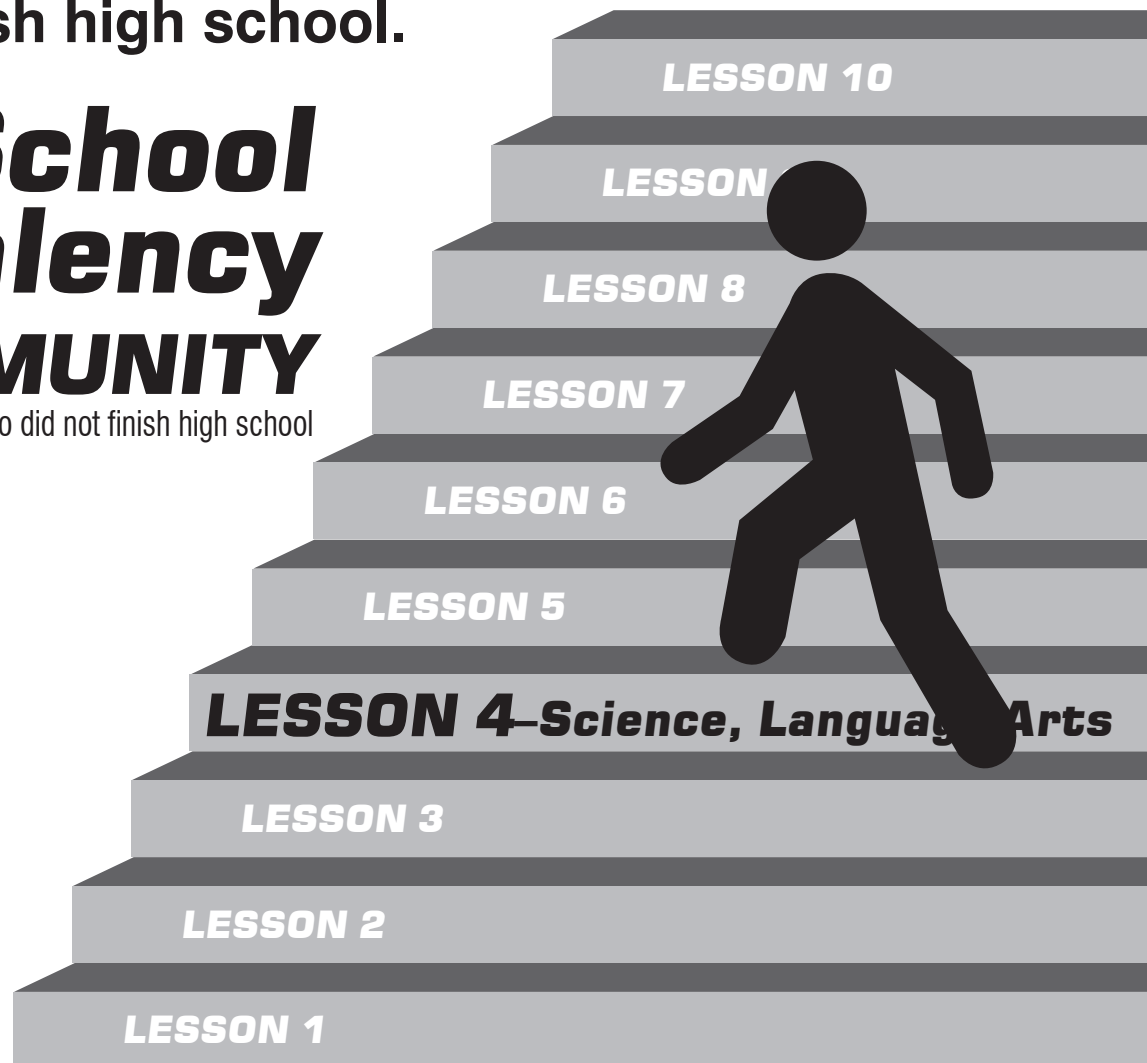


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Fourth Step
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AHEAD!**

LESSON 4

Science



You do not need to be a scientist to pass the High School Equivalency test, but being familiar with science words will help. Read the following vocabulary words. Refer back to their meaning as you read the passages and questions.

