

Food Chains and Energy Flow – Answer Key

Section 1: Energy Flow Through Producers

- 1a. Only about 8–10% of sunlight energy is transferred into chemical energy (glucose).
- 1b. About 50% of sunlight is the wrong wavelength, 30% is lost in reactions, 5% is reflected, 5% passes through the leaf.
- 2a. Producers: plants and some bacteria.
- 2b. They capture sunlight and convert it into glucose via photosynthesis.
- 3. The chemical energy is used for respiration and growth in plants.
- 4. Herbivores (primary consumers) eat plants and transfer energy to higher trophic levels.
- 5. Decomposers recycle energy by breaking down dead plant material, fruits, and seeds.

Section 2: Shortening the Food Chain

- 6. Humans are at the top of the pyramid, eating cod supported by plankton.
- 7. About 1 cod per person per day ($\approx$ 360 cod/year).
- 8. 30 people, each eating 10 sand eels/day.
- 9. 900 people could be supported, each eating 100 shrimps/day.
- 10. 2000 people could be supported as vegetarians (2 kg of plankton/day).
- 11. A vegetarian diet supports more people because fewer energy transfers means less energy is wasted.
- 12. About 90% of energy is lost at each trophic level as heat, respiration, or undigested material.
- 13. Meat diets are more common in developed countries because they can afford the inefficiency of longer food chains.
- 14. Rising populations and higher demand for meat will increase food prices and pressure on resources.
- 15. People in poorer countries often have vegetarian diets due to cost and energy efficiency of plant-based food.

Section 3: Application & Critical Thinking

- 16. Shortening the food chain reduces energy loss, so more people can be supported.
- 17. Energy pyramids show transfer is never 100% efficient—only ~10% passes on.
- 18. Vegetarian diets reduce energy loss and can support more people with fewer resources.
- 19. Energy is lost as heat from respiration, movement, waste, and uneaten material.
- 20. Climate change could reduce plant productivity, lowering energy available at all trophic levels and disrupting food security.