

# EARTH SCIENCE

## GRADE 6

### ASSESSMENT PACKET

In this section, students discover ideas in meteorology as students investigate the science of the Earth's atmosphere, and how it is driven by the sun and influenced by the oceans.

Students learn about convection currents, tornadoes, air pressure, and how sunlight, water, and wind can be used as sources of energy.



Created by Aurora Lipper, Supercharged Science

**[www.SuperchargedScience.com](http://www.SuperchargedScience.com)**

This curriculum is aligned with the National State Standards and STEM for Science.

# Educational Goals

The Earth is a dynamic system that transfers heat energy through convection, conduction, and radiation. This heat transfer, along with the energy from the sun, drives the weather on the planet.

In this section, students will discover how to measure how much energy the sun produces that reaches the Earth, how heat from the Earth's core reaches the surface, and how differences in air pressure means a storm is brewing.

## **Here are the scientific concepts:**

1. Many phenomena on the Earth's surface are affected by the transfer of energy through radiation and convection currents.
2. The sun is the major source of energy for phenomena on the Earth's surface, powering winds, ocean currents, and the water cycle.
3. Solar energy reaches Earth through radiation, mostly in the form of visible light.
4. Heat from Earth's interior reaches the surface primarily through convection.
5. Convection currents distribute heat in the atmosphere and oceans.
6. Differences in pressure, heat, air movement, and humidity result in changes of weather.
7. The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.
8. Because these patterns are so complex, weather can only be predicted probabilistically.
9. The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents.

## **By the end of the labs in this unit, students will be able to:**

- Know how to demonstrate how solar energy reaches Earth through radiation, mostly in the form of visible light.
- Design and build an experiment that demonstrates convection currents.
- Understand how to measure how much energy the sun produces.
- Record data for atmospheric temperature, pressure, and humidity.
- Differentiate observation from inference (interpretation) and know scientists' explanations come partly from what they observe and partly from how they interpret their observations.
- Measure and estimate the weight, length and volume of objects.
- Formulate and justify predictions based on cause-and-effect relationships.
- Conduct multiple trials to test a prediction and draw conclusions about the relationships between predictions and results.
- Construct and interpret graphs from measurements.
- Follow a set of written instructions for a scientific investigation.

# Earth Science Evaluation

## Teacher Section

**Overview:** Kids will demonstrate how well they understand important key concepts from this section.

**Suggested Time:** 45-60 minutes

**Objectives:** Students will be tested on the key concepts:

1. Many phenomena on the Earth's surface are affected by the transfer of energy through radiation and convection currents.
2. The sun is the major source of energy for phenomena on the Earth's surface, powering winds, ocean currents, and the water cycle.
3. Solar energy reaches Earth through radiation, mostly in the form of visible light.
4. Heat from Earth's interior reaches the surface primarily through convection.
5. Convection currents distribute heat in the atmosphere and oceans.
6. Differences in pressure, heat, air movement, and humidity result in changes of weather.
7. The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.
8. Because these patterns are so complex, weather can only be predicted probabilistically.
9. The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents.

Students will also demonstrate these principles:

1. Collecting and interpreting data from an experiment
2. Making valid observations based on their actions in lab
3. Energy is not created or destroyed, but can change to different forms.

### Materials (one set for entire class)

- Different colors of paper (red, yellow, black, white...)
- Water bottle filled with really warm water
- Water bottle filled with really cold water
- Ice Cubes
- Index cards
- Scissors
- Tape
- Dime
- Brass fastener or tack
- Paper towel
- Food dye (only have one color out)
- 2 identical thermometers
- Flashlight

### Lab Preparation

1. Print out copies of the student worksheets, lab practical, and quiz.
2. Have a tub of the materials in front of you at your desk. Kids will come up when called and demonstrate their knowledge using these materials.

### Lesson

The students are taking two tests today: the quiz and the lab practical. The quiz takes about 20 minutes, and you'll find the answer key to make it easy to grade.

# Earth Science Grade 6 Evaluation

## Student Worksheet

**Overview:** Today you're going to take two different tests: the quiz and the lab practical. You're going to take the written quiz first, and the lab practical at the end of this lab. The lab practical isn't a paper test – it's where you get to show your teacher that you know how to do something.

