

Water Cycle Activities



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Introduction to the Water Cycle

Framework Focus:

Earth and Space Science Learning Standard 10: Describe how water on earth cycles in different forms and in different locations, including underground and in the atmosphere.

Physical Sciences (Chemistry and Physics) Learning Standard 3: Describe how water can be changed from one state to another by adding or taking away heat.

Objectives:

1. Students will be able to correctly define and use basic vocabulary terms associated with the water cycle (collection, evaporation, condensation, precipitation, etc.)
2. Students will be able to illustrate a labeled diagram of the water cycle.

Introduction:

This is a water cycle wheel intended to be made after students have learned basic vocabulary terms collection, evaporation, condensation, and precipitation and have viewed multiple visual models of the water cycle. This may be done through the science text or any other technique of the teacher's choice. There is also a link to a template for a water wheel with a pre-made picture in the web resources section for students who may need an illustration to label. The objective in giving students a blank wheel is to allow them to illustrate a scene from their own experience.

Time: 45 minute period (lesson assumes prior knowledge of water cycle)

Materials:

Visual representations of the water cycle (posters, books, etc.)

Water cycle wheel and illustration blank diagrams

Markers, colored pencils, or other art materials

Water cycle vocabulary sheet (optional for this lesson)

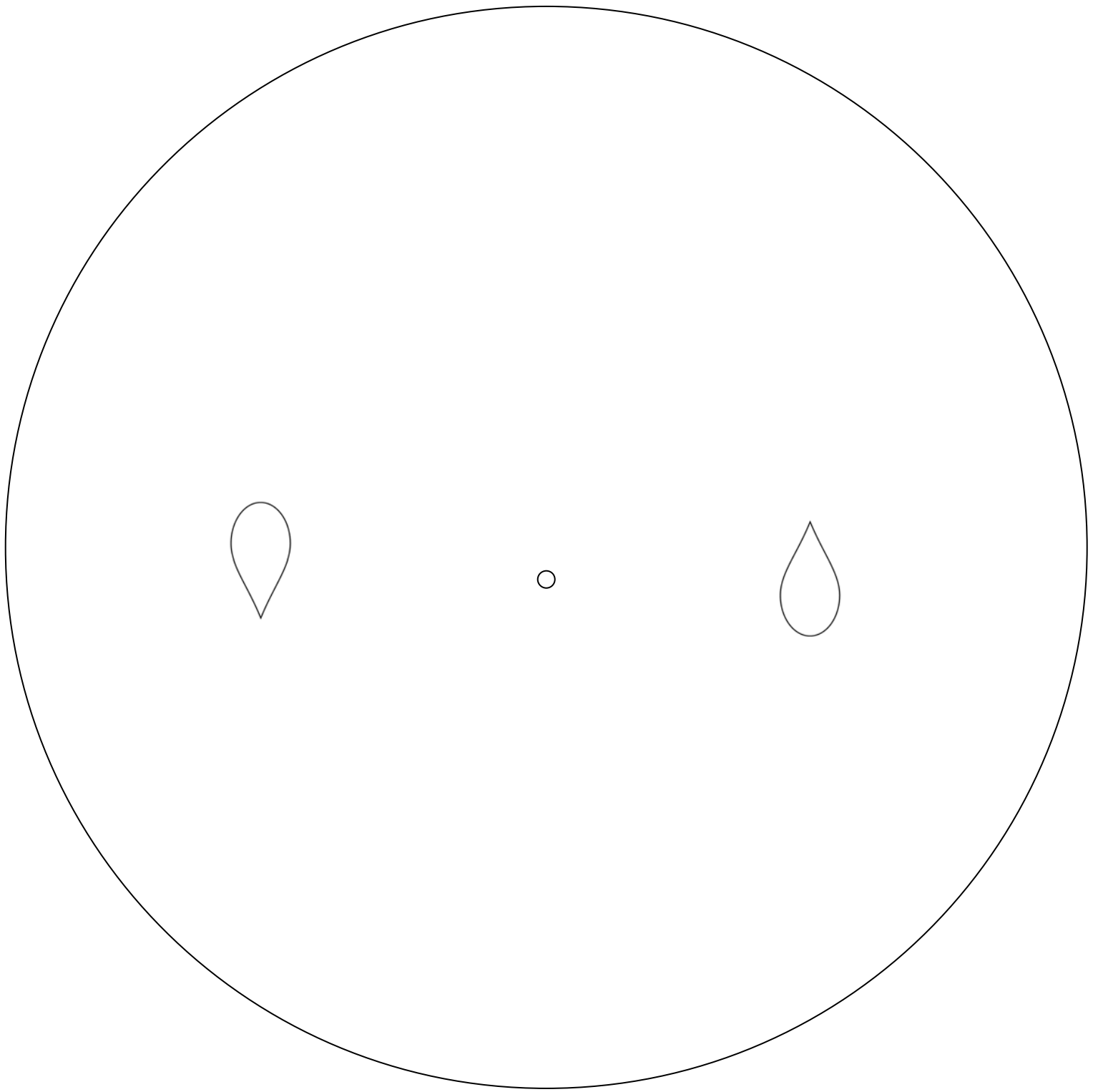
Scissors, brass fasteners

Procedure:

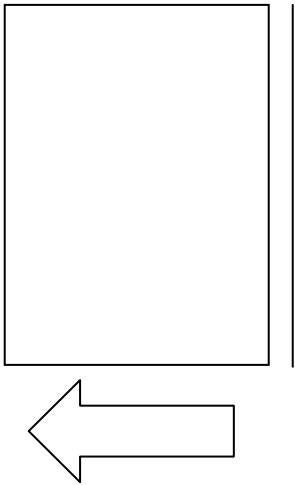
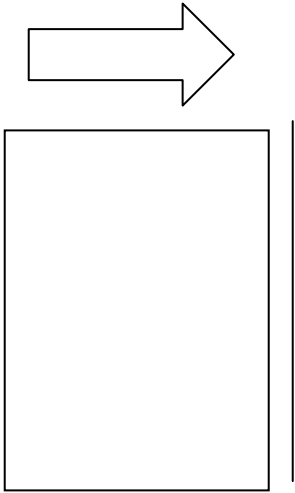
1. Students have either been previously taught or are reviewing the terms condensation, evaporation, precipitation, and collection.
2. Cut out the water cycle wheel and the water cycle illustration papers.
3. Have students place the wheel behind the illustration paper so they understand how the finished diagram will work.
4. Tell students that they must produce a diagram that will demonstrate their knowledge of the four main phases of the water cycle: collection, evaporation, condensation, and precipitation. Scenes involving oceans, lakes, or rivers will probably be easiest for students to conceptualize and illustrate. Remind students that the sun should be in their picture as its heat is necessary to the water cycle.
5. Students create their own illustrations, correctly label each stage, and fasten with brass tacks once they are done.
6. Water cycle illustration. Cut off along the lines. Cut out the two windows. Create your own illustration to show collection, evaporation, condensation, and precipitation. Label each stage correctly. Use a brass fastener to complete your diagram.
7. Water cycle wheel. Color it or run off on blue paper. Students may be asked to brainstorm other forms of precipitation to illustrate. Remember the droplets are only a symbol of the water cycling; water may precipitate in other forms such as sleet or snow, and it evaporates as a vapor or gas.
8. Have students explain the four phases of the water cycle shown in the diagram in a paragraph.

Assessment Rubric:

- 4 The diagram is correctly illustrated, labeled, and spelled to demonstrate student's understanding of the four main phases of the water cycle.
- 3 The diagram is correctly illustrated and labeled, but has spelling errors or one phase mislabeled.
- 2 The diagram is correctly illustrated but only two phases of the cycle are correct.
- 1 The diagram is incorrect and/or only one phase of the cycle is correct.
- 0 No response is given or all four phases are incorrect.



The Water Cycle



Water Cycle Journey Game

Framework Focus:

Earth and Space Science Learning Standard 10: Describe how water on earth cycles in different forms and in different locations, including underground and in the atmosphere.

Physical Sciences (Chemistry and Physics) Learning Standard 3: Describe how water can be changed from one state to another by adding or taking away heat.

Objectives:

1. Students will learn about other places water cycles on the earth.
2. Students will understand that water remains in some locations longer than others.
3. Students will practice vocabulary associated with the water cycle and use reading comprehension skills.

Introduction:

In this lesson, students will expand their knowledge of the water cycle beyond just the four basic stages. They will understand that water is present in many other places such as plant and animal life, underground, frozen in glaciers, etc. Students will also use more advanced vocabulary associated with the water cycle.

