Zoe's Garden: Gravity Science Adventure

Grade 5 science gardening

Students will be able to explain how gravity pulls objects toward Earth and affects plants, soil, water, and seeds in a garden.

Name: _____ Date: _____

1. Zoe stands in her garden holding a trowel. She drops it and it falls straight down. Circle the correct word: Gravity pulls objects (UP / DOWN) toward Earth.

2. Zoe finds a rare seed packet buried near her garden gate. True or False: Gravity affects only heavy objects like rocks, not light objects like seeds.

3. Zoe plants her rare seeds in a glass jar so she can watch them grow. She notices roots always grow downward. What force causes roots to grow down into the soil?

4. Zoe tips the glass jar sideways for one week. She checks her seedling and sees the roots have curved to grow downward again. What does this tell Zoe about gravity and plant roots?

5. Zoe waters her garden and watches water soak straight down through the soil. She also notices stems grow straight up. How does gravity explain both observations at the same time?

6. Zoe finds a hidden treasure — an old gardening journal. It says: 'On the Moon, gravity is much weaker than on Earth.' Zoe hypothesizes that seeds planted on the Moon would still show gravitropism. Do you agree with Zoe's hypothesis? Explain using what you know about gravity and plant roots.

7. Zoe designs an experiment with her rare seed jar. She places one jar right-side up, one upside down, and one sideways. After two weeks she sketches the root directions. What does Zoe's experiment test, and what result would support the idea that gravity controls root direction?

8. Zoe completes her garden adventure and writes in her own journal. She learned that gravity shapes almost everything in her garden. Describe THREE different ways gravity affects Zoe's garden. Then explain: if gravity suddenly became twice as strong, predict what would happen to Zoe's tall sunflower stems. Use science vocabulary in your answer.

Answer Key: Zoe's Garden: Gravity Science Adventure

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After Q6, pass around a small potted seedling. Ask students to predict which way roots would grow if the pot were tipped sideways — connecting Zoe's buried seed-jar discovery directly to gravitropism.

1. Zoe stands in her garden holding a trowel. She drops it and it falls straight down. Circle the correct word: Gravity pulls objects (UP / DOWN) toward Earth.

Answer: Q1: Gravity pulls objects DOWN toward Earth. Reasoning: Gravity is the force that pulls all objects toward Earth's center. The trowel falls down, not sideways or up, because gravity always acts downward.

2. Zoe finds a rare seed packet buried near her garden gate. True or False: Gravity affects only heavy objects like rocks, not light objects like seeds.

Answer: Q2: FALSE. Reasoning: Gravity pulls ALL objects toward Earth regardless of their mass. Light seeds fall to the ground just like heavy rocks do. Gravity does not skip small or lightweight objects.

3. Zoe plants her rare seeds in a glass jar so she can watch them grow. She notices roots always grow downward. What force causes roots to grow down into the soil?

Answer: Q3: Gravity causes roots to grow downward. Reasoning: Plants respond to gravity in a process called gravitropism. Roots grow in the direction of Earth's gravitational pull — downward — so they anchor the plant and find water deep in soil.

4. Zoe tips the glass jar sideways for one week. She checks her seedling and sees the roots have curved to grow downward again. What does this tell Zoe about gravity and plant roots?

Answer: Q4: This tells Zoe that gravity is always pulling roots downward no matter which way the plant is turned. Reasoning: Roots detect Earth's gravitational pull through a response called gravitropism. Even when the jar was tipped, the roots sensed 'down' and curved back toward Earth's center.

5. Zoe waters her garden and watches water soak straight down through the soil. She also notices stems grow straight up. How does gravity explain both observations at the same time?

Answer: Q5: Gravity pulls water downward through the soil. Stems grow upward because they show negative gravitropism — they grow opposite to gravity's pull. Reasoning: Gravity acts on both living and nonliving things. Water is pulled down because it has mass. Stems grow against gravity's direction to reach sunlight, which is called negative gravitropism.

6. Zoe finds a hidden treasure — an old gardening journal. It says: 'On the Moon, gravity is much weaker than on Earth.' Zoe hypothesizes that seeds planted on the Moon would still show gravitropism. Do you agree with Zoe's hypothesis? Explain using what you know about gravity and plant roots.

Answer: Q6: Yes, Zoe's hypothesis is reasonable, but with an important detail. Reasoning: Gravitropism happens because plants detect gravitational force. The Moon has weaker gravity than Earth but still has gravity. Plant roots would still grow downward toward the Moon's surface, but the response might be slower or weaker because the gravitational pull is about one-sixth of Earth's. If gravity were completely zero, gravitropism would not work at all.

7. Zoe designs an experiment with her rare seed jar. She places one jar right-side up, one upside down, and one sideways. After two weeks she sketches the root directions. What does Zoe's experiment test, and what

result would support the idea that gravity controls root direction?

Answer: Q7: Zoe's experiment tests whether gravity controls the direction roots grow, no matter how the seed is positioned. Supporting result: In all three jars the roots should curve and grow downward toward Earth, regardless of which way the jar was placed. This would support the conclusion that gravity — not the jar's position or the seed's starting angle — is the force controlling root direction. This is a controlled experiment because only the jar orientation changes while seeds, soil, water, and light stay the same.

8. Zoe completes her garden adventure and writes in her own journal. She learned that gravity shapes almost everything in her garden. Describe THREE different ways gravity affects Zoe's garden. Then explain: if gravity suddenly became twice as strong, predict what would happen to Zoe's tall sunflower stems. Use science vocabulary in your answer.

Answer: Q8: Three ways gravity affects Zoe's garden — (1) Roots grow downward into soil because of positive gravitropism, following Earth's gravitational pull. (2) Water drains downward through the soil after Zoe waters her plants, because gravity pulls liquid toward Earth's center. (3) Ripe seeds and fruit fall off plants and drop to the ground, where they can germinate and grow into new plants. Prediction about doubled gravity: If gravity became twice as strong, the gravitational force pulling Zoe's sunflower stems down would double. Stems show negative gravitropism and grow against gravity, but with double the force they would need much more energy to grow upright. The stems would likely be shorter, thicker, and sturdier as the plant adapted to resist the stronger downward pull. Very tall sunflower stems might bend or collapse under the increased gravitational force. Science vocabulary used: gravitropism, gravitational force, germinate, negative gravitropism, mass.