### Lab Test & Homework

1. Your teacher will call you up so you can share how much you understand about energy and how it works. Since science is so much more than just reading a book or circling the right answer, this is an important part of the test to find out what you really understand.
2. While you are waiting for your turn to show your teacher how much of this stuff you already know, you get to get started on your homework assignment. The assignment is due next week, and half the credit is for creativity and the other half is for content, so really let your imagination fly as you work through it. Choose one:
  - a. Write a short story or skit about energy from the perspective of the sun, wind, or water. You'll read this aloud to your class.
  - b. Make a poster that teaches the main concepts of energy. This can be about solar energy, wind energy, the water cycle, or heat transfer. When you're finished, you'll use it to teach to a class in the younger grades and demonstrate each of the principles that you've learned.
  - c. Write and perform a poem or song about energy. This will be performed for your class.

# Earth Science Grade 6 Quiz

## Teacher's Answer Key

1. Fill in the blank: A battery produces \_\_\_\_\_ energy from \_\_\_\_\_ energy. (electrical, chemical)
2. Another name for a battery is: (voltaic cell)
3. As one chemical in a battery loses electrons, what happens to the other chemical? (gains electrons)
4. What type of energy source is the solar panel most closely related to? (chemical battery)
5. Electricity is another name for the free flow of: (electrons)
6. Name two ways energy is transferred: (heat, sound, radiation, etc.)
7. What is one way to describe energy? (the ability to do work)
8. Work is when something moves when: (Energy is used over a distance.)
9. What type of heat energy is transmitted by the sun? (radiation)
10. Circle the following phenomena influenced by the sun: (climate, weather, wind, pressure)
11. Name three sources of renewable energy: (water, wind, solar power)
12. In your own words, what is energy conservation? (answers will vary)
13. List 5 ways you can conserve energy in your own home. (answers will vary)
14. Why is it important to look for renewable sources of energy? (Because other sources of energy will run out and are finite.)
15. Windmills generate what kind of energy? (electrical)
16. The light that comes from the \_\_\_\_\_ is pure energy. (sun)
17. True or false: the molecules in hotter objects move faster than in cooler objects. (true)
18. What is the dewpoint? (a temperature that if you go below it, the water in the air turns into fog)

# Earth Science Grade 6 Quiz

## Student Quiz Sheet

Name \_\_\_\_\_

1. Fill in the blank: A battery produces  
\_\_\_\_\_ energy from  
\_\_\_\_\_ energy.
2. Another name for a battery is:
  - a. Solar array
  - b. Voltaic cell
  - c. Nuclear reactor
  - d. Fusion cell
3. As one chemical in a battery loses electrons, what happens to the other chemical?
  - a. It loses electrons
  - b. It gains electrons
  - c. Nothing
  - d. It decomposes
4. What type of energy source is the solar panel most closely related to?
  - a. Biofuel
  - b. Chemical battery
  - c. Nuclear reactor
  - d. Plant energy
5. Electricity is another name for the free flow of:
  - a. Protons
  - b. Quarks
  - c. Electrodes
  - d. Electrons
6. Which of the following best describes how sound gets to us?
  - a. Chemical electricity
  - b. Solar radiation
  - c. Heat conduction
  - d. Vibrating molecules
7. What is one way to describe energy?
  - a. The amount of atoms moving around at any given moment
  - b. Electrons flowing from one area to another
  - c. The ability to do work
  - d. The square root of the speed of an electron
8. Work is when something moves when:
  - a. Force is applied
  - b. Energy is used
  - c. Electrons are lost or gained
  - d. A group of atoms vibrate
9. What type of heat energy is transmitted by the sun?
  - a. Conduction
  - b. Convection
  - c. Plasma
  - d. Radiation
10. Circle the following phenomena influenced by the sun:
  - a. Pressure
  - b. Climate
  - c. Weather
  - d. Wind
11. Name three sources of renewable energy:
  - a.
  - b.
  - c.