Time: About two 45 minute periods.

Materials:

Water Cycle Signs

Water Cycle Dice: A template is given which may be run off on cardstock and folded.

Place two to three dice at each station, depending on the size of your class.

Water Cycle Record paper

Paper to illustrate journey after the game. Long, thin strips of paper tend to work best.

Water Cycle Vocabulary paper (to use when students are illustrating their journey)

Procedures:

1. Before introducing the lesson, make up the dice for each station by running off on oak tag. Students or the teacher may label the dice. You could extend this part of the lesson by having a math discussion around the number of faces on a cube, the probability of traveling to a different station versus collecting, etc.
2. Ask students to brainstorm where water is found on the earth. As they identify each of the nine stations used in this game, place the sign up in an area of the room, along with the dice.
3. Explain that in this game students will pretend they are a molecule of water cycling through the earth and its atmosphere. Their path will be determined by rolling a single die at each station and recording their results.
4. Assign students to begin at each of the nine stations in small groups. They should begin the game by writing down the first station on their record sheet. Clipboards are useful, but not necessary.
5. Have students record which stations they visit and how many times they stay or collect at that station.
6. Students should rotate through stations and record their journey for about twenty minutes.
7. Summary: At the conclusion of the game, discuss the different paths taken by students. At which stations did water seem to collect for a long period of time? (glaciers, oceans, ground water) Through which stations did water pass quickly? (clouds, soil, animal)
8. In the second class period, have students use the long strips of paper to illustrate their journeys using their record sheets. Their illustrations should include: numbered steps, the name of the location of the water (ocean, cloud, animal, etc.) and the appropriate vocabulary to describe the change that took place (evaporation, precipitation, condensation, etc.)

Assessment Rubric:

4 Completed record sheet and accurately labeled illustration with title. Illustration must be clear and demonstrate correct usage of the vocabulary words.

3 Completed record sheet, illustration may lack some vocabulary or have some errors.

2 Not completed or illustration is unclear, unlabeled, or incorrectly labeled.

1 Very minimal response or completely incorrect response.

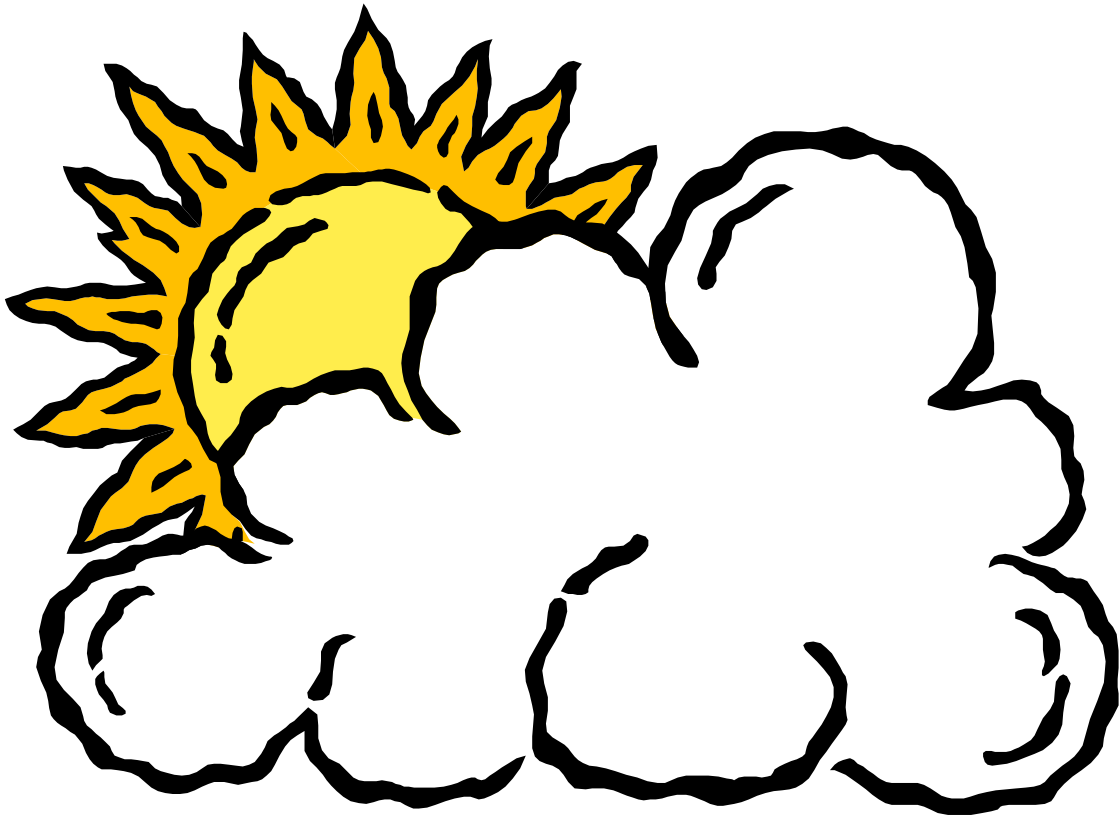
0 No response.

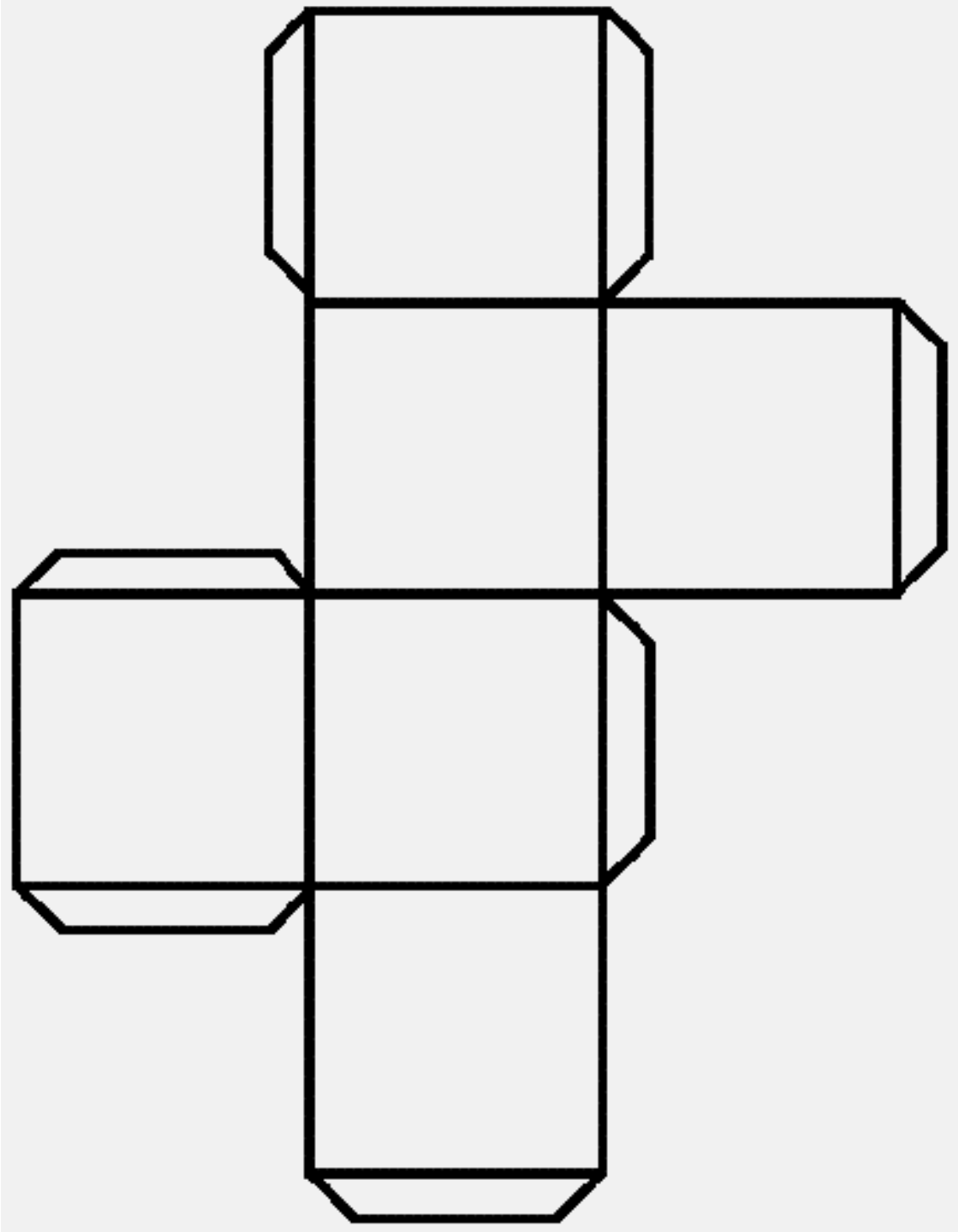
A fun summary to this part of the lesson is to ask students to put their smaller parts of the water cycle together by matching up endings and beginnings to create a larger water cycle journey. For example, a student whose last phase was cloud can link to a student whose first phase was cloud, and so on.

