

1. A zooplankton eats 150 g of phytoplankton in a year. Each gram of the phytoplankton absorbs 25 kJ of energy. How much energy is available to the zooplankton?

$$\begin{aligned} \text{phytoplankton} & \xrightarrow{10\%} \text{zooplankton} \\ \text{energy} &= 150\text{g} \times \frac{25\text{kJ}}{\text{g}} \\ &= 3750\text{kJ} \end{aligned}$$

$$\begin{aligned} \text{energy} &= 0.10 \times 3750\text{kJ} \\ &= \boxed{375\text{kJ}} \end{aligned}$$

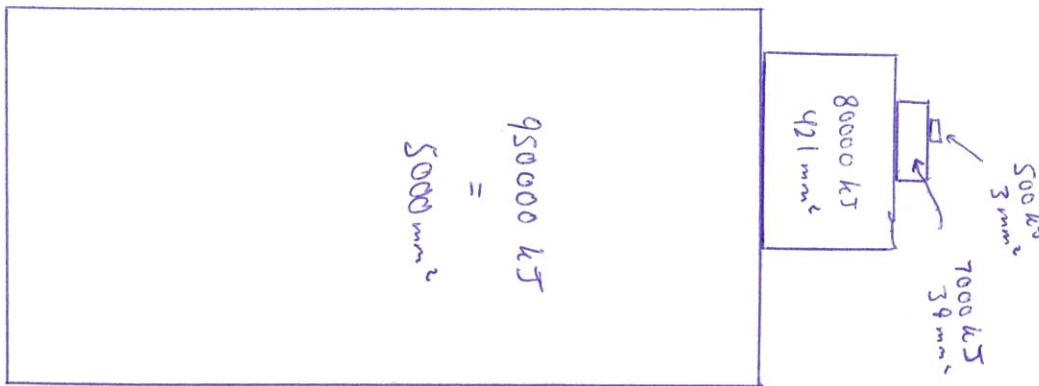
2. Use the following table to answer the next question.

Trophic Level	Energy (kJ)
Producers	950,000
Primary Consumers	80,000
Secondary Consumers	7000
Tertiary Consumers	500

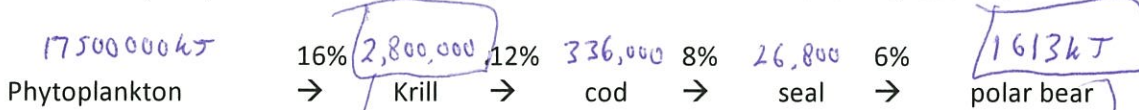
$$\frac{950000\text{kJ}}{5000\text{mm}^2} = \frac{80000\text{kJ}}{?} = \frac{7000\text{kJ}}{?} = \frac{500\text{kJ}}{?}$$

$$? = 421\text{mm}^2 \quad ? = 39\text{mm}^2 \quad ? = 3\text{mm}^2$$

Create a pyramid of energy using the information in the table.



3. Phytoplankton absorb 17,500,000 kJ of energy per day and are the start of the following food chain.



a. How much energy is available to the polar bear?

b. How much energy is available to the krill?

4. An ecosystem contains 175 snowshoe hares. Each hare consumes 2750 kJ of energy per day.

shrubs and grasses → hares → coyote

a. How much energy do the shrubs and grasses have to absorb per day to support the hare population?

$$\begin{aligned} \text{hares energy} &= 175 \text{ hares} \times 2750 \frac{\text{kJ}}{\text{hare}} \\ &= 481250 \text{ kJ} \end{aligned}$$

$$\begin{aligned} \text{shrubs/grasses energy} &= 481250 \text{ kJ} \div 0.10 \\ &= 4812500 \text{ kJ} \end{aligned}$$

b. If each coyotes requires 3500 kJ of energy per day, how many coyotes can the ecosystem support?

$$\begin{aligned} \text{total coyote energy} &= 481250 \text{ kJ} \times 0.10 \\ &= 48125 \text{ kJ} \end{aligned}$$

$$\begin{aligned} \text{number of coyotes} &= \frac{48125 \text{ kJ}}{3500 \text{ kJ/coyote}} \\ &= 13.75 \text{ coyotes} \\ &= 13 \text{ coyotes} \end{aligned}$$