Forest Energy and Matter Practice Set

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Lesson:

You are going to read and use a model of ONE forest. The same forest is used the whole way through: trees, a rabbit, a mouse, a wolf, an owl, and the decomposers living in the soil.

A model uses arrows to show where matter goes. In this lesson every arrow means "matter moves this way." It always points from where the matter is now to where it goes next:

- from the air, the water, and the soil into the trees
- from the food to whoever eats it (trees to rabbit, rabbit to wolf)
- from anything that dies or leaves waste into the decomposers
- from the decomposers back out to the soil and air

Careful: the arrow does not point from the eater to its food. It follows the matter. A wolf eats a rabbit, so the arrow points rabbit to wolf.

Matter and energy are not the same thing. Matter goes around the same circle again and again. Energy comes in from the sun, travels the same direction as the arrows, and does not come back around.

You have got it when you can put your finger on any living thing in the model and say where its matter came from and where its matter goes next.

> Everything in a forest is made of matter. Matter is the stuff that takes up space and has weight. Our forest has trees, a rabbit, a mouse, a wolf, an owl, and decomposers living down in the soil.
>
> The trees are producers, which means they make their own food. Sunlight gives them the energy to do it. But the matter they build with comes from carbon dioxide in the air and from water they pull up through their roots. That matter becomes wood, bark, leaves, roots, and seeds.
>
> Here is the part that surprises people: a huge tree is not made mostly of soil. Most of a tree came out of the air.

Where does a tree's matter come from?

Look at one new leaf on one of our trees and ask what it is made of. Carbon dioxide from the air, and water from the ground. Sunlight is the energy that puts those together, but sunlight is not matter, so no part of the leaf is made of sunlight.

Arrow: air, water, and soil --> trees

> Animals cannot make their own food, so they are consumers. They get their matter by eating.
>
> In our forest, the rabbit and the mouse eat parts of the trees: leaves, bark, seeds, and berries. The wolf eats the rabbit. The owl eats the mouse. Every time something is eaten, matter moves into the eater and becomes part of its muscles, bones, fur, and feathers for a while.
>
> Not all of it stays. Some leaves the animal as waste. Some leaves as a gas every time the animal breathes out. That matter is not gone. It has just moved somewhere else.

Follow one bite.

A rabbit eats a tree leaf, and matter from that leaf becomes rabbit muscle. Later a wolf eats the rabbit, and that same matter becomes wolf muscle.

Arrows: trees --> rabbit --> wolf

Notice which way the arrows point. They point away from the one being eaten, not toward it.

The other chain in this same forest.

A mouse eats seeds and berries from the trees, and an owl eats the mouse.

Arrows: trees --> mouse --> owl

Two chains, one forest. Both of them start at the trees, because the trees are the only ones here who can make food.

> Every living thing in the forest dies sooner or later: the leaves, the rabbit, the mouse, even the wolf and the owl. So why is the forest floor not piled high with dead bodies and old leaves?
>
> Decomposers. Fungi, like the mushrooms you see on the forest floor, and bacteria too small to see, break dead things and waste back apart. The matter they release goes into the soil and into the air.
>
> That is what closes the loop. The trees pull that matter back in and build with it all over again. Nothing in a forest gets thrown away.

What happens when the wolf dies?

Its matter does not disappear, because matter never does. Decomposers break the body apart. That matter goes into the soil and the air, and the trees take it back in to build new leaves.

Wolf --> decomposers --> soil and air --> trees

Now think back. The wolf ate the rabbit, and the rabbit ate the trees. So some of the matter sitting in that brand new leaf has already been all the way around this forest once.

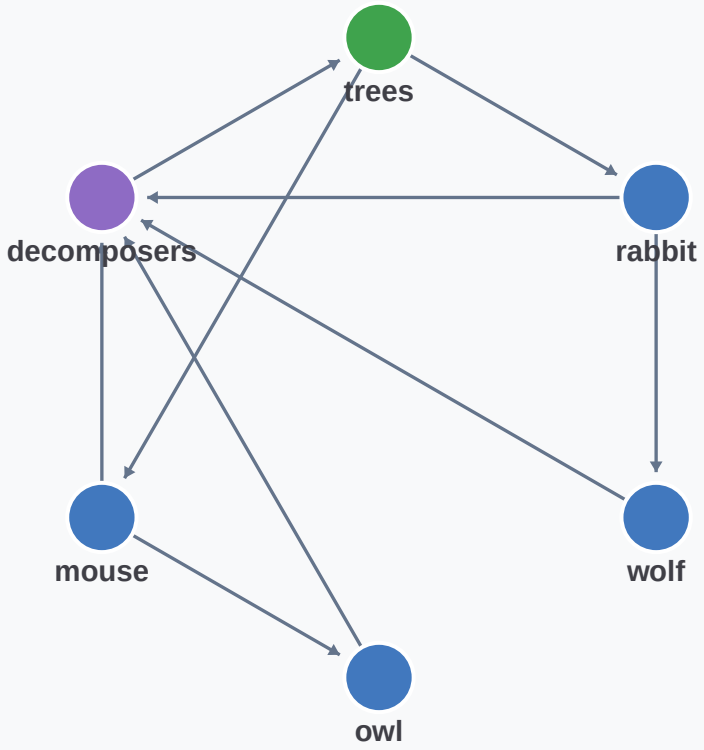
A model lets you see all of this at once.

