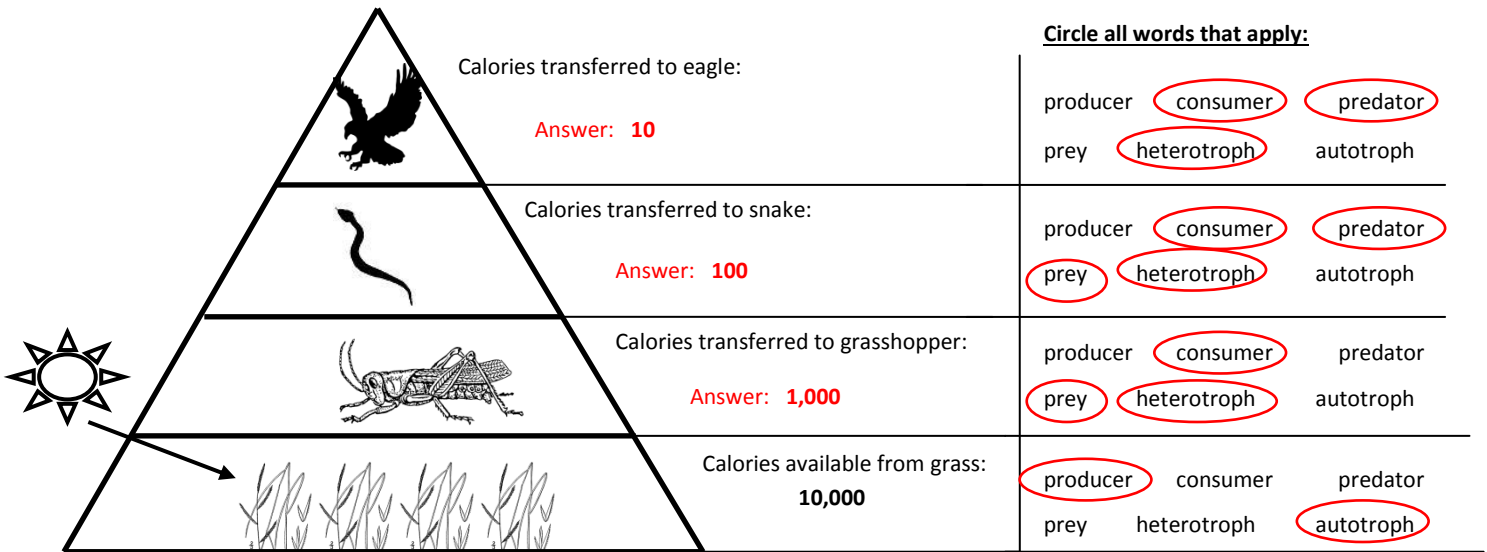Name_____ Period_____ Date_____

Energy through Ecosystems Worksheet

The amount of available energy at each trophic (feeding) level decreases as it moves through an ecosystem. As little as 10 percent of the energy at any level is transferred up to the next level.

In the energy pyramid below, calculate the amount of energy that is passed up from one trophic level to the next, assuming only 10% of the energy from the previous level is available for the next level. For each trophic level, circle all the words that apply to identify each organism as either a producer or consumer and as either an autotroph or a heterotroph. If the organism could be considered a predator and/or prey, circle those words also.

Circle all words that apply:

Calories transferred to eagle:

Answer: **10**

producer (consumer) (predator)
prey (heterotroph) autotroph

Calories transferred to snake:

Answer: **100**

producer (consumer) (predator)
(prey) (heterotroph) autotroph

Calories transferred to grasshopper:

Answer: **1,000**

producer (consumer) predator
(prey) (heterotroph) autotroph

Calories available from grass:
10,000

(producer) consumer predator
prey heterotroph (autotroph)

Questions

1. Assume that the grasshopper in the food pyramid above must eat half its body weight in grass each day. If an average-size grasshopper weighs 2 grams, and 1 blade of grass weighs 0.1grams (one tenth of a gram), how many blades of grass does the grasshopper need to eat each day?

   Answer: 10 blades of grass (=1/2 the weight of a grasshopper, or 1 g)

2. Assume a snake must eat 5 grasshoppers per day, while an eagle must eat 2 snakes per day. Use this information along with your answer from Question #1 to calculate how many blades of grass are needed to keep an eagle alive for a day?

   Answer: 100 blades of grass (=10 blades/grasshopper x 5 grasshoppers/snake x 2 snakes/eagle)

3. How many blades of grass are needed to support a family of four eagles for a week?

   Answer: 2800 blades of grass (=100 blades/eagle x 4 eagles x 7 days/week)

4. If only 10% of the energy from one trophic level passes up to the next level, what happens to the 90% energy that is *not* passed on?

Answer: much of this energy is used for metabolic processes and/or is lost as heat

5. Do you think a pyramid is a good shape to represent how matter and energy transfer in an ecosystem? Why or why not?

Answers will vary but acceptable answers include that pyramids are a good way to represent that only a fraction of the energy from a lower trophic level passes up to each higher level. Other reasonable answers should also be accepted.

6. A full-sized cow needs about 100 square feet of pasture to graze on each day. Assume an average sized classroom is about 600 square feet. How many classrooms worth of pasture would be needed to keep a cow alive for a year?

Answer: nearly 61 classrooms! (=365 days/year * 100 square feet/day /600 square feet/room)

7. Which trophic level do you think is the most important for the ecosystem and why?

Answers will vary, but acceptable answers include that the bottom level is most important because it supports every level above it. Accept other reasonable answers such as "the top level because it keeps the levels below it in check", etc.