CLN Televised Courses
GED Preparation/Science
Nina Beegle, Instructor

GED Science
Focus Sheet: Lesson 1

FOCUS:

- Life Science
  - ❖ Plant and Animal Biology

ISSUES/ACTIVITIES:

- Cell Structure
- Rain Forest - application of photosynthesis
- Life cycle/Food Chain
- Water Cycle
- Photosynthesis Experiment: Biology in the Kitchen
- Ecosystems
- Barn owls feature
- Characteristics of flowering plants

MATERIALS:

- Vocabulary Crossword
- Barn owls handout
- Wildlife background information
- Ecology information

TEXTS:

- Contemporary's GED Science:
  - ❖ Plant & Animal Biology, pp. 159-220
  - ❖ Concepts and Processes in Science, pp. 27-48
  - ❖ Ecosystems, pp. 206-207

- Steck-Vaughn's GED Science:
  - ❖ Pretest, pp. 13-31
  - ❖ Cell Structure, pp. 36-41
  - ❖ Photosynthesis, pp. 44, 48, 91
  - ❖ Evolution, pp. 74-81, 146-147
  - ❖ Ecosystems, pp. 84, 88, 89-97

SKILLS AND STANDARDS:

- SCANS
  - ❖ Workplace Competencies
    Resources: C1
    Information: C5-C7
    Systems: C15, C16

  - ❖ Foundation Skills
    Basic Skills: F1, F2, F3, F5, F6
    Thinking Skills: F7-F12

SITE FACILITATOR TASKS:

- Enroll students / send enrollments to CLN
- Give students the assignment from the text, answer questions
- Encourage students to try experiments as demonstrated or do discussions
- Ask students to record observations, evaluate results, report back
- Copy & distribute worksheets
- Correct work in textbook with answer key

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Assignment Sheet: Lesson 1

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Plant & Animal Biology, pp. 159-220				
• Concepts and Processes in Science, pp. 27-48				
• Ecosystems, pp. 206-207				
Steck-Vaughn's GED Science:				
• Pre-test, pp. 13-31				
• Cell Structure, pp. 36-41				
• Photosynthesis, pp. 44, 48, 91				
• Evolution, pp. 74-81, 146-147				
• Ecosystems, pp. 84, 88, 89-97				
Worksheets				
• Vocabulary Worksheet				
• Barn Owl Handout				
• Wildlife Handout				
• Ecology Background Worksheet				

Finish your homework before the next class.

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Lesson 1: Vocabulary Worksheet