Vocabulary to Know:

Physics—the study of energy in all its forms: mechanical; heat; electricity; magnetism; light; nuclear power; solar energy; and geothermal energy

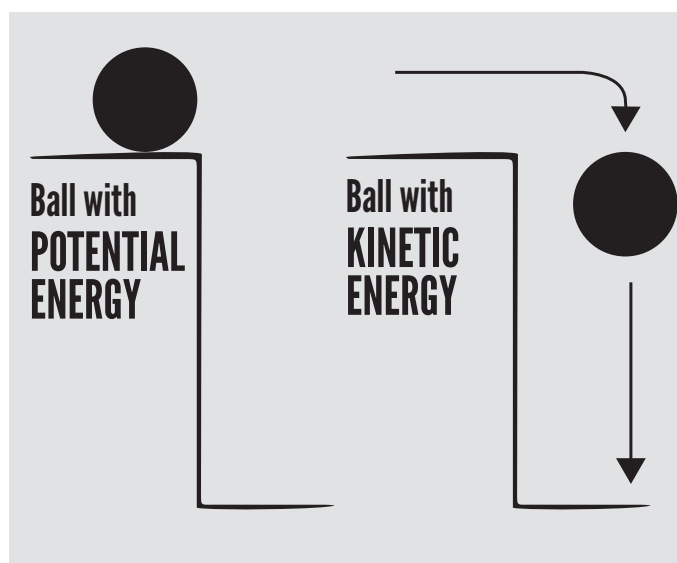
Law of Conservation of Energy—States that during interaction, energy may change from one form to another, but no energy is lost. The total amount of energy present remains constant.

Kinetic Energy—energy of motion

Potential Energy—stored energy

Nuclear Energy—

- A. The energy released by a nuclear reaction, especially by fission or fusion
- B. Nuclear energy regarded as a source of power, also called *atomic energy*



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ASSIGNMENT 1

DIRECTIONS

Read the passage and answer questions that follow.
Use a separate sheet of paper.

What is Energy?

Scientists define energy as the ability to do work. Energy makes change possible. We use it to do things for us. We have learned how to transfer energy from one form to another and use it to do work for us and live more comfortably.

Forms of Energy

Energy is found in different forms including light, heat, chemical, and motion. They can all be put into two categories: potential and kinetic.

- Potential energy is energy that is stored, or not in motion.
- Kinetic energy is energy at work, in action—for instance, that's the case with electricity, heat, light, motion, and sound.

Collisions

What happens to energy when objects collide, for instance if you drop a ball? Energy cannot be created or destroyed, but can be transformed. If a ball drops, energy is transferred and transformed, in sound for instance, but the total amount of energy remains the same.

Dropping the Ball

Before dropping a ball, you must lift it up from its resting surface. When you do this, you are transferring energy from your muscles to the ball and giving the ball potential energy: the higher you lift it, the more potential energy it has.

As the ball falls towards the ground, its potential energy is transformed into kinetic energy, which will continue increasing as it gains momentum, until it finally collides with a surface.

LESSON 4

Science



Bouncing Back

Elastic potential energy is what causes a ball to bounce, or rebound, because it is transformed into kinetic energy, which is then used to bring the ball back up. However, the ball won't get as high as where it started from, because some of its energy has been transferred to the floor or transformed into sound (in the noise it makes upon impact) and thermal energy (friction with the table).

Furthermore, even though we can't see it, as the ball hits the ground, or a table, it changes shape for a split second, which requires energy.

This is why the height of each bounce is a little less than the height of the previous one. Some of the kinetic energy the ball has when it strikes the floor is retained, but some is transformed, so each time the ball bounces it loses a bit of its kinetic energy, and after several bounces it has so little of it left that it ceases to bounce.

1. What is energy?

- A. change in motion
- B. light and heat that an object stores
- C. any work that an object does in motion
- D. the ability to do work

2. Why does the author describe what happens when a ball is dropped?

- A. to explain how energy is transformed
- B. to explain how energy is created and destroyed
- C. to explain that dropping a ball is not a real form of work
- D. to explain that the amount of energy in an object remains constant

3. The ball has less energy after it bounces than it does as it is falling to the ground. Which evidence from the text supports this statement?

- A. Elastic potential energy is what causes a ball to bounce, or rebound.
- B. Each time the ball bounces on the ground, it loses a bit of its energy.
- C. The higher the ball is lifted, the more potential energy it has.
- D. As the ball falls towards the ground, its potential energy is transformed to kinetic energy.