Water Cycle Journey Record Sheet

Number of station	Location of water (ocean, glacier, animal, etc.) (make a tally each time you roll "stay/collect")	Movement of water to get to next location (evaporation, precipitation, condensation, etc.)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

Clouds





Cloud Station Die. Label each face as follows:

Precipitate onto glacier

Precipitate into ocean (2 faces)

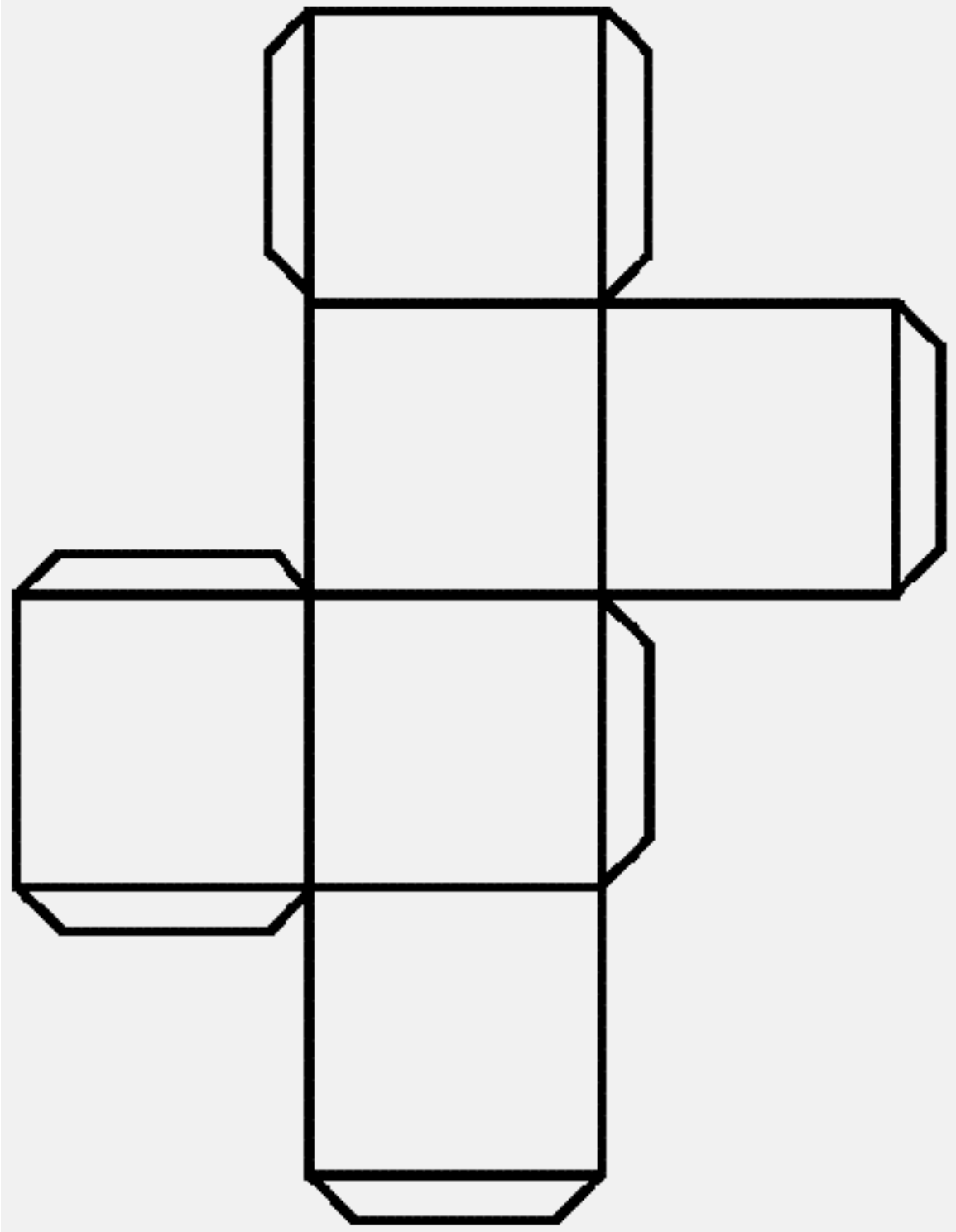
Precipitate into soil

Precipitate into rivers or lakes (your choice!)