VOCABULARY LIST

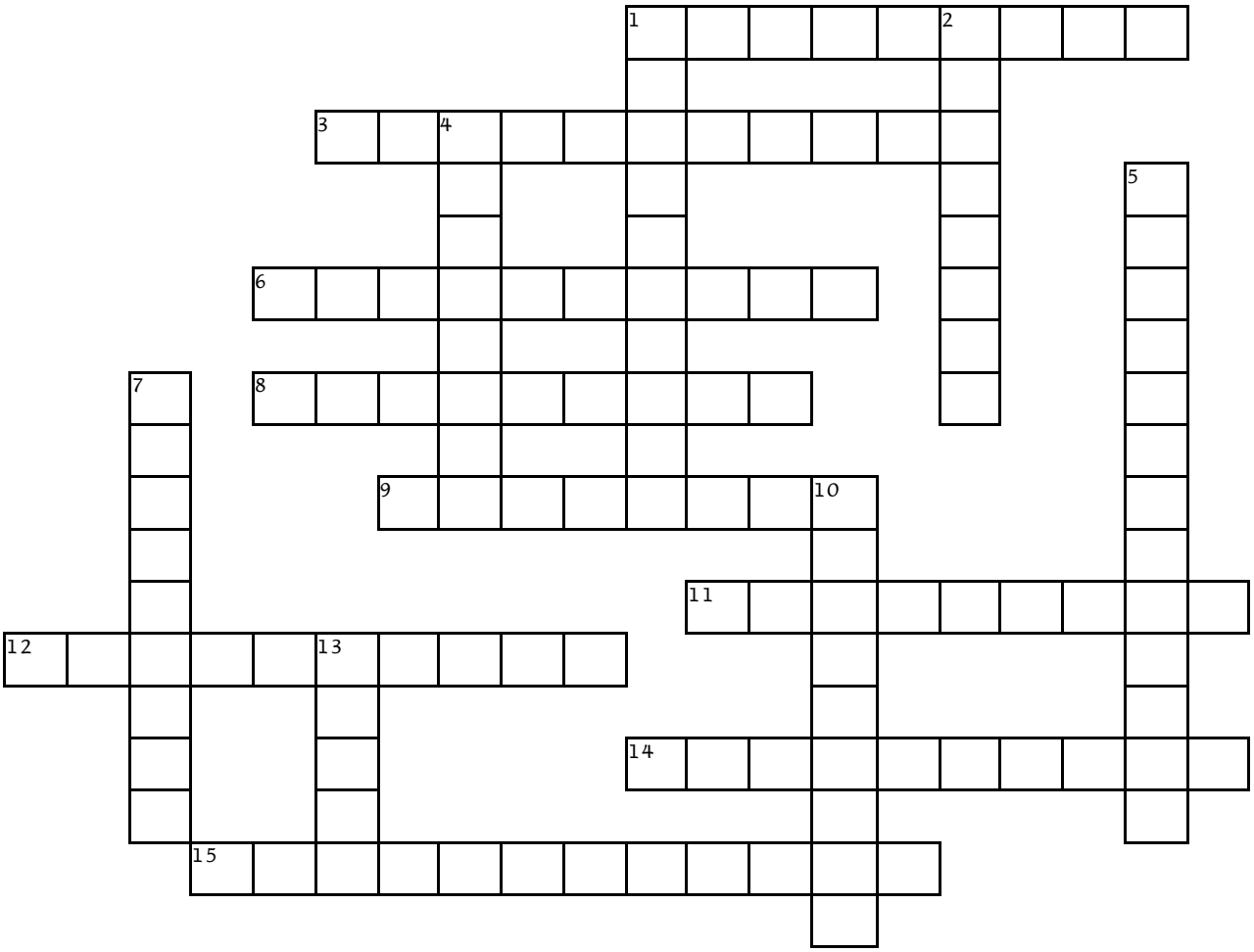
abiotic	refers to anything that is non-living
amphibian	a cold-blooded animal that hatches with water-breathing gills and develops into a adult with air-breathing lungs
asynchronously	happening at different times, not at the same time
binocular vision	seeing something with both eyes at the same time
Biology	the study of living things
biomes	this is the largest ecosystem that the earth can be divided into, such as a desert. A biome is classified by its distinctive climate and plant life.
biotic	refers to anything that is living
brood	the young of certain animals, especially birds
castings	something that is thrown away, such as molted feathers
community	a group of several populations of plants and animals that interact within the same habitat
consumer	an organism that gets energy by eating plants and/or animals
decomposers	an organism that gets energy by eating and breaking down dead plants and/or animals
ecology	the study of the relationship between organisms and their environment
ecosphere or biosphere	a self-contained system that has all the elements needed to support life
ecosystem	an ecological community and its environment that functions as a single unit
geological features	the structure of the earth's surface
hydrological cycle	the cycle of water leaving the earth through evaporation and returning to the earth through precipitation

incubation	the act of sitting on eggs to keep them at the right temperature to develop and hatch
monocular vision	seeing something with only one eye at a time
nocturnal	most active at night
organism	an individual form of life that has all the parts needed to carry out all the life processes
pinion feathers	the main flight feathers in the wing of a bird
population	a group of individuals of the same specie
precipitation	any form of water that falls to the earth's surface
producers	an organism that makes its own food by converting the energy of sunlight into carbohydrates
tropical rainforest	a specialized ecosystem that has a very hot, humid climate and a high rate of precipitation
rodents	a group of mammals, such as rabbits or mice, that have large front teeth that are good for gnawing
substratum	the layer of soil immediately below the top soil
symmetrical	something that is the same on both sides of a central dividing line
talons	the claws of birds that are designed for hunting other animals for food
terrestrial	relating to areas on land and not areas under water
transpiration	to give off vapor containing waste products (e.g. sweat)
vertebrates	an animal that has a backbone

QUESTIONS:

1. Look at the following groups of words. Underline the part of the words that is the same in each group. Do you think you know what that part might mean?
   - biosphere, biomes, abiotic, biotic _____
   - asynchronously, abiotic _____
   - ecology, ecosphere, ecosystem _____
   - ecology, biology _____
   - monocular, binocular _____

2. FILL IN THE FOLLOWING CROSSWORD:



ACROSS CLUES:

1. This gets energy by converting sunlight into food.
3. This gets energy by eating and breaking down dead plants and/or animals.
6. This is immediately below the topsoil on the earth.
8. This refers to several populations of plants and animals living in the same habitat.
9. This refers to an individual member of a specie.
11. This refers to the ability to see something with both eyes at the same time.
12. This refers to an animal that has a backbone.
14. This refers to sitting on eggs to hatch them.
15. This refers to the earth's water cycle.