4. During the process of dropping a ball, when does the ball have the least amount of energy?

- A. as it is falling to the ground
- B. after the first bounce
- C. as it is being lifted in the air
- D. after the last bounce

5. What is "Dropping the Ball" mostly about?

- A. how energy is transferred when a ball is dropped
- B. how to drop a ball
- C. how potential energy is converted to kinetic energy
- D. why a ball changes shape for a split second after it hits the ground

6. Read the following sentence: "As the ball falls towards the ground, its potential energy is transformed into kinetic energy, which will continue increasing as it gains momentum, until it finally collides with a surface." What does the word "momentum" mean?

- A. the ability of an object to stay in one place
- B. the ability of an object to change direction
- C. the ability of an object to go slower in a certain direction
- D. the ability of an object to go faster in a certain direction

LESSON 4

Science



7. Choose the answer that best completes the sentence below. Energy cannot be created or destroyed; _____, energy can be transformed.

- A. however
- B. therefore
- C. furthermore
- D. initially

DIRECTIONS

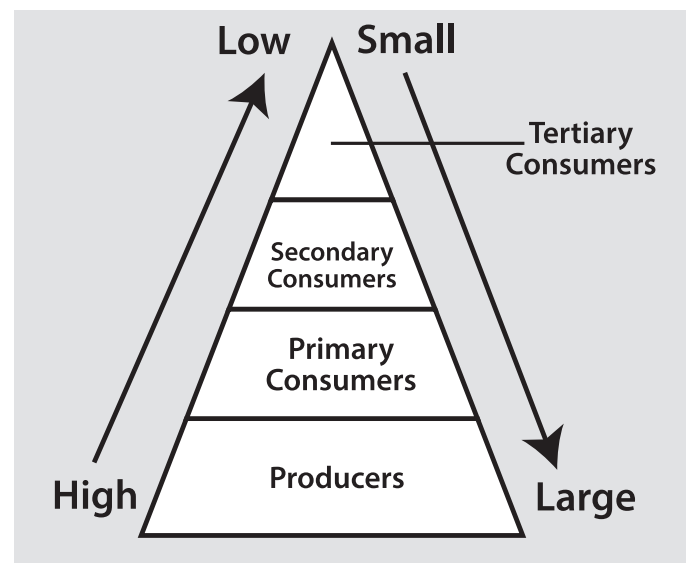
Answer questions 8 and 9 on a separate sheet of paper. Write in complete sentences. Don't be afraid of being wrong. Just put your best thoughts down on the paper. Try to use your own words in your writing.

8. After the ball hits the ground, why doesn't the ball rise to the height where it started?
9. Explain how energy is transformed when a ball is dropped. Be sure to explain:
- 1. What happens when the ball is lifted?
 - 2. What happens when a person lets go of the ball?
 - 3. What happens when the ball collides with the ground, and bounces?

DIRECTIONS

Choose the correct answer: use the charts to answer questions 10 and 11.

An energy pyramid is a graphic model of energy flow in a community. The different levels represent organisms that compose a food chain.



10. Which statement best describes the flow of energy through this pyramid?

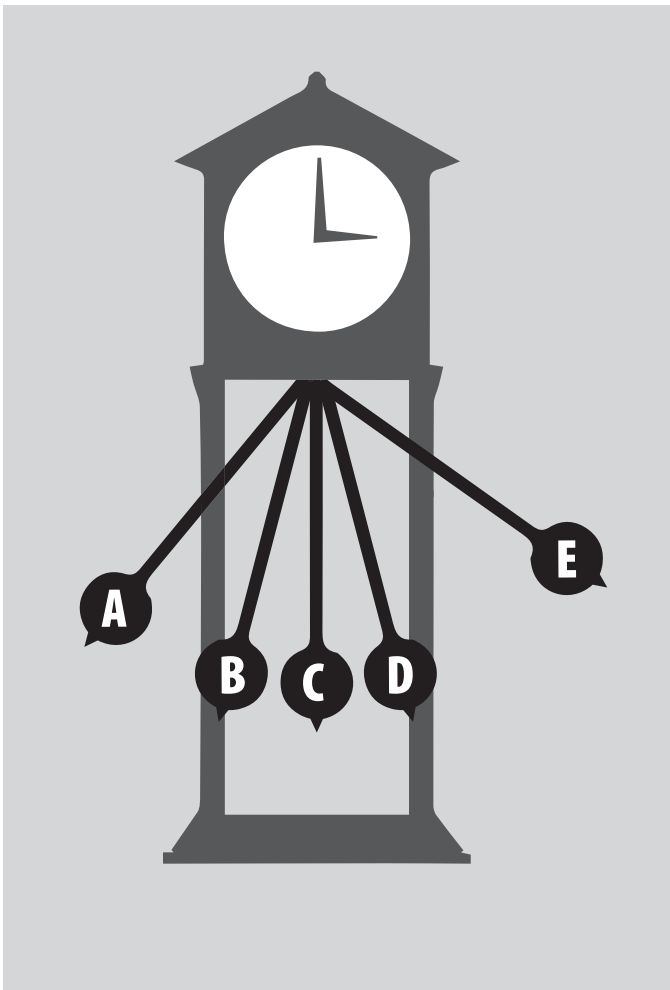
- A. All of the energy from the lower levels is available to the top level.
- B. The producer level directly provides energy for all of the other levels.
- C. The highest amount of energy is transferred between levels that contain consumers.
- D. Energy is directly transferred from the primary consumers to the secondary consumers.