Stay condensed in clouds

Animals

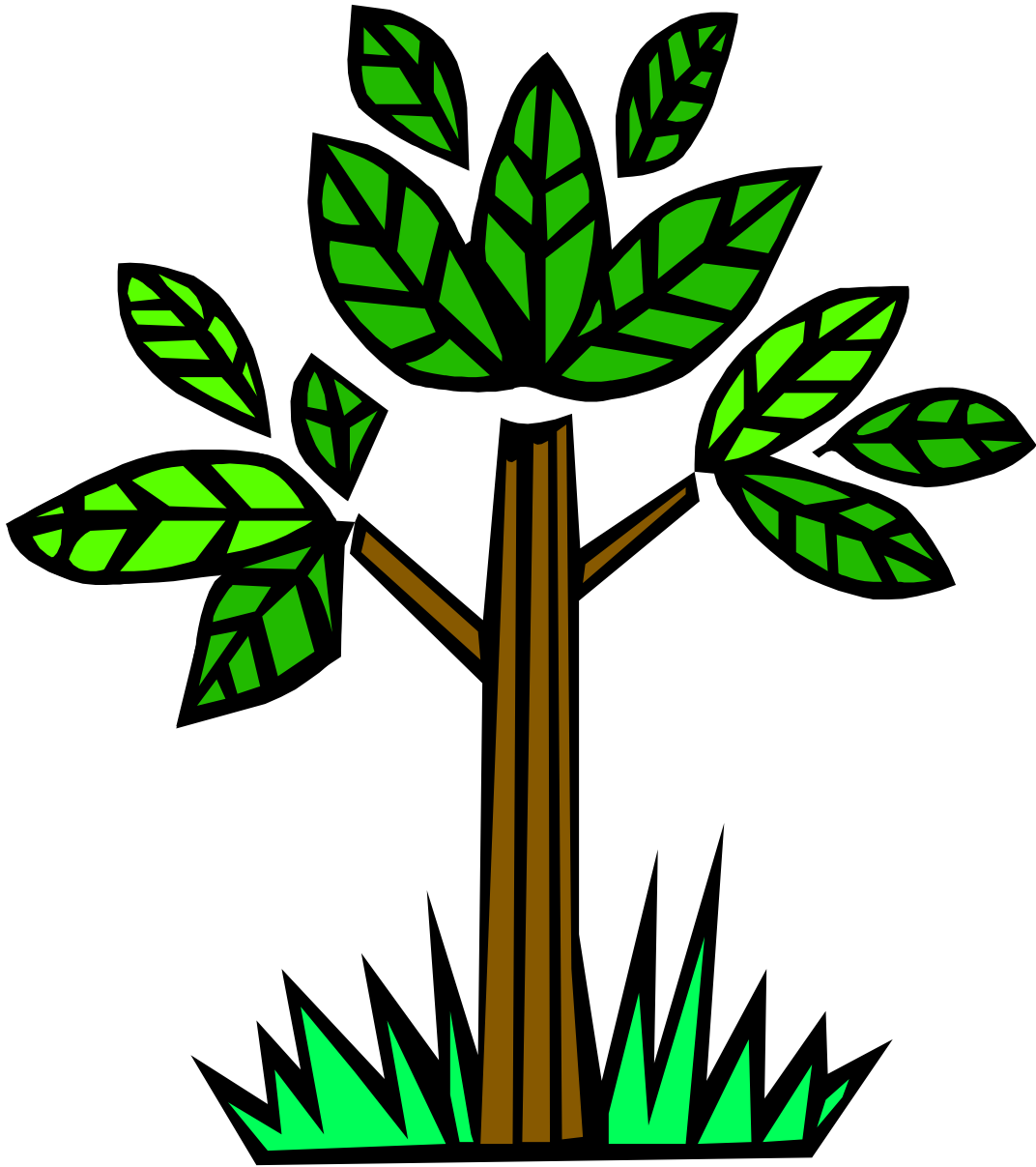


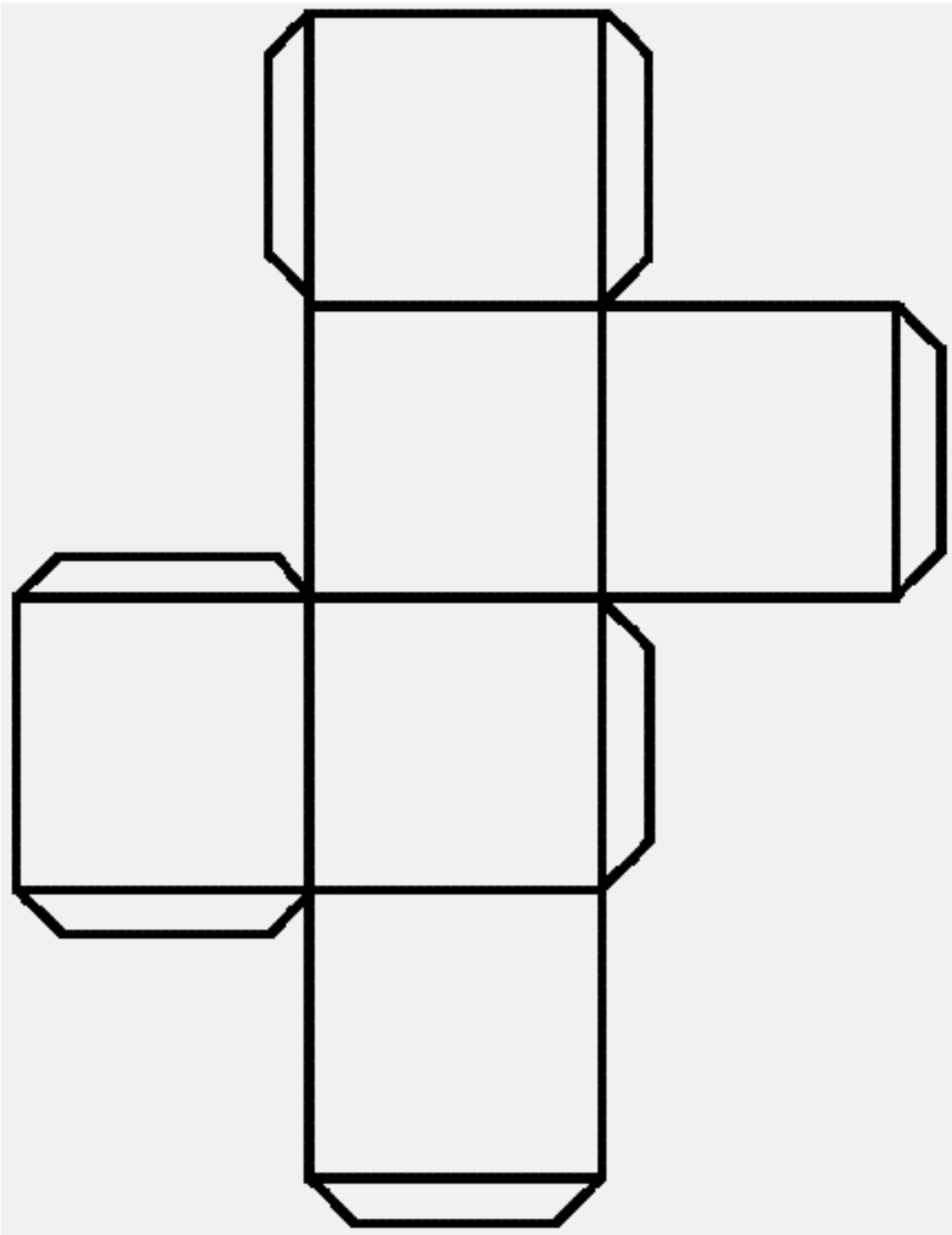


Animal Station Die. Label each face as follows:

- Perspire out of animal and evaporate to clouds
- Leave animal through respiration and evaporate to clouds
- Pass out of animal and go into soil (2 faces)
- Pass out of animal and into lake
- Stay in the body of the animal

Vegetation





Vegetation Station Die. Label each face as follows:

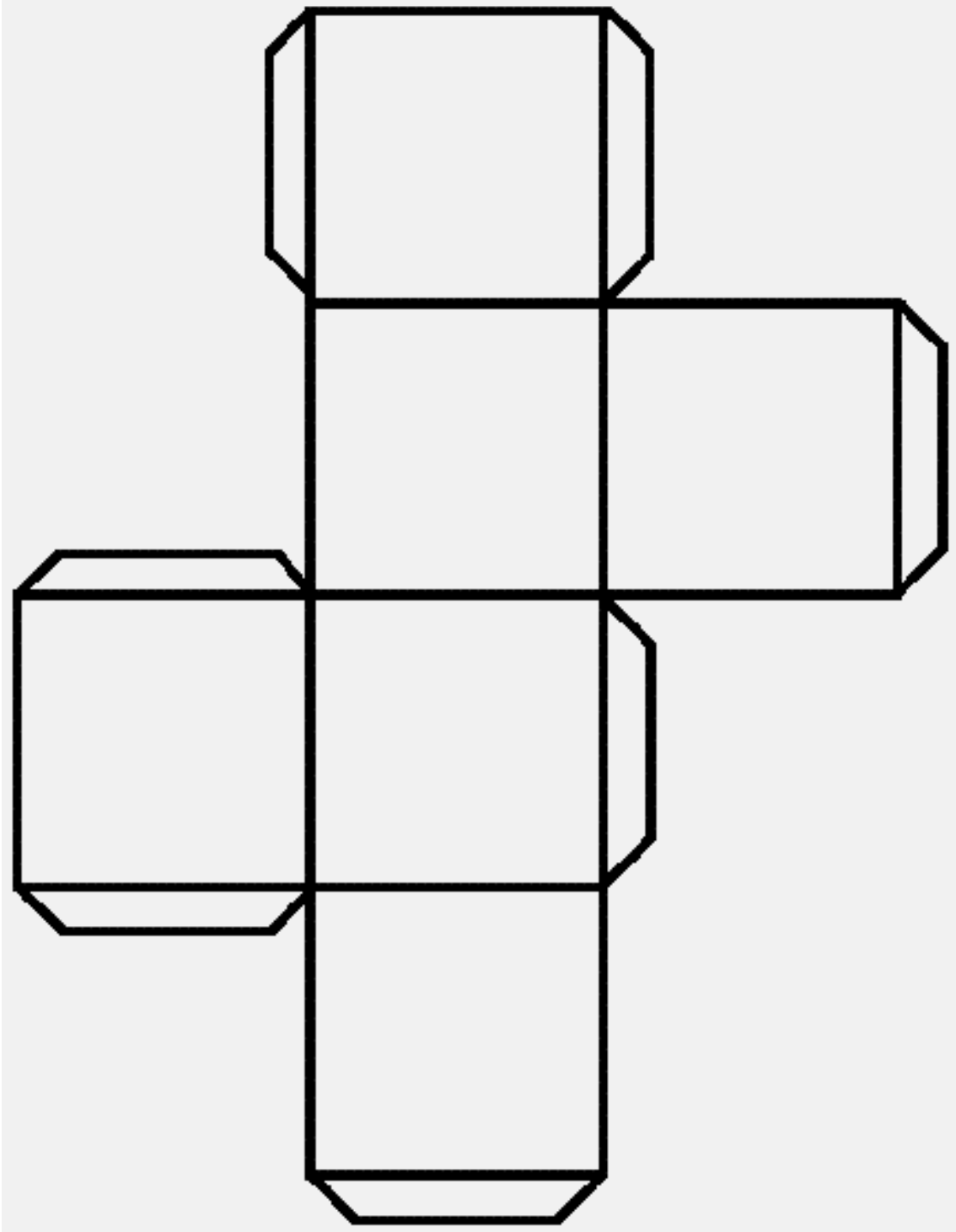
Be eaten by animal (2 faces)

Transpire and evaporate to clouds (3 faces)

