LESSON MAKER PRO

Biomass on the Move

Use a food-chain model to estimate biomass at each level.

HIGH SCHOOL · BIO.5

BIO.5 "Students will Investigate and evaluate the interdependence of living organisms and their environment. Illustrate levels of ecological hierarchy, including organism, population, community, ecosystem, biome, and biosphere..."

NAME _____ DATE _____

THE 10% MODEL

In a simple food-chain model, about 10% of the biomass at one level becomes biomass at the next level. Divide by 10 to move toward a consumer, or multiply by 10 to work backward. These results are estimates, not exact amounts in nature.

WORKED EXAMPLE

Use the model to estimate the lizard biomass supported by these shrubs.

DESERT FOOD CHAIN

Level	Biomass
Shrubs	9,000 g
Grasshoppers	900 g
Lizards	?

1. Shrubs to grasshoppers: 9,000 g / 10 = 900 g.
2. Grasshoppers to lizards: 900 g / 10 = 90 g.

Answer: About 90 g of lizard biomass.

PRACTICE 6 problems

1 Estimate the rabbit biomass and fox biomass supported by the grass.

MEADOW FOOD CHAIN

Level	Biomass
Grass	5,000 g
Rabbits	?
Foxes	?

ANSWER _____

2 Estimate the phytoplankton biomass needed to support the zooplankton.

OCEAN FOOD CHAIN

Level	Biomass
Phytoplankton	?
Zooplankton	240 g
Small fish	24 g

ANSWER _____

3 How many grams of plant biomass do not become insect biomass in this model?

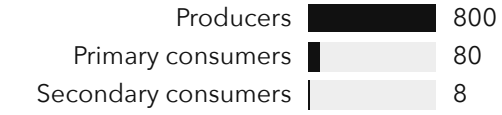
FIELD FOOD CHAIN

Level	Biomass
Plants	3,600 g
Insects	360 g
Birds	36 g

ANSWER _____

4 How much more producer biomass than primary consumer biomass does the graph show?

BIOMASS IN A FOOD CHAIN



ANSWER _____

5 Estimate the tertiary consumer biomass supported by the producers.

FOUR-LEVEL FOOD CHAIN

Level	Biomass
Producers	12,000 g
Primary consumers	?
Secondary consumers	?
Tertiary consumers	?

ANSWER _____

6 Each food chain has a producer, a primary consumer, and a secondary consumer. Which chain supports more secondary consumer biomass, and by how much?

TWO FOOD CHAINS

Chain	Producer biomass
A	6,000 g
B	4,000 g

ANSWER _____

APPLY IT Show your work

1 A school garden club can grow the plant biomass shown in the table. Caterpillars eat the plants, and songbirds eat the caterpillars. About how much more songbird biomass could the added planters support?

SCHOOL GARDEN PLANS

Plan	Plant biomass
Current garden	18,000 g
With added planters	24,000 g

ANSWER _____

2 At a restored pond, tadpoles eat algae, and herons eat tadpoles. Estimate the algae biomass needed to support the tadpoles and the heron biomass the tadpoles could support.

RESTORED POND FOOD CHAIN

Level	Biomass
Algae	?
Tadpoles	750 g
Herons	?

ANSWER _____

CHALLENGE One step up

In an urban wetland, insects feed on the plants in two separate patches. Fish eat insects from both patches, and herons eat the fish. Estimate the total heron biomass the patches could support. Show your steps and name one assumption of your model.

WETLAND PLANT PATCHES

Patch	Plant biomass
A	25,000 g
B	35,000 g

WORK SPACE AND ANSWER

Biomass on the Move

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Estimate the rabbit biomass and fox biomass supported by the grass.	**Rabbits: about 500 g. Foxes: about 50 g.**
2	Estimate the phytoplankton biomass needed to support the zooplankton.	**About 2,400 g of phytoplankton.**
3	How many grams of plant biomass do not become insect biomass in this model?	**3,240 g.**
4	How much more producer biomass than primary consumer biomass does the graph show?	**720 g.**
5	Estimate the tertiary consumer biomass supported by the producers.	**About 12 g of tertiary consumer biomass.**
6	Each food chain has a producer, a primary consumer, and a secondary consumer. Which chain supports more secondary consumer biomass, and by how much?	**Chain A, by about 20 g.**

PART 2 · APPLY IT

1. **About 60 g more songbird biomass.** The current garden supports about 180 g of songbird biomass, while the added planters raise that estimate to 240 g. The difference is 60 g.
2. **About 7,500 g of algae and 75 g of heron biomass.** Multiply 750 g by 10 to estimate the algae biomass. Divide 750 g by 10 to estimate the heron biomass.

CHALLENGE

25,000 g + 35,000 g = 60,000 g of plants. The model gives 6,000 g of insects, 600 g of fish, and about 60 g of heron biomass. One assumption is that 10% of the biomass passes to the next level at each step.

Accept equivalent calculations with units. Treat all biomass predictions as estimates based on the 10% model.