LESSON 4

Science



Kinetic energy is the energy of motion and **potential** energy is the energy of position. A swinging pendulum in a grandfather clock oscillates between the two forms of energy.



11. Circle which letter indicates the place where *potential* energy is greatest?

- A. B. C. D. E.

ASSIGNMENT 2

DIRECTIONS

Read the following passage and answer the questions. The italicized words are words that you may not be familiar with. If you need to, look them up in a printed or online dictionary. Vocabulary is a crucial, very important, tool to becoming a better reader.

Everyday Energy

Edward I. Maxwell

The pitcher gets into her set. Her glove and pitching hand come together by her chin, and she then lowers them to her belt. She looks at the catcher and nods. She brings her front leg up and pauses, standing perfectly balanced on her back leg. Then, in an instant, she steps forward with her front leg. Her whole body lurches toward home plate and her pitching arm swings out after it like a whip. At the furthest point, when a whip would crack, she lets the ball fly toward the catcher's mitt. The batter steps forward with her front leg and rotates her torso, swinging the bat with her eyes fixed on the incoming fastball.

“STRIKE THREE! BATTER'S OUT!”

Moments like these happen all across the physical world, whether on the molecular or cosmic level. Potential energy is the energy, chemical or physical, stored within an object, atom or molecule. Think about a car at the top of a roller-coaster, pausing just before it plunges into the next turn. A log resting in a fireplace just before it is about to be lit, is a *treasure trove* of potential energy. As the log burns, the connections between carbon atoms that make up the wood are being broken down, and the potential energy stored within those connections is being released as heat and light. As a comet approaches a planet or star, it slows, momentarily affected by the larger body's gravity. The potential energy builds and then reaches a breaking point, as the

LESSON 4

Science

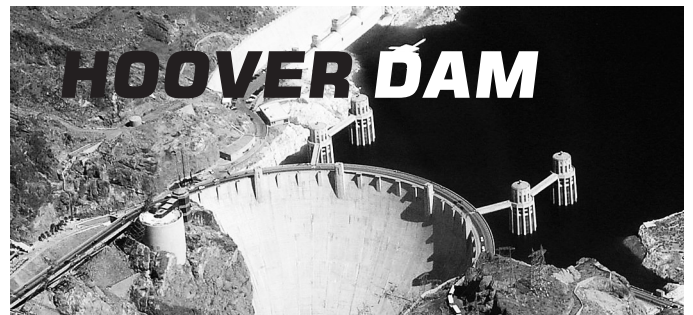


comet accelerates around the larger body and is slingshotted out the other side.

Sports showcase countless examples every day of potential energy being *converted* into kinetic energy. Kinetic energy is the energy of movement. When an archer draws and holds her arrow, her bow is brimming with stored potential energy. When she releases the bowstring, all the potential energy is quickly converted into kinetic energy, which is transferred to the arrow that takes flight. The transfer of kinetic energy from the bow to the arrow is not a perfectly efficient process. What this means is that some of the energy does not make it to the arrow. Instead, the energy might be absorbed by the archer's arm, causing it to jerk to the side when the bow twangs. The most important thing to remember is that although the transfer of energy between objects may be inefficient, the energy still exists. It has simply been transferred along a different pathway. Therefore, the total sum of energy is still conserved.

