



# SCIENCE

## GENERAL SCIENCE SCALE

below **181**

### Physical Sciences

Students understand the ideas about the interactions of matter, the relationship between force and motion, and how energy forms transfer and transform.

- Which is a solid?
- A. air
  - B. milk
  - ✓ C. rock
  - D. water

**181-190**

Which action is an example of melting?

- ✓ A. heating a block of ice until the ice turns to water
- B. warming a pan of water until the water is all gone
- C. stirring some sugar in water until the sugar is invisible
- D. cooling water in the freezer until the water becomes solid

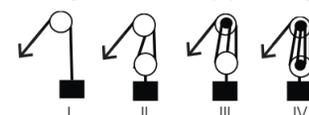
**191-200**

Which group of magnets has attractive forces between all 3 magnets?

- ✓ A.
- B.
- C.
- D.

**201-210**

The diagram shows four pulley systems lifting a box.



Which pulley system will lift the box with the **least** input force?

- A. I
- B. II
- C. III
- ✓ D. IV

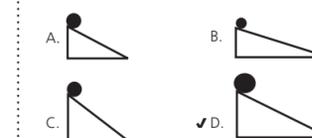
**211-220**

Which observation indicates that a substance is a mixture?

- ✓ A. It separates into 2 layers after 24 hours.
- B. It remains the same color when cut in half.
- C. It turns black and emits smoke when burned.
- D. It breaks into 4 pieces when hit with a hammer.

**221-230**

Solid steel balls are located on ramps as shown. Which ball has the **greatest** gravitational potential energy?



**231-240**

What is the hydronium concentration of a basic solution?

- A.  $[H^+] = 1 \times 10^9$
- B.  $[H^+] = 1 \times 10^{-9}$
- C.  $[H^+] = 9 \times 10^1$
- ✓ D.  $[H^+] = 9 \times 10^{-1}$

above **241**

Which chemical equation represents a neutralization reaction?

- A.  $CaCO_3 \rightarrow CO_2 + CaO$
- B.  $2 HCl + 2 K \rightarrow 2 KCl + H_2$
- C.  $CH_4 + 2 O_2 \rightarrow CO_2 + 2 H_2O$
- ✓ D.  $NaOH + HCl \rightarrow NaCl + H_2O$

### Life Sciences

Students understand the ideas about the structure and function of organisms, how matter and energy move through ecosystems, how heredity affects organisms, and how biological evolution affects the unity and diversity of life.

The diagram shows the parts of a plant.



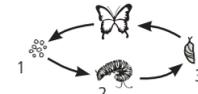
Which part is labeled with the X?

- A. flower
- B. leaf
- ✓ C. root
- D. stem

Which phrase describes all predators?

- A. animals that eat plants and fungi
- B. animals that hibernate in the winter
- ✓ C. animals that hunt other animals for food
- D. animals that live in herds with other animals

The diagram shows the life cycle of a butterfly.



What are the names of stages 1, 2, and 3?

- A. egg, pupa, and larva
- B. larva, egg, and pupa
- ✓ C. egg, larva, and pupa
- D. pupa, larva, and egg

What is a function of the respiratory system in animals?

- A. to move blood
- B. to detect sound
- ✓ C. to obtain oxygen
- D. to break apart food

Where does photosynthesis happen in plants?

- ✓ A. chloroplasts
- B. epidermis
- C. roots
- D. stomach

### Earth and Space Sciences

Students understand concepts related to the weather and climate on Earth, the cycles of Earth, plate tectonics and how Earth changes over time, as well as the concepts related to the Solar System and the Universe.

Which object is shaped **most** like Earth?

- A. an oval egg
- ✓ B. a round ball
- C. a flat pancake
- D. a square block

Which factor of weather usually indicates rain?

- A. The wind speed is low.
- ✓ B. The sky has many clouds.
- C. The air temperature is high.
- D. The wind direction is from the north.

Which statement describes the Northern Hemisphere of Earth at the beginning of winter?

- A. It is tilted toward the Sun.
- ✓ B. It is tilted away from the Sun.
- C. It is rotating faster than the Southern Hemisphere.
- D. It is rotating slower than the Southern Hemisphere.

How does air in Earth's atmosphere move while being heated?

- A. around in circles
- ✓ B. upward in columns
- C. downward in funnels
- D. horizontally in layers

Which planet has the **greatest** orbital speed?

- A. Earth
- ✓ B. Mercury
- C. Neptune
- D. Saturn

A mineral sample has large crystals. Where did this mineral sample likely form?

- A. on the ocean floor
- B. within a quickly evaporating brine pool
- C. in the air after being ejected from a volcano
- ✓ D. along the edges of a slowly cooling magma pool

How can large droplets of water become tiny droplets of water in the water cycle?

- A. They can evaporate, precipitate, and then condense.
- B. They can condense, evaporate, and then precipitate.
- C. They can precipitate, condense, and then evaporate.
- ✓ D. They can precipitate, evaporate, and then condense.

Which evidence does **not** support the theory of plate tectonics?