Stay inside of the plant or tree

Rivers



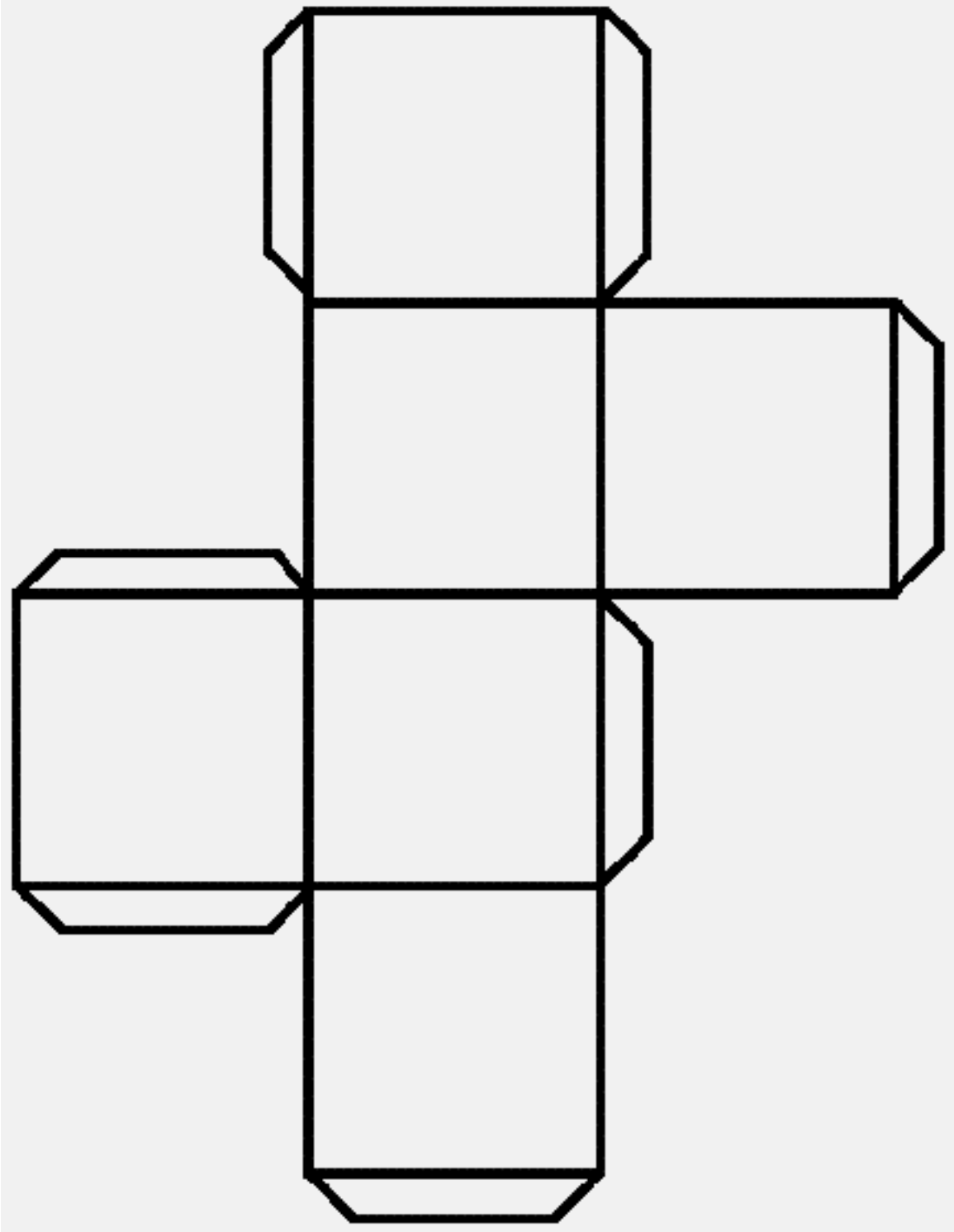


River Station Die. Label each face as follows:

- Evaporate into clouds
- Flow into lake
- Flow into ocean
- Seep into groundwater
- Be drunk by an animal
- Stay, collect, flow in the river

Oceans





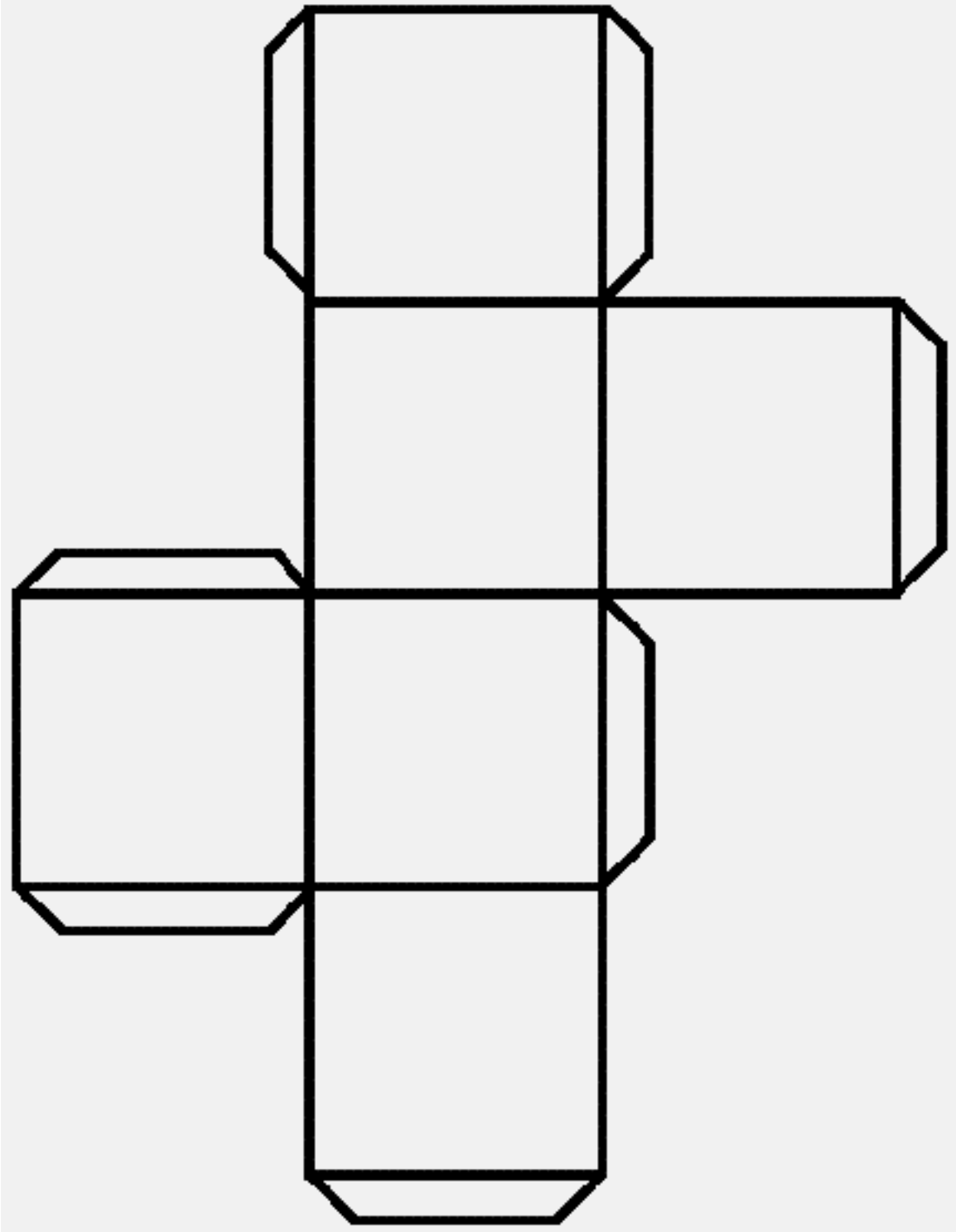
Ocean Station Die. Label each face as follows:

Stay and collect in the ocean (3 faces)

Evaporate into the clouds (3 faces)

Lakes





Lake Station Die. Label each face as follows:

Stay and collect in the lake (2 faces)