The *conversion* of stored potential energy into kinetic energy can also be harnessed to power homes, factories and entire cities. The most notable example is the Hoover Dam. The Hoover Dam is an arch-gravity dam by design. This design name is the first clue as to how exactly the dam *harnesses* energy. Located in the Black Canyon of the Colorado River, the Hoover Dam formed, and now holds back, Lake Mead—the largest *reservoir* in the United States. The dam was built toward the beginning of the *Great Depression*. Constructed between 1931 and 1936, the dam had been the subject of planning and design sessions since 1900. Deliberations included discussions of potential catastrophes, should the dam fail or the lake grow beyond expectations.

Gravity acts as a force upon Lake Mead. Held at bay by the Hoover Dam, the waters of Lake Mead and the Colorado River gain greater potential energy with each passing moment. The Arizona and Nevada spillways are two means by which the waters of Lake Mead can escape the dam. As the lake water tumbles over the walls into a spillway, potential energy is instantly converted into kinetic energy. The channels through which the water normally escapes every day are the four intake towers. These towers funnel the water through sluices, or passageways, to the powerhouse and *hydroelectric generators*. When the water reaches the intake towers and is allowed to flow down through the sluices, all the stored potential energy created by the force of gravity acting upon the water is converted into kinetic energy, just as when water flows over the wall into a spillway.



By harnessing the converted potential energy of Lake Mead, the Hoover Dam provides power to California, Nevada and Arizona. Well over a dozen turbines are housed within the power plant at the base of the dam. Electricity production varies annually depending on how much water is required downriver from the dam and the water levels of Lake Mead. The greatest amount of energy was produced during 1984; a year after floods brought the lake to its highest levels. As of 2009 the American Southwest has entered a prolonged period of seasonal droughts. As a result, compared to its peak periods of energy production, the Hoover Dam has been recently generating much less energy.

LESSON 4

Science



- 1. A rollercoaster car at the top of the hill, an archer preparing to release an arrow, and a lake that sits above a dam are all examples of what kind of energy?**
 - A. potential energy
 - B. kinetic energy
 - C. gravitational energy
 - D. consumption of energy
- 2. What does the author describe in the passage?**
 - A. the history of human energy use in the United States
 - B. the ways in which potential energy is converted to kinetic energy
 - C. the best reasons to build new dams in the American Southwest
 - D. the consequences of drought for people who rely on dams
- 3. The conversion of stored potential energy into kinetic energy can also be harnessed to power homes, factories and entire cities. Which example from the text supports this conclusion?**
 - A. the softball pitcher
 - B. the slingshotting comet
 - C. the archer
 - D. the Hoover Dam
- 4. Which of the following conclusions is supported by the text?**
 - A. Nuclear power is the most efficient kind of energy for powering cities.
 - B. Professional athletes should study the science of energy to play better.
 - C. Dams power cities by converting stored potential energy into kinetic energy.
 - D. Drought is a serious problem for farmers in the American Southwest.
- 5. What is this passage mainly about?**
 - A. The movement of comets through our solar system
 - B. The scientific forces behind our favorite roller-coasters
 - C. The unusual properties of water molecules in rivers
 - D. The conversion of potential energy into kinetic energy
- 6. Read the following sentences: “The Arizona and Nevada spillways are two means by which the waters of Lake Mead can escape the dam. As the lake water tumbles over the walls into a *spillway*, potential energy is instantly converted into kinetic energy.”**

As used in the passage, what does the word “*spillway*” mean?

 - A. A place where water flows over the top of a dam, creating energy
 - B. A place where water accidentally spills, causing problems for engineers
 - C. A place where water flows underground, into tunnels
 - D. A place where water flows into nearby farms, watering crops
- 7. Choose the answer that best completes the sentence below.**

“The conversion of stored potential energy into kinetic energy can be harnessed to power homes, factories and entire cities. _____, the Hoover Dam provides power to California, Nevada and Arizona.

 - A. Even though
 - B. Initially
 - C. For instance
 - D. However

LESSON 4

Science; Language Arts



8. How does the Hoover Dam provide power to California, Nevada and Arizona?

9. What two factors determine the energy production?

1.

2.

ASSIGNMENT 3

DIRECTIONS

Read the following passage and answer the questions on a separate sheet of paper.

ARE YOU A BULLY?

Researchers at Compass Academy have been asking this question for the last eight months, and according to a recent experiment they believe they have found the answer. Experiments show that one's propensity for being a bully is probably not the product of one's personality or background. Bullying may be a natural response to specific situations, hard-wired into the human brain. Given the right environmental conditions, anyone, even the most easygoing person, can quickly turn mean.