- A. the mapping of glacial features on different continents
- B. the matching of fossil types in South America and Africa
- C. the mid-ocean ridges with alternating magnetic stripes on the seafloor
- ✓ D. the mass extinction of species on a continent within a small period of time

## CONCEPTS AND PROCESSES SCALE

below **181**

### Scientific Inquiry

Students plan, perform, and evaluate scientific investigations. The key skills they use include observing, questioning, predicting, hypothesizing, and inferring from data.

Which group of words is **best** to use in their notebooks?

- A. red, tall, happy, wet
- B. old, round, gray, funny
- ✓ C. hard, smooth, curved, large
- D. young, happy, lonely, windy

**181-190**

A student did an experiment to answer the question, "Do red candles burn faster than white candles?" The student lit the red candles and measured the time for them to burn. The student kept the unlit white candles as controls. Using these results, the student could not answer the question.

What was wrong with the student's experiment?

- A. The student's timer did not operate properly.
- B. Red was not a good color to choose for the experiment.
- ✓ C. The time for the white candles to burn was not measured.
- D. The student did not repeat the experiment at least 3 times.

**191-200**

A student read that when salt, sugar, and water are combined, the mixture becomes a candy called saltwater taffy.

How should the student test this idea?

- ✓ A. Mix salt, sugar, and water and observe what happens.
- B. Take a vote among friends who have eaten saltwater taffy.
- C. Buy some saltwater taffy and see if it is a mixture with salt in it.
- D. Grind up some saltwater taffy to see if you get salt, sugar, and water.

**201-210**

Different types of insects have different kinds of mouthparts. Mouthparts may relate to the insect's diet.

Which would be a testable hypothesis to help explain the different mouthparts?

- ✓ A. Insects with similar mouthparts will have similar diets.
- B. Insects use sharp mouthparts for protection.
- C. Bigger insects have bigger mouthparts.
- D. Climate affects the diet of insects.

**211-220**

A student grew 3 plants controlling all variables but one. The first plant was grown under red light, the second plant was grown under green light, and the third plant was grown under blue light.

Which question was the student probably investigating?

- A. How does the type of soil affect the rate of plant growth?
- ✓ B. How does the color of light affect the rate of plant growth?
- C. How does the amount of water affect the rate of plant growth?
- D. How does the amount of sunlight affect the rate of plant growth?

**221-230**

Students want to investigate the motion of objects. They have a metric ruler, a stopwatch, a ramp, and 4 types of balls (baseball, tennis ball, golf ball, and soccer ball).

Which hypothesis can the students test using only their equipment?

- A. Balls will roll slower down a rougher ramp.
- ✓ B. A tennis ball will roll down a ramp faster than a golf ball.
- C. The ball with the greatest temperature will accelerate the most.
- D. The heaviest ball will roll down a ramp in the least amount of time.

**231-240**

Which is the **simplest** question to answer using a scientific investigation?

- A. How does a pendulum function?
- B. What animal makes the best pet for young children?
- ✓ C. Which type of soil produces the tallest tomato plants?
- D. Why do some birds like sunflower seeds better than thistle seeds?

above **241**

A research biologist had statistically significant laboratory results.

Why were the results significant?

- A. The results confirmed the hypothesis.
- ✓ B. The results could not be caused by chance alone.
- C. The results will probably be valuable to humankind.
- D. The results were very similar to the results of another biologist.

### Nature of Science

Students show understanding of scientific theories, inference, systems thinking, and the interactions between science and technology.

What is always needed to cause a change in a system?

- A. air
- ✓ B. energy
- C. force
- D. water

The picture shows a real electric circuit.



How do scientists and engineers think of this real electric circuit?

- A. as a cell
- B. as a cycle
- C. as a model
- ✓ D. as a system

A student poured water into a bowl and set the bowl in front of a window. The student recorded observations and inferences until all the water was gone.

Which statement from the student's notebook is an inference, and **not** an observation?

- A. Half of the water is gone by day two.
- ✓ B. Water evaporated faster on sunny days.
- C. There is a line of residue in the bowl where the water was.
- E. The water temperature is the same as the room temperature.

Students observed some tomato plants. They found that the ones that grew the tallest were exposed to 10 hours of sunlight.

What is the **best** way for the students to report their finding?

- A. Plants need sunlight to grow.
- B. Plants grow best with 10 hours of sunlight.
- ✓ C. Tomato plants grow tall with 10 hours of sunlight.
- D. Tomato plants need 10 hours of sunlight to grow the tallest.

Which action is **not** how science and technology usually interact?

- ✓ A. Science provides technology with tools.
- B. Science produces a demand for new technologies.
- C. Science knowledge can limit the technologies that are produced.
- D. Science discovers information that can be applied in new technologies.

Which is an input and an output in plant systems?

- A. light
- ✓ B. oxygen
- C. minerals
- D. nitrogen

Which statement **best** describes scientific theories?

- A. They are often wrong.
- B. They are educated guesses.
- C. They can be proven correct.
- ✓ D. They are explanations of facts.

Which sentence represents the use of Occam's Razor in the process of science?

- A. Theories should be tested with many repetitions of all possible experiments.
- B. When new data does not support an established theory, reject the theory and start over.
- ✓ C. When two competing theories make the same prediction, the theory that is simpler is better.
- D. Testing a theory with controlled experiments is better than testing with broad investigations.