Be drunk by an animal

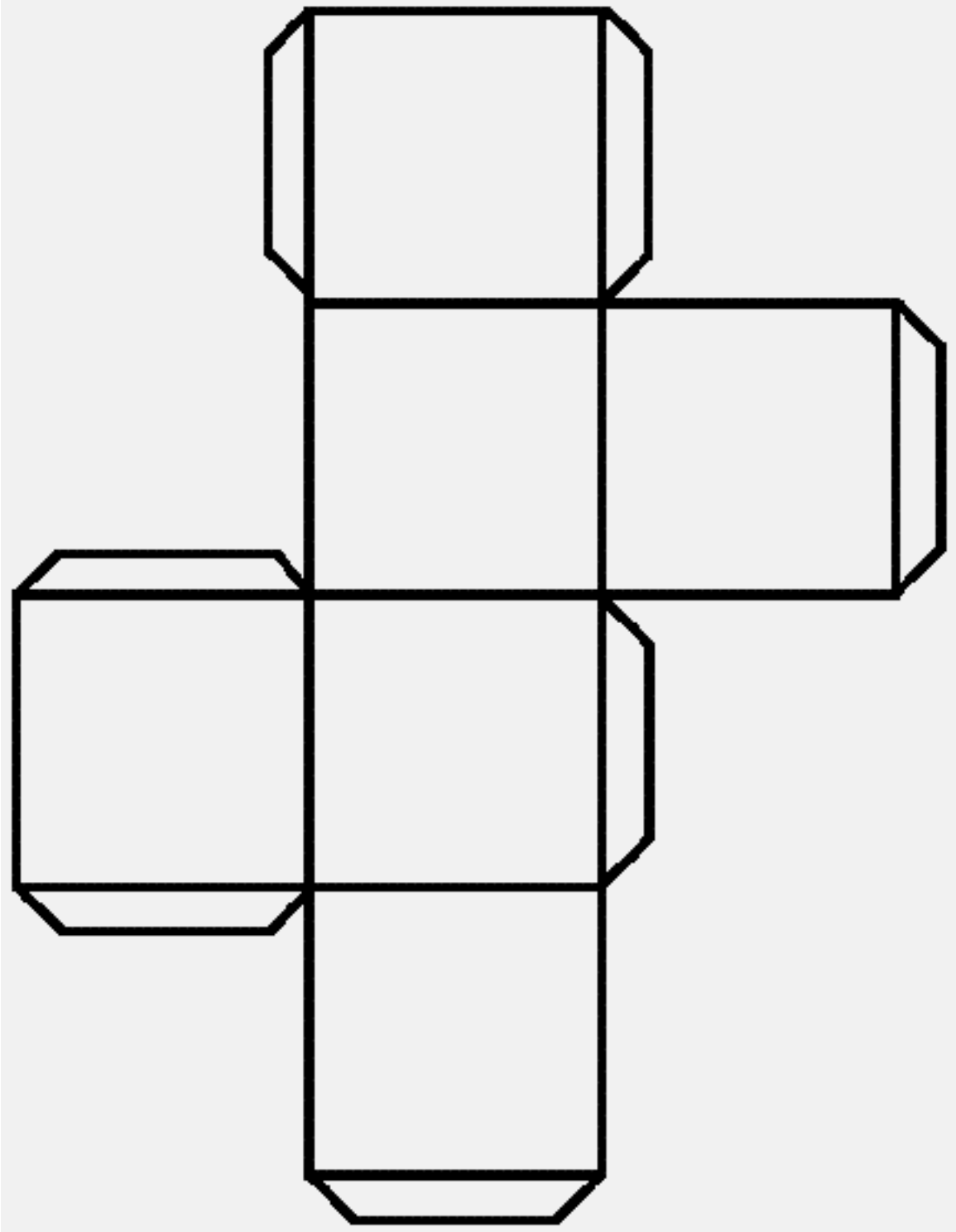
Seep/sink into groundwater

Evaporate to clouds

Flow into rivers

Glaciers





Glacier Station Die. Label each face as follows:

Stay/collect in the glacier (3 faces)