To arrive at this conclusion, researchers examined thirty sample populations, or "teams," consisting of twenty individuals each. In each of these teams, a leader was selected. Not just any leader would do. The population of leaders selected had to be very diverse; for example, the researchers did not want their results to be skewed because all team leaders were white males aged 15–18. Therefore, leaders were selected to represent a variety of traits. Each leader had a different age and gender, as well as different economic, social, and ethnic backgrounds.

LESSON 4

Reasoning through Language Arts



After the teams had been established, researchers began the experiment. The teams were given a goal of forming a line from shortest to tallest, using every person on the team. Sounds pretty simple, right? But there was a catch: the leader was the only one allowed to move team members into position. Absolute power was given solely to the team leader, and team members had to obey him or her no matter what. What is more, in order to incentivize the teams, they were told that a \$2000 prize was to be awarded to the team that managed to form a perfect line in the least amount of time.

Given the relatively large team size, there was almost always a case in which the leader had to make a tough decision regarding who was taller. And, upon the decision, there was likely disagreement on behalf of the team members. Given that a \$2000 payoff was at stake, things often became rather heated. In the shuffle, it was not uncommon to hear team members utter such criticisms as, “Great, we’re never going to win now,” and “Who picked our team leader?” Researchers found that in roughly 80% of all cases in which such remarks were made, the team leader immediately entered bully mode, disparaging ornery team members with remarks such as “Shut up,” and “Just do what I say and keep your mouth shut, okay?” In one such occasion, the team leader was recorded saying, “There’s a reason I’m the boss here, buddy,” when in actuality, there wasn’t. In a particularly tense exchange, the team leader was overheard asking the team member if he “wanted to get hurt”—a classic bullying tactic—and researchers were forced to intervene. Unsurprisingly, this group did not win the prize.

What are we to glean from such a study? The belief that some people are born bullies is certainly shaken; it seems anyone can be a bully, no matter his or her background. So the next time you feel the bully within yearning to come

out, don’t let it. If you see someone else being a bully, don’t judge him or her so quickly. Instead, realize that their bullying behavior doesn’t just come from within. Rather, one study shows that it may very well come from without.

- 1. Based on its use in paragraph 1, it can be inferred that the word *propensity* belongs to which of the following word groups?**
 - A. inclination, proclivity, tendency
 - B. decision, action, affirmation
 - C. ability, aptitude, capacity
 - D. tug, gravity, pull
- 2. Based on information in the passage, it can be understood that something that is “hard-wired” into the brain is**
 - A. attached to the brain via physical wires
 - B. a result of one’s environment
 - C. a product of the imagination
 - D. an inborn trait
- 3. Which of the following sentences from the passage best summarizes the main idea of the passage?**
 - A. “Researchers at Compass Academy have been asking this question for the last eight months, and according to a recent experiment, they believe they have found an answer.”
 - B. “Given the right environmental conditions, anyone, even the most easy going person, can quickly turn mean.”
 - C. “One team leader was actually recorded saying, ‘There’s a reason I’m the boss here, buddy’ when in actuality, there wasn’t.”
 - D. “The belief that some people are born bullies is certainly shaken; it seems anyone can be a bully, no matter his or her background.”

LESSON 4

Reasoning through Language Arts



4. In paragraph 2, the author writes, “The population of leaders selected had to be very diverse; for example, the researchers did not want their results to be skewed because all team leaders were white males aged 15–18.” Given the context of this quotation, it can be understood that the author means to say that the researchers wanted to
- A. ensure that their experiment was designed to test whether personality traits had a general correlation with bullying
 - B. avoid the risk of failing to include a certain social demographic in their experiment
 - C. eliminate the possibility that the public would view their experiment as racially prejudiced and therefore invalid
 - D. guarantee that no certain leader would feel excluded or left out
5. As used in paragraph 4, the word *disparaging* most nearly means
- A. inflicting physical harm
 - B. verbally abusing
 - C. challenging
 - D. firmly replying
6. Do you agree with the conclusion presented

DIRECTIONS

Use a separate sheet of paper to answer question 6.

Write in complete sentences.

in this passage? Why or why not? Explain. Use *evidence* from the passage to support your answer.

Evidence is something that shows that something else is true.

ASSIGNMENT 4

DIRECTIONS

Choose the best word(s) to complete the sentences.