How to read it: every arrow means "matter moves this way." Put your finger on any living thing and follow the arrow out of it to see where its matter goes next. Follow an arrow backwards to see where its matter came from.

The most common mistake is pointing the arrow the wrong way. A wolf eats a rabbit, so it feels natural to draw wolf --> rabbit. But the matter moves out of the rabbit and into the wolf, so the arrow is rabbit --> wolf. The arrow follows the food, not the hunter.

One more rule worth knowing. Matter travels in a circle: air, water and soil --> trees --> animals --> decomposers --> back to the soil and air --> trees again. The same matter gets used over and over. Energy does not do that. Energy arrives from the sun, travels along those same arrows, and leaves as heat. It never loops back around, which is why the sun has to keep shining on this forest every day.

How matter moves through this forest



Every arrow means "matter moves this way." Put your finger on any organism and follow the arrow out of it to see where its matter goes next. Notice that every a

Your turn. Try it first, then check yourself.

Question: where did the matter in the owl's feathers come from?

Work backwards along the arrows: owl <-- mouse <-- trees <-- air, water and soil.

So those feathers are built out of matter that used to be a tree seed, and before that was gas floating in the air. Now work forwards: when the owl dies, decomposers --> soil and air --> trees. Same matter. Still moving.

Follow the matter, organism by organism

	Where its matter comes from	Where its matter goes next
Trees	Air, water and soil	The rabbit and mouse that eat them
Rabbit	The tree leaves it eats	The wolf, and decomposers when it dies
Wolf	The rabbit it eats	Decomposers when it dies
Owl	The mouse it eats	Decomposers when it dies
Decomposers	Dead plants, animals and waste	Back to the soil and air, then the trees

Every living thing takes matter in from somewhere and passes it along to something else. Nobody in the forest creates matter, and nobody destroys it.

Instructions:

Read each question carefully. Choose the best answer. Use the hints if you need help, and learn from the feedback after each answer. Think about how matter moves in the forest and how energy flows through the forest food chain.

1. In this forest, which living thing makes its own food using sunlight, water, and carbon dioxide?

- ◯ A) The rabbit
- ◯ B) The trees
- ◯ C) The wolf
- ◯ D) The owl

2. In this forest, which path best shows matter moving from the environment into a plant?

- ◯ A) Soil and air -> trees
- ◯ B) Wolf -> trees
- ◯ C) Trees -> soil and air
- ◯ D) Owl -> rabbit

3. Which pair shows a consumer and what it eats in this forest?

- ◯ A) Rabbit and plants
- ◯ B) Decomposers and sunlight
- ◯ C) Soil and air
- ◯ D) Trees and sunlight

4. A student says, 'Trees get matter by eating a rabbit.' What is wrong with this idea?

- ◯ A) Rabbits make their own food, so trees eat them.
- ◯ B) Owls get matter from sunlight, so trees eat owls.
- ◯ C) Wolves make the soil, so trees eat wolves.
- ◯ D) Trees make their own food, so they do not eat rabbits.

5. Which chain shows matter moving in the correct order in this forest?

- ◯ A) Wolf -> trees -> rabbit
- ◯ B) Rabbit -> wolf -> trees
- ◯ C) Wolf -> rabbit -> trees
- ◯ D) Trees -> rabbit -> wolf

6. In this forest, a rabbit eats plants. What happens to some of the matter from the plants?

- ◯ A) It disappears forever.
- ◯ B) It stays only in the roots of the trees.
- ◯ C) It becomes part of the rabbit's body for a time.
- ◯ D) It turns into sunlight.

7. In a forest, an owl eats a mouse, and the mouse ate seeds and berries. Which statement best describes how matter moves through this system?

- ◯ A) Mouse -> decomposers -> soil and air
- ◯ B) Mouse -> wolf -> sunlight
- ◯ C) Mouse -> trees -> rabbit
- ◯ D) Mouse -> sunlight -> owl

8. Why are decomposers important in the forest?

- ◯ A) They make sunlight for trees.
- ◯ B) They turn wolves into rabbits.
- ◯ C) They stop matter from moving.
- ◯ D) They break down dead things and waste.