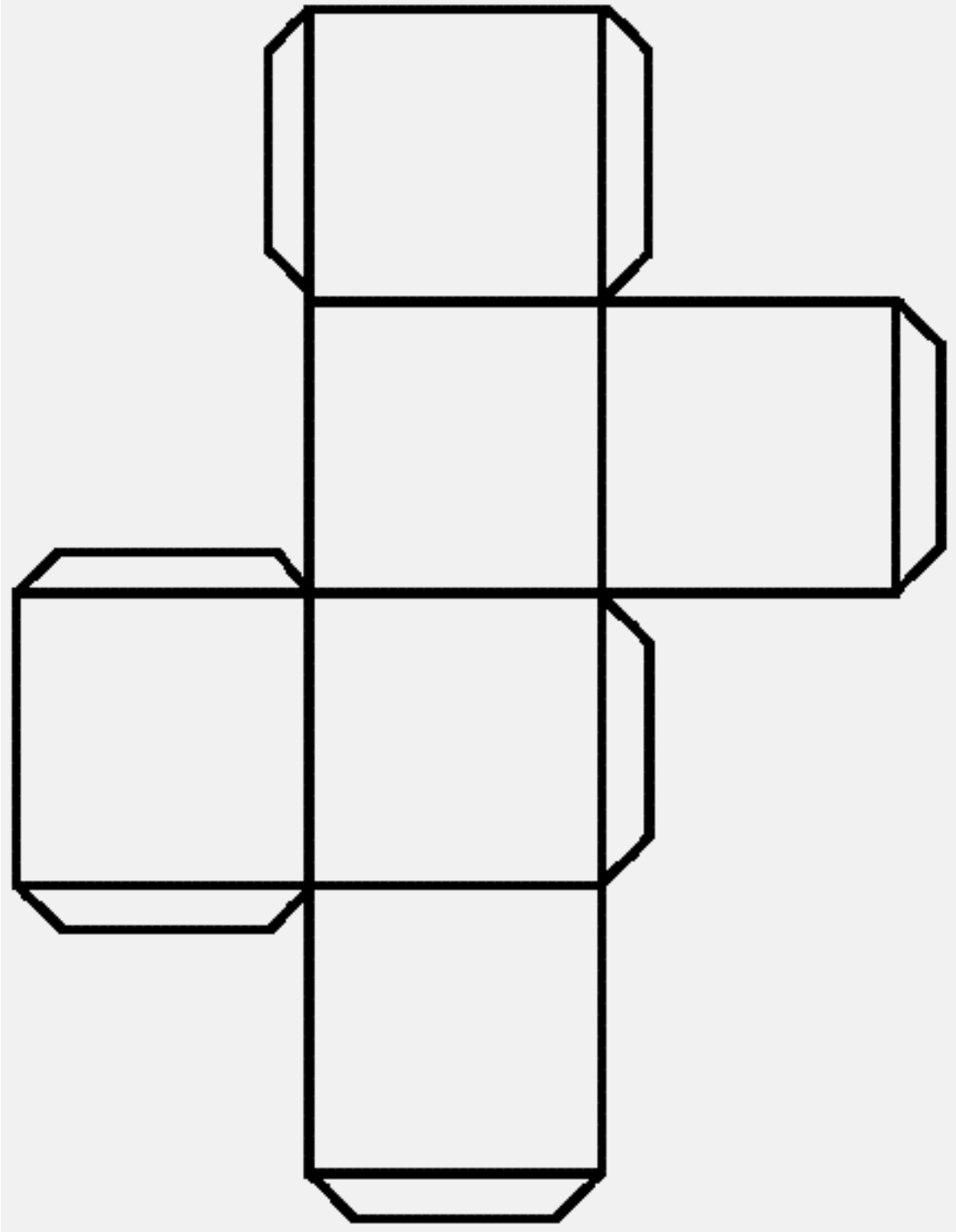
Melt and flow to rivers

Melt and sink to groundwater

Evaporate to clouds

Soil

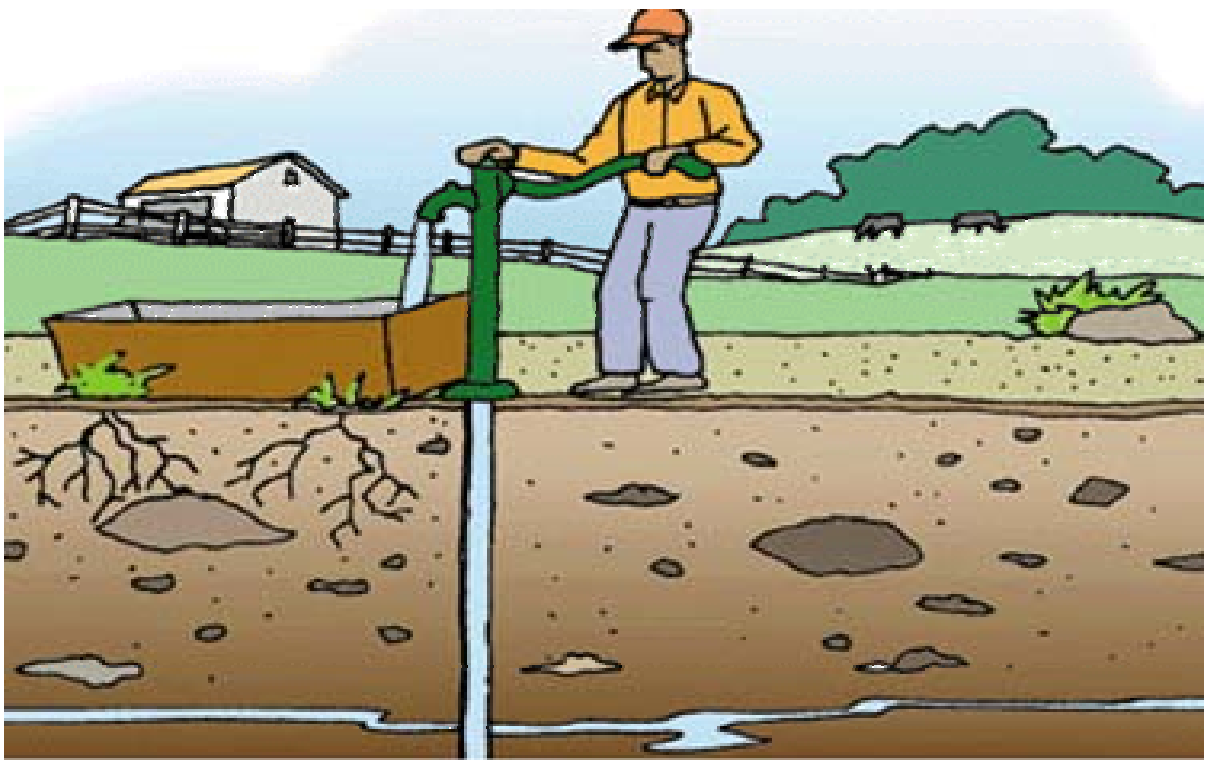


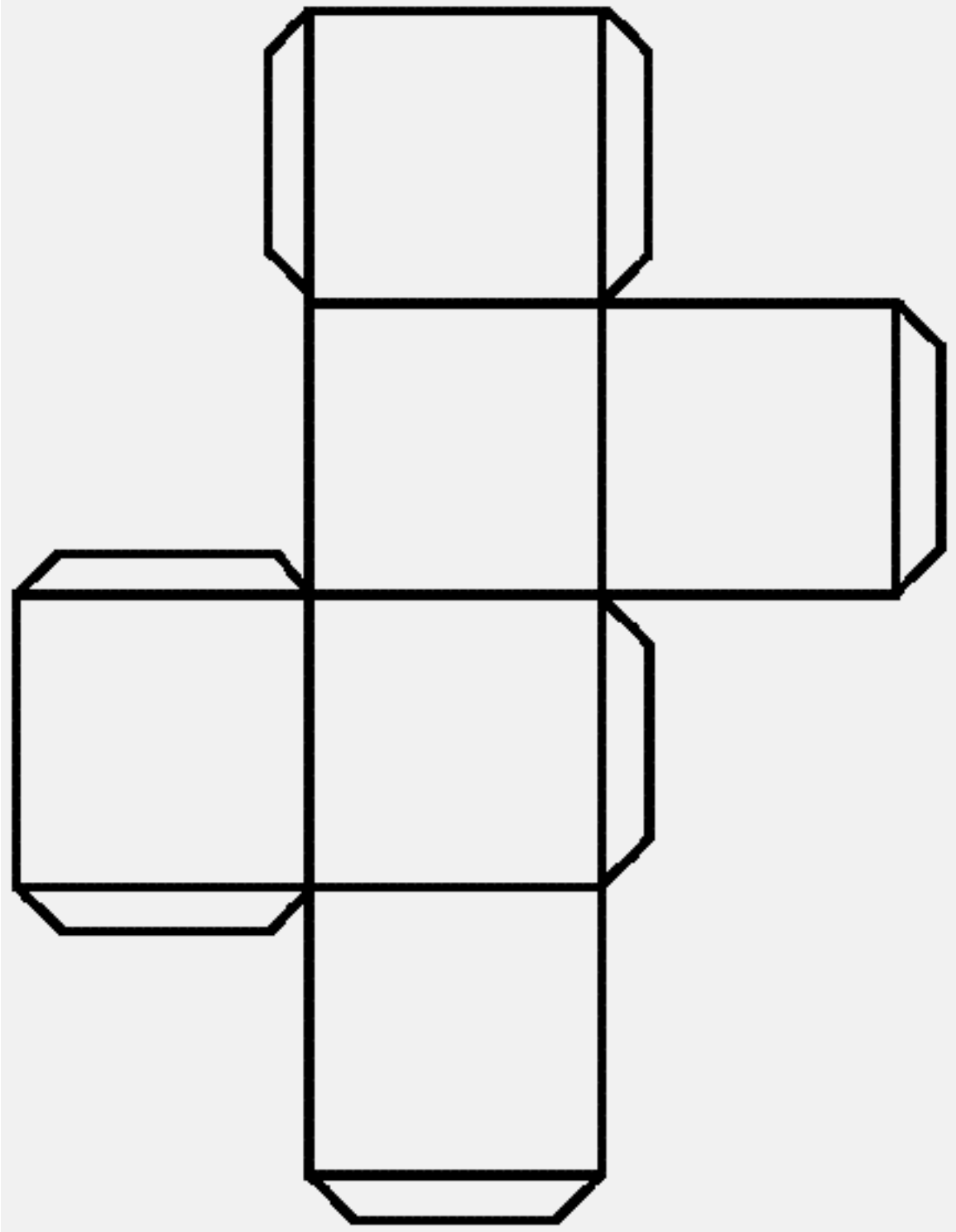


Soil Station Die. Label each face as follows:

- Stay/collect in soil
- Be absorbed by vegetation (trees/plants)
- Evaporate to clouds (2 faces)
- Sink into groundwater
- Seep into river

Groundwater





Groundwater Station Die. Label each face as follows:

Stay/collect in groundwater (3 faces)

Seep into lake

Seep into river

Travel through well, be drunk by animal

Journey Through the Water Cycle Story

Framework Focus:

Earth and Space Science Learning Standard 10: Describe how water on earth cycles in different forms and in different locations, including underground and in the atmosphere.

Physical Sciences (Chemistry and Physics) Learning Standard 3: Describe how water can be changed from one state to another by adding or taking away heat.

Objective: Students will use their composition skills to write a story based on their journey through the water cycle. They will demonstrate an understanding of the vocabulary used to describe phases of water as it cycles through earth's atmosphere.

Time: 60 minute period, possibly multiple periods if additional drafts are desired

Materials:

Water cycle record sheets and illustration from the previous activity

Writing materials.

Journey Through the Water Cycle assignment sheet

Water Cycle Vocabulary sheet

Procedure:

1. Have students gather their record sheets and illustrations from the Water Cycle Journey Game.
2. Distribute Journey Through the Water Cycle writing assignment paper.
3. Distribute Water Cycle Vocabulary paper.
4. Review instructions and vocabulary with students.
5. Have students follow regular writing procedures to compose water cycle stories.

Summary: Students share their journeys and read their stories aloud to one another. This may be done in small groups or whole class.

Journey Through the Water Cycle

Assignment Summary: You have learned water cycle vocabulary and taken an imaginary journey through the water cycle. Now you will be using some creative writing techniques to tell your story from the point of view of a water molecule.

Purpose: The purpose of this assignment is to demonstrate your understanding of the phases and changes water goes through and the locations water is found on the planet by using the correct vocabulary.

Writer's Role: You will pretend that you are a water molecule telling the story of your journey. Use your record sheet and illustration from the water cycle game to trace your experience.

Audience: Your audience is your peers and teacher. Your story should be interesting and fun to read, but also demonstrate your understanding of water cycle vocabulary and facts.

Form: Type Three essay, may be revised and edited to be a Type Four or Five

FCAs : At least 15 underlined vocabulary words used correctly (60 points)

At least 5 different transitional words (first, next, finally, etc.) (10 points)

Topic development. You must describe at least 10 phases of the water cycle. (30 points)

Procedure:

1. Look at your journey through the water cycle and your vocabulary words.
2. Pretend you are a water molecule going through this journey. Write your story as a first person narrative.
3. Remember to always check your vocabulary words and FCAs.
4. Be creative! Don't just list. Use your knowledge of geography to add details to your story.