DOWN CLUES:

1. This is a group of individuals of the same specie.
2. This refers to something that is thrown away.
4. This is an organism that eats plants or animals.
5. This refers to giving off vapor that contains waste products.
7. This refers to creatures that are most active at night.
10. This refers to the ability to see with only one eye at a time.
13. This can refer to young birds.

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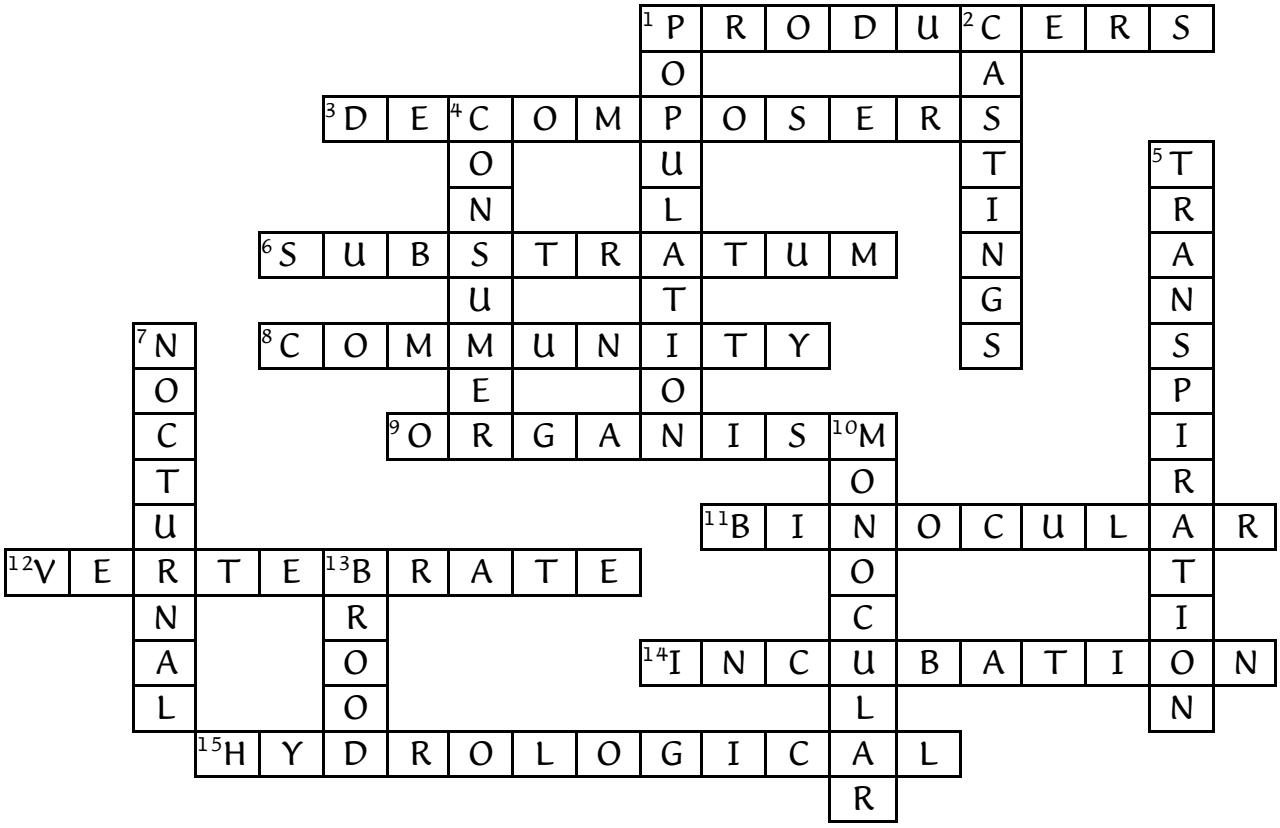
Lesson 1: Answer Key

1. VOCABULARY QUESTIONS:

. Underline the part of the words. What does that part might mean?