9. Which model best shows matter moving after a mouse dies in the forest?

- ◯ A) Mouse -> decomposers -> soil and air
- ◯ B) Mouse -> wolf -> sunlight
- ◯ C) Mouse -> trees -> rabbit
- ◯ D) Mouse -> sunlight -> owl

10. Which choice best compares the roles of trees and decomposers?

- ◯ A) Trees and decomposers both eat only wolves.
- ◯ B) Trees break down waste, and decomposers make food.
- ◯ C) Trees are consumers, and decomposers are sunlight.
- ◯ D) Trees make food, and decomposers break down dead things.

11. Which sentence explains why matter in a rabbit does not stay in one place forever?

- ◯ A) Matter stays trapped inside one animal forever.
- ◯ B) Matter only moves from wolves to owls.
- ◯ C) Matter disappears after the animal eats.
- ◯ D) Matter moves through living things and can return to the environment.

12. A student writes: 'Sunlight is matter because trees use it.' Which choice best fixes the mistake?

- ◯ A) Sunlight is a kind of rabbit food.
- ◯ B) Sunlight is the same as decomposers.
- ◯ C) Sunlight is not matter; it is energy.
- ◯ D) Sunlight is matter because it becomes soil.

13. A forest model shows these arrows for energy flow: sunlight -> trees -> rabbit -> wolf. What does this model show best?

- ◯ A) Energy flows from sunlight through living things.
- ◯ B) Energy moves only inside the soil.
- ◯ C) Energy moves from wolf to rabbit to trees.
- ◯ D) Energy stops after the trees use it.

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(Answer Key)

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1. In this forest, which living thing makes its own food using sunlight, water, and carbon dioxide?
Hint: Think about the producer in the forest.

Answer: B) The trees

Explanation: Green plants are producers because they make their own food using sunlight, water, and carbon dioxide.

2. In this forest, which path best shows matter moving from the environment into a plant?
Hint: Plants use water and carbon dioxide from the environment.

Answer: A) Soil and air -> trees

Explanation: Matter moves from the environment into trees when they take in water and carbon dioxide to make food.

3. Which pair shows a consumer and what it eats in this forest?
Hint: Look for an animal and its food.

Answer: A) Rabbit and plants

Explanation: A rabbit eats plants, so that pair shows a consumer and its food.

4. A student says, 'Trees get matter by eating a rabbit.' What is wrong with this idea?
Hint: Remember what producers do.

Answer: D) Trees make their own food, so they do not eat rabbits.

Explanation: Trees do not eat rabbits. Trees are producers and make their own food from sunlight, water, and carbon dioxide.

5. Which chain shows matter moving in the correct order in this forest?
Hint: Start with the environment and a producer.

Answer: D) Trees -> rabbit -> wolf

Explanation: Matter moves from the environment to trees, then to a rabbit, and then to a wolf.

6. In this forest, a rabbit eats plants. What happens to some of the matter from the plants?
Hint: Think about what happens after an animal eats.

Answer: C) It becomes part of the rabbit's body for a time.

Explanation: When a rabbit eats plants, some of the matter from the plants becomes part of the rabbit's body for a time.

7. In a forest, an owl eats a mouse, and the mouse ate seeds and berries. Which statement best describes how matter moves through this system?
Hint: Think about decomposers and the environment.

Answer: A) Mouse -> decomposers -> soil and air

Explanation: The best model shows the mouse's matter moving to decomposers and then back to the soil and air.

8. Why are decomposers important in the forest?
Hint: Think about dead things and waste.

Answer: D) They break down dead things and waste.

Explanation: Decomposers break down dead plants, dead animals, and waste, and they return matter to the soil and air.

9. Which model best shows matter moving after a mouse dies in the forest?
Hint: Think about decomposers and the environment.

Answer: A) Mouse -> decomposers -> soil and air

Explanation: The best model shows the mouse's matter moving to decomposers and then back to the soil and air.

10. Which choice best compares the roles of trees and decomposers?
Hint: Trees make food; decomposers break down dead things.

Answer: D) Trees make food, and decomposers break down dead things.

Explanation: Trees are producers that make food, while decomposers break down dead plants, dead animals, and waste.

11. Which sentence explains why matter in a rabbit does not stay in one place forever?
Hint: Animals eat, use, and return matter.

Answer: D) Matter moves through living things and can return to the environment.

Explanation: Matter moves through living things and can return to the environment through waste and decomposers.

12. A student writes: 'Sunlight is matter because trees use it.' Which choice best fixes the mistake?
Hint: Energy and matter are not the same thing.

Answer: C) Sunlight is not matter; it is energy.

Explanation: Sunlight is energy, not matter. Trees use sunlight to help make food from water and carbon dioxide.

13. A forest model shows these arrows for energy flow: sunlight -> trees -> rabbit -> wolf. What does this model show best?
Hint: Arrows show where energy goes.

Answer: A) Energy flows from sunlight through living things.

Explanation: The model shows that energy starts with sunlight and flows to trees, then to the rabbit, and then to the wolf.