Answer Keys

Chapter 1

Lesson 1

Page 13

If possible, have students keep their models of weathering and erosion for the next day, when they can reuse them to model deposition.

- Students should plan how they can use the materials to model weathering and erosion of Earth's surface features. For example, they might use soil to build a mountain chain, then dig a river valley, and finally pour water over these "landforms." DOK 3
- Student observations will depend on their models. Students should use the ruler to measure the depth to which water weathers and erodes their landforms. For example, a "mountain" might be reduced in height from 8 centimeters (cm) to 5 cm. DOK 2
- Students should understand that their models show how water weathers landforms, wearing them down, and then erodes weathered sediment, moving it downhill. DOK 3

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- Students should argue that tall landforms, such as mountains and cliffs, will become shorter and more rounded, while deep features, such as valleys and canyons, will become wider or deeper. Evidence could include measurements of height, depth, or width. Some students may point out that sediment in rivers and valleys will be particles of the same rock that make up nearby mountains. DOK 3

Lesson Review

1. D DOK 1
2. C DOK 1
3. A DOK 2
4. B DOK 2

Lesson 2

Page 18

Students can reuse their models from Lesson 1 to explore deposition.

- Students should describe how soil or sand in their original models was deposited by water at the bottom of the sloping pans or trays. DOK 2
- When students rebuild their models to show deposition, their measurements and observations should focus on areas where water drops sand or soil and this "sediment" builds up, forming "floodplains" or "deltas." DOK 3

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- Students should demonstrate an understanding of how a constructive process built up their landform and what kind of evidence would support their argument. For example, a floodplain will grow taller each year after flooding, and the sediment composing it should be the same as the sediment in a nearby river bottom. Or, a mountain formed by a volcano should have rocks and particles that show signs of melting (pieces of old lava). DOK 3

Lesson Review

1. C DOK 1
2. C DOK 1
3. C DOK 2
4. D DOK 2

Lesson 3

Page 23

- Students' questions should relate to what occurs during a flood and how a flood may affect people. Sample questions: How often do floods happen in this area? Are floods more common in certain seasons? Do people use the land in the area for farming? DOK 3

Page 24

- Students should ask questions about dams, levees, storm drains, or land mapping. Sample questions: Where are levees used in Georgia? How do scientists use technology to map floodplains? As needed, help students find appropriate sources for answering their questions. Remind students who research their questions online to use trustworthy websites. Government and university websites usually provide the best, most reliable information. DOK 3

Page 25

- Sample questions: What plants and animals live on the beach? Do people use the beach? Have any solutions already been tried? DOK 3

Page 26

- Students should ask questions about groins, seawalls, or beach nourishment. Also accept questions about dune planting even though it is not a technological solution. Sample questions: Why do towns build seawalls if they make erosion worse? What kinds of plants can live on dunes in Georgia? As needed, help students find appropriate sources for answering their questions. DOK 3
- Sample questions: How often does the area have earthquakes? Have large earthquakes occurred in the area? Do people in the area plan to construct tall buildings? DOK 3

Page 28

- Sample questions: Can scientists use seismographs to predict earthquakes? What features help keep tall buildings from falling down during earthquakes? As needed, help students find appropriate sources for answering their questions. DOK 3

Lesson Review

1. A DOK 2
2. D DOK 2
3. B DOK 2
4. D DOK 1

Chapter 1 Review

1. c DOK 2 S5E1.a
2. c DOK 2 S5E1.c
3. d DOK 2 S5E1.a, b
4. b DOK 3 S5E1.b
5. a DOK 1 S5E1.a
6. b DOK 2 S5E1.c
7. a, d DOK 2 S5E1.a

Chapter 2

Lesson 4

Page 36

- Students should ask a testable question about a physical change to a substance. Sample question: How will crushing an aluminum can change its physical properties? DOK 2
- Students' hypotheses should propose an answer to their question. Sample answer: Crushing an aluminum can will change its size, shape, texture, and volume, but not its mass or color. DOK 3

Page 39

Depending on the size of the particles in your class's sand and gravel, colanders may work better than strainers for separating the substances.