• bio<u></u>sphere, bio<u></u>mes, a<u>bio</u>tic, <u>bio</u>tic	Life (from Greek word for life)
• <u>a</u>synchronously, <u>a</u>biotic	Without
• <u>eco</u>logy, <u>eco</u>sphere, <u>eco</u>system	Dwelling (from Greek word for house)
• eco<u>logy</u>, bio<u>logy</u>	Study of (from Greek word for knowledge
• mono<u>cular</u>, bin<u>ocular</u>	Relating to the eye (from Latin for sight)

2. CROSSWORD ANSWERS:



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Lesson 1: Ecology Background Information

Ecology is the study of the interaction of living things with their respective environments. This includes physical factors that affect the distribution and success of living things. These physical factors include sunlight, water, air, temperature, atmospheric gases and substratum, and are not only success factors, but limiting factors as well. Physical factors do not operate independently on the organisms. Each of these factors is dependent upon one another and is important in the life processes of the organism and to the whole ecosystem.

An ecosystem is a self-sustained natural system. The two parts, the biotic or living part, and the abiotic or non-living part, are completely interrelated. Each plant and animal performs a specific function in that particular community and fills a particular niche. If one organism is destroyed, theoretically the whole ecosystem could eventually fall apart. In other words, nothing can be changed without eventually affecting the whole system.

The sun is the basic source of energy and is imperative for green plants to carry on photosynthesis. Because plants depend upon the sun for their energy, animals are directly or indirectly dependent upon the sun for their energy. Many aspects of sunlight -- intensity, duration, and wavelength -- are important in the regulation of life processes. Sunlight is also the driving factor behind weather, climate, and thus the hydrological cycle. These interact with geological features and cause different ecosystems.

Moisture is as necessary to growth as is sunlight. Without water, plants could not grow and without plants, animals could not survive. There are many adaptations in the plant and animal kingdoms to the amount of water available and temperature range. The long-term average of precipitation and temperature is called climate, which is one of the factors used to classify the major terrestrial ecosystems of the planet. These are the largest ecosystems into which the earth's land surface can be divided. They are called biomes and are named for the main type of vegetation found there. Each supports a large variety of plants and animals. However, there are ecosystems within ecosystems, and some are as small as a rock or a rotting tree branch.

The substratum, or soil, is the material in which organisms grow. The type of soil in an area determines the kinds of organisms that will be

supported, and in turn, the kinds of plants and animals help determine the types of soils found.

Ecosystems have three main biotic components. They are producers, consumers, and decomposers. The producers are green plants that make their own food. Consumers are organisms, either plants or animals, that get their food energy from other living things. Decomposers are plants and animals that live off once-living materials and cause them to rot or decay. In nature, everything works in cycles. This is true within ecosystems. Plants and animals live and die and decompose only to be recycled into new life forms again -- as the life forms decompose they become building blocks for new life forms.

Abiotic cycles are also affected by biotic cycles. As dead plants and animals decay they contribute to the carbon cycle, the nitrogen cycle and the water cycle, and they replenish the soil. For instance, carbon is found in every living thing because green plants use carbon dioxide to manufacture food containing carbon through the process of photosynthesis. The carbon is stored in the plant or passed along to consumers in the food chain. As organisms decompose, they release carbon back into the system. Another way in which organisms affect the abiotic components is the hydrological cycle. In the rainforest, for example, the trees take in great amounts of water and release it into the atmosphere in the process of transpiration. This, in turn, affects the weather conditions of the area.

If we look at all matter, it can be organized into different categories, from the smallest particle to the universe. Ecologists are concerned with five levels of the organization of matter -- organisms, populations, communities, ecosystems, and the ecosphere. A group of individual organisms of the same species is called a population, and may be local or global. Several populations, including both plants and animals, that interact together is called a community. Each organism in such a community has a habitat, which is the place where it lives. A community of living things, interacting with one another and with their physical environment, is called an ecosystem. All of the ecosystems on the planet make up a planetary ecosystem, an ecosphere or biosphere.

As we look at our ecosystems today, we can see that they are complex systems made up of interrelated connections, like a web. Although they are constantly changing and adjusting to circumstances, there is an intricate balance within each system and on the planet as a whole. The environmental problems that we face today seem to be a threat to that balance. To our knowledge, no other species within the system has had the ability to precipitate the major changes that humans have. We have degraded much of

the natural environment, our water, soil and atmosphere, to the point that we may be in a crisis situation. The population explosion of humans in recent history and the lifestyle changes we have made are straining the strands of the ecosystems. There are those who are convinced that our technology will be the answer to the problems we have made. There are others who think that we have already gone too far to repair the damage. Perhaps we are still somewhere in the middle. We are daily faced with choices that may have farther-reaching consequences than we can possibly imagine. In any event, we need to understand the intricate workings of the ecosystems in order to make intelligent decisions.