Water Cycle Vocabulary

Words to describe how water changes from a liquid to a gas through heating:
evaporation, evaporated, evaporating

Words to describe how water changes from a gas to a liquid through cooling:
condensation, condensed, condensing

Words to describe how water falls from the sky in forms such as rain, snow, sleet, or hail:
precipitation, precipitated, precipitating

Words to describe how water stays in one place without changing form:
collection, collected, collecting

Words to describe how water leaves pores of plants or animals as a vapor:
transpiration, transpired, transpiring

Words to describe how water leaves pores of animals as a liquid:
perspiration, perspired, perspiring

Words to describe how water leaves animals through breathing as a vapor:
respiration, respired, respiring

Other useful vocabulary words:

cycling

phases

vapor

absorbed

atmosphere

temperature

molecule

melted

cumulus cloud

stratus cloud

cirrus cloud

seeped (from lake or river to ground water, from soil to ground water)

sank (from lake or river to ground water, from soil to ground water)



What Fraction of Earth's Water is Usable?

(adapted from "Apple Ocean" by Jeff Cenoz and Lindy Millman)

Framework Focus:

Earth and Space Science Learning Standard 10: Describe how water on earth cycles in different forms and in different locations, including underground and in the atmosphere.

Math Number Sense and Operations Learning Standard 4.N.3: Demonstrate and understanding of fractions as unit wholes (as parts of a collection and as locations on the number line not included in this activity)

Objectives:

Students will use their knowledge of fractions to create a model which represents how much of earth's water is actually available for human use.

Time: 45 minute period

Materials:

One apple for every two students

Dull knives

What Fraction of Earth's Water is Usable? paper

Procedure:

1. Distribute materials.
2. Follow the directions on "What Fraction of Earth's Water is Usable?" paper.

Summary/Assessment: Teacher observation during the activity. Ask students to share and discuss their responses to the last two questions.

What Fraction of Earth's Water is Usable?

(adapted from "Apple Ocean" by Jeff Cenoz and Lindy Millman)

This is an interesting way to see how much of the earth's land and water is usable by humans! All you need is an apple, a dull knife, an adult, and a knowledge of fractions!

1. Cut your apple into equal fourths. Set three of the four pieces aside. These three-fourths represent the part of the earth covered by ocean. Mark them ocean by labeling a paper towel or plate. The other fourth represents the part of the earth that is land not covered by water.
2. Cut the earth quarter into equal halves. One piece represents all the land that is too dry, too wet, too cold, too hot, or otherwise uninhabitable by people. The other piece, which is one eighth of the entire earth, is the land that is habitable by people.
3. Cut this one-eighth into four pieces. Set aside three of these pieces. The remaining piece represents the portion of the habitable land in which we are able to grow food.
4. This piece is worth $1/32$ of the whole. Cut off a thin slice. This tiny slice represents $3/100$ of 1% of the earth's surface. All of our drinking water comes from this tiny area!
5. Now turn your attention to the ocean part of the earth; the three quarters you put aside at the beginning.
6. Take one of the quarters and cut it in half. This piece, worth $1/8$ of the world's surface, represents the productive zones of the oceans, or parts of the ocean that support life.
7. Now take this $1/8$ and cut it into four equal pieces. One of these represents the productive area of the oceans along the Pacific coast of North America, one of the riches regions of the oceans.
8. Now take one of these pieces, which are worth $1/32$, and cut off a thin slice. This tiny slice represents the photic zone, the top 100 meters (300 feet) of the ocean through which light can penetrate and support photosynthesis. Since most marine life depends in some way on photosynthesizing plants, most all of the ocean's life is concentrated in this narrow surface region.

Look at the reasons in #2 why some areas of earth may not be inhabitable by humans. List at least three areas of the earth that may fit into these categories.

What do you notice about the fraction of usable land and water versus the fraction of land and water that is unusable?

Building a Water Filter

Framework Focus:

Technology and Engineering Learning Standard 1.1 Identify materials used to accomplish a design task based on specific properties.

Technology and Engineering Learning Standard 2.1 Identify a problem that reflects the need for shelter, storage, or convenience.

Technology and Engineering Learning Standard 2.3: Identify relevant design features for building a prototype of a solution to a given problem.

Objectives:

1. Using appropriate materials to design a water filter.
2. Using reading comprehension skills to follow directions and/or additional procedures, lab protocol, etc.

Time: Approximately two 60 minute periods

Materials:

Clear plastic containers or cups (2 per group)

About a gallon of dirty water (you can just mix water with potting soil)

About ten two-liter soda bottles cut in half (you may choose to cut them beforehand)
(one per group)

Gravel

Sand

Charcoal

Cotton balls

Centimeter rulers

Science notebooks or other record keeping paper (not included)

Procedures:

1. Students may be broken up into teams of 2-5, depending on the size of the class and needs of the teacher.
2. Display the gallon of dirty water at the front of the class. Tell the students that they are to design a prototype of a water filter to solve the problem of the dirty water using only the materials displayed.
3. Students discuss how they would use the given materials to build a water filter with their partners.
4. Students create labeled diagrams of their prototypes that must include numbered steps on how they plan to build the model, including the thickness of each layer of material.
5. Students will present their prototype diagrams to one another.
6. During the second period, give students the materials to build their prototypes.
7. Students will be given samples of dirty water to run through their filters.
8. Depending on the level of your class, you may choose to give students the direction sheet on the following page instead of having them build their own prototypes. They could read the directions first, illustrate what the filter will look like according to the directions, then build it.
9. To summarize the lesson, have students label their samples and then place side by side for comparison. Discuss possible reasons for differences in the clarity of water samples, as well as how boiling would be an additional step to purify the water. Depending on the level of students and available resources, boiling the water may be an additional step. Awards could be given for cleanest water samples.

Water Filtration

(adapted from Scott Foresman Discover the Wonder)

Problem: You have been given dirty water which needs to be cleaned.

Solution: Design and build a water filter out of the materials presented.

Procedure:

1. Allow your water sample to settle undisturbed while you are following the other directions.
2. Cut your bottle nearly in half so that the bottom part is slightly bigger than the top part. Keep the bottom of the bottle to use in step 7.
3. Put a layer of cotton about 3 cm thick into the neck of the bottle. The cotton should fill the narrow part of the neck and go just past the part where the bottle widens.
4. Put a layer of charcoal about 1 cm thick on top of the cotton.
5. Put a layer of gravel about 3 cm thick on top of the charcoal.
6. Put a layer of sand about 3 cm thick on top of the gravel.
7. Place the neck of the bottle over the bottom of the bottle you put aside in step 2.
8. Look at your container of water. Is there some dirt floating on the top or some sediment stuck on the bottom? Skim whatever you can off of the top with a spoon and discard. Leave the sediment alone.
9. Pour the rest of the water into a plastic cup. Leave any sediment behind in the first container.
10. Take the water in the plastic cup and slowly pour it through your filter. You may pour it through the filter as many times as you wish.
11. Label your sample with your group number or names.
12. Wait for the next direction from your teacher.

Resources

Branley, Franklyn M. (1963). *Down Comes the Rain*. New York, NY: Harper Collins.

Branley, Franklyn M. (1963). *Snow is Falling*. New York, NY: Thomas Y. Crowell.

Burton, Jane, and Taylor, Kim. (1997). *The Nature and Science of Rain*. Milwaukee, WI: Gareth Stevens Publishing.

Butler, Daphne. (1996). *What Happens When Rain Falls?* Austin, TX: Steck-Vaughn.

Davies, Kay. (1996). *See for Yourself: Rain*. Austin, TX: Steck-Vaughn.

Hooper, Meridith. (1998). *The Drop in My Drink: The Story of Water on Our Planet*. New York, NY: Viking.

Manning, M., and Brita Granstrom. (1997). *Splish Splash Splosh! A Book About Water*. (1997) New York, NY: Franklin Watts.

Nelson, Dennis. (1995). *Project WET Curriculum Activity Guide*. Houston, TX: The Watercourse and the Council for Environmental Education.

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Sands, S. (1998). *Kids Discover Rain and Snow*. New York, NY: Kids Discover.

Trueit, Trudi Strain. (2002). *The Water Cycle*. New York, NY: Franklin Watts.

Wick, Walter. (1996). *A Drop of Water: A Book of Science and Wonder*. New York, NY: Scholastic Press.

Websites:

<http://www.epa.state.il.us/kids/fun-stuff/water-cycle/wheel-part-1.html>

<http://www.epa.state.il.us/kids/fun-stuff/water-cycle/wheel-part-2.html>

Two part water cycle wheel model.

<http://www.epa.gov/>

U.S. Environmental Protection Agency.

<http://daphne.palomar.edu/jthorngren/latent.htm>

Easy to understand information on physical states of water, heat, etc.

<http://njawwa.org/kidsweb/Default.html>

Water cycle activities and information.

http://www.ucar.edu/learn/1_1_2_3t.htm

Information on water phases and molecular structure.

<http://www.lakelandschools.org/It/Technology/water.htm>

Water cycle model, questions, and puzzle.