1. Though Peter did not appear to be particularly _____, he was easily the _____ player on the team.
 - A. brawny ... strongest
 - B. athletic ... frailest
 - C. husky ... bravest
 - D. delicate ... densest
 - E. intelligent ... fastest
2. In order to _____ discussion about the novel, the teacher asked his students a series of questions about its themes.
 - A. advocate
 - B. hasten
 - C. aggravate
 - D. facilitate
 - E. perplex
3. Though the attorney did not directly state that the witness was a liar, the jury was able to _____ that the witness was not _____.
 - A. understand ... valuable
 - B. imagine ... scandalous
 - C. infer ... trustworthy
 - D. deduce ... likeable
 - E. impose ... honest
4. The helicopter _____ over the scene of the accident and lingered at a low altitude.
 - A. soared
 - B. hovered
 - C. excelled
 - D. collided
 - E. stormed

LESSON 4

Reasoning through Language Arts



ASSIGNMENT 5

Writing–Usage

Parts of Speech–Verbs I

Verbs are the part of the sentence that tells the reader what the subject is doing, thinking, feeling, or being. A sentence can have one verb or more than one.

Action verb—run, talk, play, etc.

“State of being” verb—is, are, am, was, have, etc.

Verb phrase—two or three verbs used together in a sentence to create the correct verb tense

Verb tense—present, past, future, progressive, perfect tense

DIRECTIONS

Underline the verbs or verb phrases in the sentences, and tell whether they are action verbs or state of being verbs.

1. Jim plays basketball.

2. They will return on the airplane.

3. Badger is a funny dog.

4. I have been here a long time.

5. I should have been playing the drum.

6. Go home.

Parts of Speech–Verbs II

The use of helping verbs causes certain changes in verb phrases that we need to be able to recognize. One change is the use of contractions (contractions are two or more words combined together with an *apostrophe*).

It’s a good idea to memorize the helping verbs. If you haven’t memorized them, take a few minutes to learn them.

Group 1: **is, am, are, was, were, be, being, been**

Group 2: **has, have, had**

Group 3: **do, does, did**

Group 4: **shall, will, should, would**

Group 5: **may, might, must, can, could**

DIRECTIONS

List the contractions in the following sentences.

7. I’ve done it again.

8. You aren’t going with us.

9. She’s staying to tend the kids.

LESSON 4

Reasoning through Language Arts



ASSIGNMENT 6

DIRECTIONS

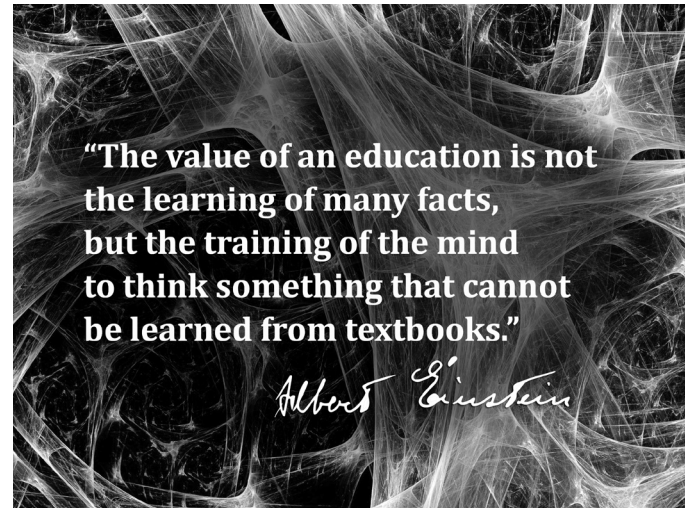
On a separate sheet of paper, rewrite and edit the following two passages for correct punctuation, capitalization, spelling, or grammar.

Dear Great-Uncle Eddie

I am excited about seeing you when you come for a visit next month we will pick you up at Greensboro Regional Airport on Saturday April 15 at 6 pm please be sure to bring a bathing suit towel and sunscreen could you also please bring the latest family photos I cant wait to see you

Love

Jay



The pursuit of independence in the later half of the 19th century in the American colonies developed slowly. As punitive and onerous laws were imposed by the British crown and parliament, resentment grew among the American colonists. In 1774 the colonists established a separate shadow government and began training troops near Boston Massachusetts. After military conflicts in 1875 at Lexington and Concord, and at the battle of Bunker Hill, the independence movement gained momentum. George Washington named Commander of the Continental Army in March, 1776 and representative of each colony meet in Philadelphia in June, 1776 to draft the historical Declaration of Independence.

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