Questions:

1. How does the tone of this article change in the last paragraph? Do you agree or disagree with the author? Write a short essay explaining your opinion. Give at least two supporting reasons.

2. Look at the items listed below and decide which one of the five levels of the organization of matter they represent.

	Levels of the organization of matter		Examples
	ecosystem	a)	the earth
	ecosphere	b)	wolf pack
	population	c)	lemmings feed on the roots of grasses and clover and are eaten by foxes and owls
	organism	d)	lemming
	community	e)	all living things in the Arctic tundra

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Lesson 1: Ecology Background Information
Answer Key

Questions:

1. How does the tone of this article change in the last paragraph? Do you agree or disagree with the author? Write a short essay explaining your opinion. Give at least two supporting reasons.

   Answers may vary

2. Look at the items listed below and decide which one of the five levels of the organization of matter they represent.

	Levels of the organization of matter		Examples
e	ecosystem	a)	the earth
a	ecosphere	b)	wolf pack
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c	community	e)	all living things in the Arctic tundra

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Lesson 1 Handout: BARN OWL Tyto Alba

Courtesy of Lynn Granstrom

The barn owl is the widest ranging nocturnal bird. It is 15 to 20 inches long, with a wingspan of 43 to 47 inches, and helps man by eating rodents.

HABITAT:

Roosting sites are chosen for safety, shelter and closeness and proximity to food supply. The barn owl likes hollow trees, old barns, old church belfries and open spaces to hunt small mammals such as mice, voles, and rats.

GENERAL INFORMATION:

- The barn owl is the prey of the great horned owl. Its mottled tan and white color usually blends with the area in which it lives.
- The longest lifetime recorded for any owl is 68 years.
- The barn owl often returns to the same nesting site. One farm in England has had a pair of barn owls return to the same nesting site for 200 consecutive years. We can assume it hasn't always been the same two owls.
- Owls are often thought of as wise, but also evil and bad luck. Universally, they are acknowledged as "Messengers of Death" and they call away the soul.
- Owls have been in existence for 50 million years.

EYE SIGHT:

The eyes of owls have 10 times more rods that gather light than human eyes. This accounts for their big eye. Their eyes are in the front of the face and they have excellent binocular vision, but not monocular vision like most birds. To compensate for this, owls have more neck bones than humans, for instance, and have a greater range of motion with their heads. Their eyes dilate separately so an owl can see in sunlight and shadow at the same times.

HEARING:

The ears are slits covered by feathers that lift when the bird listens. They have the largest eardrum of any bird. The ears are not symmetrical which is an advantage in pinpointing sound. Barn owls can hunt in the total darkness by sound. The feather arrangement of the eye disks help them gather or direct sound.

TALONS:

Owls have one back and three forward talons, but they can move one back for a two and two arrangement, a real advantage when grabbing a rat.

NOISELESS FLIGHT:

Owls are able to fly almost noiselessly. This is because they have a large wingspread to help distribute their body weight and because they have specially designed feathers. The pinion feathers on daytime birds are much stiffer than on the owls. The owls' feathers are finely fringed at the edges and have a velvet pile on their surfaces. Noiseless ... "all the better to hear you with, my dear"... said the owl to the mouse.

FEEDING:

- Barn owls eat small mammals, small birds and some insects. In one study researchers collected 2200 barn owl pellets, which contained 99% small mammals and 1% small birds. Of the 99% small mammals, 90% were mice. In total the 2200 pellets contained 6815 rodents. (Zim, p. 41)
- In another study, out of 15,587 vertebrates recovered in pellets, 4.2% were birds, .3percent were amphibians and 95.5% were small mammals, mostly rodents. (Lavine, p. 56)
- Pellets take 8 hours to form. Owlets up to 1 month old do not regurgitate bones; they digest them for calcium. However, it seems that the parents usually tear the prey into pieces and eat the heads themselves.
- At 8 weeks the owlets are often flying but still need to be fed. Two adult owls feeding owlets will often make 20 or more feeding/hunting trips per night.