- Students should outline a combination of steps that will separate the sand and gravel from the water and then separate the sand from the gravel. For example, students might suggest pouring the mixture through a filter (paper towel and funnel) and then separating the sand from the gravel by pouring both solids through the strainer. DOK 3
- Student observations will vary. Students should note that the different sizes of the solid particles allow them to be separated. DOK 2
- Students should note that separating the substances does not change their physical properties, because they look and feel the same afterward. DOK 3

Lesson Review

1. A DOK 1
2. D DOK 2
3. D DOK 2
4. C DOK 2

Lesson 5

Page 44

- Students should write arguments that are bolstered with evidence of temperature change. For example, a puddle of liquid water on a sidewalk evaporated into water vapor, a gas, because it was a hot day and the sun warmed the water. As the sun warmed the water, the water particles on the puddle's surface moved faster and farther apart. DOK 3

Page 45

- Students should plan the following steps: measuring the mass of the salt, dissolving the salt in the water, evaporating the water, and measuring the mass of the salt again. Students should note how they will raise the temperature of the water to make it evaporate. For example, they might pour the solution in a tray and leave the tray on a sunny windowsill or above a heat source, such as a lamp. DOK 3
- Student observations will vary, but students should note that the mass of the salt was essentially the same after it was separated with evaporation. DOK 3

Lesson Review
1. C DOK 1
2. A DOK 2
3. B DOK 2
4. B DOK 2

Lesson 6

Page 50

- Students should outline steps to test for clues of chemical change. For example, for the mixture scenario, students could measure the temperatures of the two original substances and compare them to the temperature of the mixture in the jar, smell the mixture for a new odor, look for bubbles or signs of gas, and compare the colors of the two substances with the color of the mixture. DOK 3

Lesson Review
1. C DOK 1
2. B DOK 2
3. D DOK 2

Lesson 7

Page 57

Encourage students to choose their own electrical sources and loads. You may wish to have students research alternate electrical sources, such as solar panels and wind turbines. If time allows, have students present and explain their designs to the class (or to small groups).

- Student designs should show and label all parts of a complete circuit, including an electrical source, a load, a connector, and a switch. Each part should be accompanied by an explanatory sentence. DOK 3

Page 58

- Students should note that lightning is static electricity, which occurs naturally. A negative charge builds up in a cloud. At the same time, another cloud becomes positively charged. Lightning is the sudden electric discharge between the clouds (or between a cloud and the ground). Students should compare lightning with electrical energy, which is produced, controlled, and used by people as a source of energy to meet their needs. Electrical energy flows smoothly and constantly through circuits. Students should provide a list of library or online sources. DOK 3

Lesson Review
1. B DOK 2
2. B DOK 2
3. A DOK 1

Lesson 8

Page 62

- Students should revise their circuit designs by replacing the switch with a material to be tested or by cutting a wire and placing the material to be tested between the two ends. DOK 3
- Student predictions should be based on what they learned about conductors and insulators in the lesson. DOK 3
- The controlled variables include the electrical source, connector, and load. DOK 3
- The variable that changes is the material being tested. DOK 3

Lesson Review
1. D DOK 1
2. A DOK 1
3. C DOK 2
4. C DOK 2

Lesson 9

Page 67

Provide students with strong magnets, magnetic objects (such as steel paper clips), and an array of materials to test (such as index cards, wooden rulers, metal rulers, plastic cutlery, and cloth). Encourage students to test different thicknesses of material. For example, they could test the magnetic field through 1, 2, and 4 index cards.

- Magnetic objects will vary. DOK 1
- Student data should include the greatest distance at which the magnet attracts the magnetic object. Students should also record how that distance changes when various materials are placed between the magnet and the magnetic object. Certain objects—or thicknesses—will block the magnetic field. DOK 2
- Students should conclude that the magnetic field is reduced by putting material between the magnet and the magnetic object, and that the magnetic field is further reduced when the material's thickness is increased. DOK 3

Lesson Review
1. C DOK 1
2. A DOK 2
3. B DOK 1
4. A DOK 2

Lesson 10

Page 70

- Magnetic objects will vary. DOK 1
- Students should recognize that the variable that changes is the number of loops of wire around the nail. They should observe that the electromagnet grows stronger (picks up more of the magnetic objects and picks them up more quickly) the more times they wrap the wire around the nail. DOK 2
- Students should conclude that an electromagnet can be strengthened by increasing the number of loops of wire around its core. DOK 3