12. In your own words, what is energy conservation?

17. True or false: the molecules in hotter objects move faster than in cooler objects.

18. What is the dewpoint?

13. List 5 ways you can conserve energy in your own home.

14. Why is it important to look for renewable sources of energy?

15. Windmills generate what kind of energy?

16. The light that comes from the \_\_\_\_\_ is pure energy.

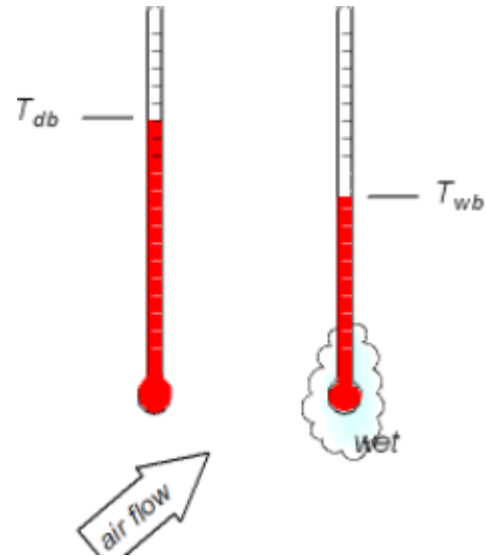
# Earth Science Grade 6 Lab Practical

## Teacher's Answer Key

This is your chance to see how well your students have picked up on important key concepts, and if there are any holes. Your students also will be working on their homework assignment as you do this test individually with the students.

### Materials:

- Different colors of paper (red, yellow, black, white...)
- Water bottle filled with really warm water
- Water bottle filled with really cold water
- Ice Cubes
- Index cards
- Scissors
- Tape
- Dime
- Brass fastener or tack
- Paper towel
- Food dye (only have one color out)
- 2 identical thermometers
- Flashlight



**Lab Practical:** Ask the student *Note: Answers given in italics!*

You will demonstrate two of the following:

1. Design an experiment that will figure out which color gets the hottest. *Student will put the different papers outside in the sun or under a strong light source, come back after a period of time and measure the temperature reading of the papers. Student will mention energy being transferred from the sun to the paper in the form of radiation (light).*
2. Design an experiment that demonstrates convection currents and describe what is going on during this experiment. *Insert a color drop of food dye into the hot water bottle. Using an index card, invert the cold bottle over the warm so you can view the warm water rising into the cold. Leave the cold bottle clear so you can view the warm water easier.*
3. Design an experiment that will measure the humidity in the air. *There are two ways to do this:*
  - a. *Student can tape two thermometers to a paper and leave the ends exposed to the air, and wrap a piece of wet paper towel around the end of one of them and blow across both ends to see a temperature difference. Use the table on the next page to give you the humidity based on the wet and dry thermometers. (See image above.)*
  - b. *Build a hair hygrometer as we did during an experiment where the hair is gently stretched out and we can measure if the hair changes length after a period of time using a lever arm indicator.*

# Earth Science Grade 6 Lab Practical

## Student Exam

**This is your chance to see how well your students have picked up on important key concepts, and if there are any holes. Your students also will be working on their homework assignment as you do this test individually with the students.**

### Materials:

- Different colors of paper (red, yellow, black, white...)
- Water bottle filled with really warm water
- Water bottle filled with really cold water
- Ice Cubes
- Index cards
- Scissors
- Tape
- Dime
- Brass fastener or tack
- Paper towel
- Food dye (only have one color out)
- 2 identical thermometers
- Flashlight

**Lab Practical:** Ask the student to complete two of the following:

1. Design an experiment that will figure out which color gets the hottest and describe what is happening.
2. Design an experiment that demonstrates convection currents and describe what is going on during this experiment.
3. Design an experiment that will measure the humidity in the air (refer to table on next page).

## Relative Humidity (%)

Dry-Bulb Temperature (°C)	Difference Between Wet-Bulb and Dry-Bulb Temperatures (C°)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
-20	100	28														
-18	100	40														
-16	100	48														
-14	100	55	11													
-12	100	61	23													
-10	100	66	33													
-8	100	71	41	13												
-6	100	73	48	20												
-4	100	77	54	32	11											
-2	100	79	58	37	20	1										
0	100	81	63	45	28	11										
2	100	83	67	51	36	20	6									
4	100	85	70	56	42	27	14									
6	100	86	72	59	46	35	22	10								
8	100	87	74	62	51	39	28	17	6							
10	100	88	76	65	54	43	33	24	13	4						
12	100	88	78	67	57	48	38	28	19	10	2					
14	100	89	79	69	60	50	41	33	25	16	8	1				
16	100	90	80	71	62	54	45	37	29	21	14	7	1			
18	100	91	81	72	64	56	48	40	33	26	19	12	6			
20	100	91	82	74	66	58	51	44	36	30	23	17	11	5		
22	100	92	83	75	68	60	53	46	40	33	27	21	15	10	4	
24	100	92	84	76	69	62	55	49	42	36	30	25	20	14	9	4
26	100	92	85	77	70	64	57	51	45	39	34	28	23	18	13	9
28	100	93	86	78	71	65	59	53	47	42	36	31	26	21	17	12
30	100	93	86	79	72	66	61	55	49	44	39	34	29	25	20	16