in living organisms and converted to heat. |  |
| 4.2.U5 | Living organisms cannot convert heat to other forms of energy. |  |
| 4.2.U6 | Heat is lost from ecosystems. |  |
| 4.2.U7 | Energy losses between trophic levels restrict the length of food chains and the biomass of higher trophic levels. | [The distinction between energy flow in ecosystems and cycling of inorganic nutrients should be stressed. Students should understand that there is a continuous but variable supply of energy in the form of sunlight but that the supply of nutrients in an ecosystem is finite and limited.] |
| 4.2.S1 | Quantitative representations of energy flow using pyramids of energy. | [Pyramids of energy should be drawn to scale and should be stepped, not triangular. The terms producer, first consumer and second consumer and so on should be used, rather than first trophic level, second trophic level and so on.] |

**Watch the following** [**Topic 4.2 video**](https://www.youtube.com/watch?v=KO64Rrky7Pc) **and take notes for each of the Understandings for Topic 4.2. We will go over any questions following your independent study session.**

4.2.U1 *Most ecosystems rely on a supply of energy from sunlight*

1. For most biological communities, what is the initial source of energy?
2. What are some examples of organisms that can utilize this energy source? What process do they use to harvest this energy?
3. How do heterotrophs (such as consumers, saprotrophs, and detritivores) obtain energy? Which element does the energy come from?
4. (NOT IN VIDEO) What is the *key factor* to determine energy availability to organisms? For example, deserts have high sunlight intensity levels but less energy available to higher trophic levels as compared to redwood forest in California where intensity of sunlight is less but more energy is available to support organisms in the higher trophic levels.

**ACTIVITY: Complete Data-base questions on pg 214.**

4.2.U2 *Light energy is converted to chemical energy in carbon compounds by photosynthesis.*

1. What do producers use to absorb sunlight?
2. What is their role? What is it used for?

4.2 U3 Chemical energy in carbon compounds flows through food chains by means of feeding.

1. What is a food chain?
2. Generally, how many organisms are found in a chain?
3. Who are always first on a chain? What follows?
4. What do the arrows indicate on a food chain?
5. Draw an example of a food chain

4.2 U4 Energy released from carbon compounds by respiration is used in living organisms and converted to heat.

1. Living organisms need energy for cell activities such as:
   1. Synthesizing….
   2. Pumping….
   3. Moving….
2. What supplies energy for these activities?
3. (Review) What process transfers the chemical energy in glucose (and other carbon compounds) into ATP?
4. Not all the energy converted from the oxidation of carbon compounds (such as carbohydrates and lipids) are converted to ATP, what else is it released? NOTE: These reactions are known as *exothermic reactions*.
5. When is it also produced? Provide an example.

**IN-Class ACTIVITY: Complete Data Based Question from pg 216**

4.2 U5 Living organisms cannot convert heat to other forms of energy.

1. Living organisms can perform various energy conversions such as: (done for you)
   1. Light energy to chemical energy in photosynthesis
   2. Chemical energy to kinetic energy in muscle contractions
   3. Chemical energy to electrical energy in nerve cells
   4. Chemical energy to heat energy in heat-generating adipose tissue.
2. What cannot be converted into any other forms of energy?

4.2 U6 - Heat is lost from ecosystems.

1. What happens to the heat produced by living organisms?
2. What do ecologist believe about the heat produced?

4.2 U7 Energy losses between trophic levels restrict the length of food chains and the biomass of higher trophic levels.

1. What is biomass? What does it include?
2. What % will be transferred from one trophic level to the next?
3. What are the reasons for the trend of energy loss?
4. Explain why are there limitations to the length of food chains?

4.2 S1 Quantitative representation of energy flow using pyramids of energy

25. Draw an example of a quantitative representation of an energy flow pyramid (can use textbook pg 218 as reference).

NOTE: units should be in amount of energy per unit area per year. Often the units are in “kilojoules per metre squared per year (kJ m-2yr-1). Bars should be drawn with widths relative to their energy content at each level.

**HOMEWORK:**

Data-Base Questions on pg 219 (and 214, 216 if not completed already)