Page 72

- Students should argue that a magnet's ability to attract objects is permanent, so it can be used for permanent jobs, such as holding pieces of paper to a refrigerator. Students may support this argument with observations from personal experience and by recalling that they had to pull magnetic objects from their magnets in the Lesson 9 investigation. Students should recognize that an electromagnet's ability to attract objects is temporary, so it can be used for jobs in which it is helpful to turn the magnetic field off, such as separating paper clips from a mixture of trash and then dropping them into a container. They may support this argument with information learned in this lesson and with evidence from their electromagnet experiment. DOK 3

Lesson Review
1. B DOK 1
2. D DOK 2
3. A DOK 2
4. C DOK 2

Chapter 2 Review

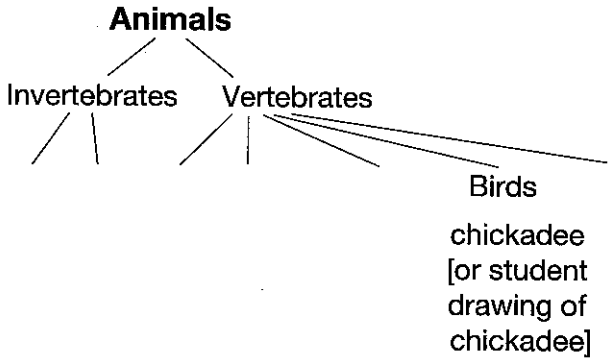
1. c DOK 2 S5P2.a
2. c DOK 2 S5P1.a
3. d DOK 1 S5P3.b
4. c DOK 3 S5P1.b
5. b DOK 2 S5P2.c
6. c DOK 2 S5P1.c
7. c DOK 2 S5P1.b
8. b DOK 2 S5P3.a, b
9. c DOK 1 S5P1.c
10. d DOK 2 S5P2.b
11. d DOK 2 S5P3.b
12. c, e DOK 2 S5P1.a
13. c DOK 3 S5P1.a
14. d DOK 1 S5P2.c
15. a, c, e DOK 2 S5P1.c
16. d DOK 3 S5P3.a, b
17. b DOK 2 S5P1.b
18. c DOK 2 S5P2.b

Chapter 3

Lesson 11

Page 83

If students research animals online, remind them to use trustworthy websites. Government and university websites provide the best, most reliable information. You may wish to draw a simple "tree" diagram on the board. Explain to students that this kind of diagram shows relationships among groups. Each member of a group shares the group's characteristics, and every group shares the defining characteristics of the group above it. So, for example, every bird has feathers and wings. And birds share the defining characteristic of vertebrates—a backbone.



You may wish to suggest that students turn their books sideways to allow more space for their diagrams. Some students may wish to draw their animals.

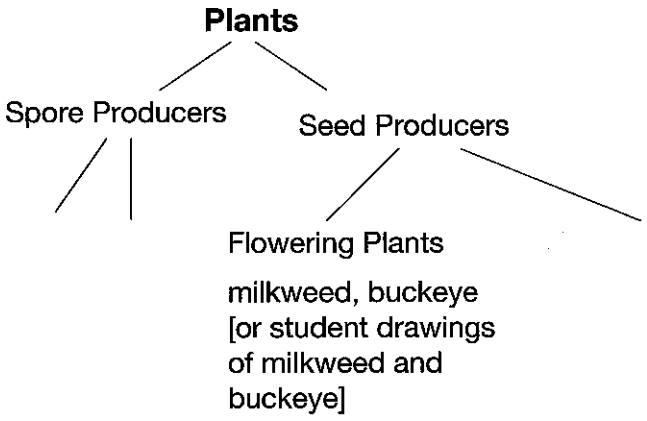
- Student diagrams should indicate which group each animal belongs to. The vertebrates should be separated from the invertebrates. DOK 3

Lesson Review
1. A DOK 1
2. C DOK 2
3. B DOK 2
4. B DOK 2

Lesson 12

Page 88

If students research plant classification online, remind them to use trustworthy websites, such as those of government agencies and universities. You may wish to draw a simple "tree" diagram on the board. Remind students that this kind of diagram shows relationships among groups. Each member of a group shares the group's characteristics, and every group shares the defining characteristics of the group above it.



You may wish to suggest that students turn their books sideways to allow more space for their diagrams. Some students may wish to draw their plants.

- Students' diagrams should indicate which group each plant belongs to. The spore producers should be separated from the seed producers. DOK 3

Lesson Review

1. B DOK 1
2. A DOK 2
3. B DOK 1
4. D DOK 3

Lesson 13

Page 92

- Students should write questions that would allow them to figure out how horses acquire the ability to move in a running walk. Sample questions: Can young horses move in a running walk? Do horses that move in a running walk have babies that can move in a running walk? If young horses are separated from their mothers, do they move in a running walk? If young horses are not trained (by people), do they move in a running walk? DOK 3

Page 94

- Students should write questions that would allow them to determine how the trait for yellow tomatoes is acquired. Sample questions: Will seeds from the yellow tomatoes grow into plants that produce yellow tomatoes? Are there any diseases that cause tomato plants to have yellow tomatoes? Does the plant with yellow tomatoes have any signs of such a disease? Does the plant with yellow tomatoes get the same amount of water and sunshine as the other plants? If the plant is moved or watered more (or less), do the tomatoes stay the same? DOK 3

Lesson Review

1. C DOK 1
2. B DOK 2
3. C DOK 2
4. D DOK 2

Lesson 14

Page 97

Remind students to use trustworthy websites, such as those of government agencies and universities. Explain that an image formed by a microscope is called a micrograph.

You may wish to help students select well-targeted words or phrases to enter in online search engines, such as "oak tree stem," "oak tree microscope," "zebra fish skin," or "zebra fish micrograph."

If your class has access to microscopes, have students collect firsthand evidence by observing relatively large plant cells, such as those of onion skins.

- Students should collect evidence about the cells that make up the plants and animals they selected. Evidence may include cell descriptions, information about the cells, and sketches of micrographs. DOK 3

Page 100

Encourage students to think creatively about how to model their cells. What kind of material could they use for the cell membrane of an animal cell? What kind of material would be best for the cell wall of a plant cell? What kind of material would make good cytoplasm? Because students will not actually make their models, they are free to choose materials that would be good in a model but might be difficult to work with.

- Students should draw diagrams of their cell models. The diagrams should indicate materials to be used to make the models. For example, the cell wall of a plant cell might be made with cardboard or clear plastic, the nucleus with clay, the cytoplasm with clear gelatin, and the chloroplasts with green water balloons. The plant cell should show the nucleus, cell membrane, cell wall, cytoplasm, and chloroplasts. The animal cell should show the nucleus, cell membrane, and cytoplasm. DOK 3

Page 101

- Students should note that plant cells have a cell wall, giving them a boxy shape, and that animal cells only have a cell membrane, so they are more rounded. Students may also note that plant cells have organelles that animal cells do not have or need—chloroplasts, which are filled with green chlorophyll. DOK 2

Lesson Review

1. D DOK 1
2. A DOK 2
3. C DOK 2
4. D DOK 1

Lesson 15

Page 104

- Students should describe how a kind of microorganism benefits other organisms or the natural environment in some way. For example, the billions of bacteria in the human gut (stomach and intestines) break food down so that our bodies can use it. Without these bacteria, humans could not survive. DOK 3

Page 105

- Students should describe how a kind of microorganism harms other organisms or the natural environment in some way. For example, a kind of bacteria that lives in ticks causes Lyme disease in people. When a tick with the bacteria bites a person, the bacteria may infect the person. A person with Lyme disease can have a fever, headache, and joint pain. DOK 3

Lesson Review

1. A DOK 1
2. C DOK 2
3. C DOK 2

Chapter 3 Review

1. b DOK 2 S5L3.c
2. a DOK 2 S5L1.a
3. b DOK 2 S5L1.b
4. d DOK 1 S5L2.b
5. a DOK 2 S5L1.a
6. c DOK 3 S5L4.a
7. c, d, e DOK 2 S5L3.b
8. a DOK 2 S5L1.b
9. b DOK 2 S5L2.a
10. d DOK 2 S5L3.a
11. d DOK 1 S5L1.a
12. a DOK 1 S5L4.b
13. d DOK 2 S5L2.b
14. a, c, e DOK 2 S5L3.c

Investigation 1

This investigation relates to the content presented in Lesson 1, "How Earth's Landforms Are Worn Down." The investigation may be integrated with this lesson or presented as a stand-alone activity.

Encourage students to write their initial questions, plans, and predictions *before* reading through the investigation. These exercises will help them begin to think about the scientific process. Students will have an opportunity to modify and improve their questions, plans, and predictions later in the investigation.

Ask a Question

Student questions will vary but should be testable and should relate to weathering by ice.

Plan Your Investigation

Have students form small groups. Show students the key materials: plaster of paris, balloons, paper cups, and water. Lead a class discussion to help students plan an investigation. Encourage students to think creatively about the investigation. Ask students questions—What is your question? How can you test it? How can you use the materials to model rocks? How can you model the process of water freezing inside a rock? What are some steps will you need to follow? Remind students that they will be able to compare their plans with the investigation's actual plan and then revise their plans as needed.

Make a Prediction
Predictions will vary but should reflect the idea that freezing water expands and will thus crack or break the rocks modeled in the investigation. Students' predictions do not need to be correct as long as they are reasonable and show an understanding of the purpose of the investigation.

Compare Plans
Students should describe the ways in which their group's plans differ from the actual steps. Sample answers: We could not figure out how to use the water balloons. We planned to make cracks in the plaster and fill the cracks with water. In our plan, we used two cups instead of four. We forgot to include a cup of plaster without a water balloon.

Question
Students may revise their initial questions.

Prediction
Students may revise their initial predictions.

Materials
Students should list all the materials used in the investigation.

Steps
Students should write the steps of their investigation in order and clearly enough that another student could follow them.

Safety
Sample answer: I told my teacher when I spilled some plaster of paris. I did not play with the water balloons.

Observations
Sample observations: I observed that the cups holding the balloons were bulging and that plaster had broken and fallen out of those cups. The cup with the biggest balloon had the most broken plaster. The cup with the smallest balloon was only cracked and broken a little bit. The cup with no balloon was not broken at all.

Conclusion
Students should draw conclusions that their observations support. Sample conclusion: I learned that expanding ice can break plaster, which showed me that expanding ice could do the same thing in rock. The bigger the crack is and the more water that fits inside, the more the ice expands and breaks the rock. My observations did/did not support my prediction.

Plan Another Investigation
Students should suggest ways to modify the investigation, such as modeling larger rocks or using a wider range of sizes of water balloons.

Investigation 2
This investigation relates to the content presented in Lesson 5, "States of Water." The investigation may be integrated with this lesson or presented as a stand-alone activity.

Encourage students to write their initial questions, plans, and predictions *before* reading through the investigation. These exercises will help them begin to think about the scientific process. Students will have an opportunity to modify and improve their questions, plans, and predictions later in the investigation.

Ask a Question
Student questions will vary but should be testable and should relate to evaporation and condensation.

Plan Your Investigation
Assign students to small groups. Show students the materials: plastic cups, water, plastic wrap, rubber bands, and ice cubes. Lead a class discussion to help students plan an investigation. To facilitate the discussion, ask questions—What question will you test? How could you test it? How can you use the materials to show evaporation? How can you use the materials to show condensation? What are some steps you will need to follow?

Make a Prediction
Predictions will vary but should reflect the idea that warming water evaporates and cooling water vapor condenses. Students' predictions do not need to be correct as long as they are reasonable and show an understanding of the purpose of the investigation.

Compare Plans
Students should describe the ways in which their group's plans differ from the actual steps. Sample answers: We could not figure out how to make water vapor condense. We put the ice cubes in the water. We forgot to include a cup without ice cubes. We made the water evaporate by putting the cups on a radiator.

Question
Students may revise their initial questions.

Prediction
Students may revise their initial predictions.

Materials
Students should list all the materials used in the investigation.

Steps
Students should write the steps of the investigation in order and clearly enough that another student could follow them.

Safety
Sample answer: I did not put anything in my mouth. I told my teacher when I spilled some water.

Observations
Sample observations: The ice melted. Many tiny droplets formed on the bottom of the plastic wrap and the sides of the cup with ice. Only a few droplets formed in the cup without ice.

Conclusion
Students should draw conclusions that their observations support. Sample conclusion: I learned that when water warms, it evaporates into the air. You know it is in the air because then it condenses, and you see the droplets. I learned that water vapor condenses, forming droplets of liquid water, on cold surfaces. My observations did/did not support my prediction.

Plan Another Investigation
Students should suggest ways to modify the investigation or, perhaps, plan another investigation, such as measuring the rates of evaporation at different temperatures.