THE BROOD:

- Barn owls lay between 4 and 7 eggs. Eggs are laid from April to June. Sometimes they have two broods in a season. Incubation is 32 - 34 days. The eggs hatch asynchronously (at intervals, not at the same time). If there is not enough food the first born owls will eat the newborn.
- The male will hunt for food for the female during incubation and both parents hunt to feed the owlets. They may mate for life.
- Owls are not nest builders. They either find an old nest of another bird or just lay their eggs on a board in a barn. They surround the eggs with castings.

OWL SLANG (Sparks and Soper, p. 171):

Owl: a harlot (obsolete, 19th century)
To owl: to smuggle (c. 1750 - 1820, an owler was a person or vessel engaged in smuggling sheep and wool from England to France).
To walk by owl light: to fear arrest (c. 1650 - 1700).
To owl: to sit up at night (1890's onward, now obsolete).

Take the owl: to become angry (18th - mid 19th centuries).
Current slang: *nightowl, owlly, wise as an owl...*

BIBLIOGRAPHY:

Angell, Tony (1974). Owls. Seattle: University of Washington Press.

Burton, Jan & Taylor, Kim (1983). Nightwatch. New York: Facts on File.

Lavine, Sigmund A. (1971). Wonders of the Owl World. New York: Dod, Mead and Co.

Sparks, John, & Soper, Tony (1970). Owls, their Natural and Unnatural History. New York: Taplinger Pub. Co.

Zim, Herbert S. (1977). Owls. New York: Morrow.

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Lesson 1: Wildlife Background Information

Wildlife includes all forms of animals, from the smallest to the largest, and vegetation, that exist in a natural, undomesticated state. The environment and its physical features determine which species of wildlife end up forming a community. Wildlife populations are dynamic. Changes in plant communities, microclimate, topography, and other ecological activities occur daily within a community, and affect wildlife populations. Food, water, shelter, and space also regulate the kind and number of species able to inhabit a certain area.

Wildlife populations are dependent upon the quality of their habitat. Some habitats have a higher capacity to support wildlife than others because of an abundant food supply, more space, more accessibility to water, or a more diverse vegetative growth that is suitable for shelter or protection.

Wildlife species are interdependent with one another as well as with their environments. If one species is removed, the balance of the environment is upset. All animals interchange energy with each other and their environments. Plants derive their nourishment from the soil, the air and the sun. The animals in the area derive their nourishment from these plants as well as other animals. In turn, each animal helps other animals of the area satisfy specific needs. Animal droppings help fertilize the soil, which in turn goes into plant growth and becomes food for other animals. These factors help keep wildlife species in balance within the community in which they live. Consequently, one species usually does not overpopulate a community. However, when environmental changes occur within an area, the organisms are affected. If the change is brought about quickly, species that cannot adapt die out and possibly become extinct.

Animal reproduction is kept in balance by environmental factors. Heavily preyed upon animals reproduce more prolifically than others. Natural processes such as, predation, starvation, disease or accidents dispose of the population surplus. If any of these factors is diminished, populations will increase. Sooner of later, the balance will be restored because of mortality.

Unfortunately, humans have caused the biggest upset to the ecosystem. We have caused havoc in the rest of the natural world by destroying habitats when harvesting or mining natural resources, converting natural lands to human dwelling

areas (development), and by widespread pollution. Many animals are endangered and possibly facing extinction, as a result of some of man's negative interventions with the natural environment.

Questions:

1. According to the above passage, plants derive their nourishment from:
   a) the air, the sun, and small insects
   b) the soil, the air, and the sun
   c) the sun, the soil, and other plants
   d) the sun, the soil, and small insects.
2. When the incidence to an animal population of predation, starvation, disease, or accidents decreases, the population will tend to
   a) decrease
   b) increase
   c) increase or decrease, depending on the specific species
   d) remain stable, as long as there is at least some vegetation available for food

For further information look at the following websites:

http://www.nwf.org/wildlife/
http://www.wildlifeforever.org/states.html

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Lesson 1: Wildlife Background Information (Key)

Answers:

1. According to the above passage, plants derive their nourishment from:
   a) the air, the sun, and small insects
   b) the soil, the air, and the sun
   c) the sun, the soil, and other plants
   d) the sun, the soil, and small insects.
2. When the incidence to an animal population of predation, starvation, disease, or accidents decreases, the population will tend to
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GED Science
Focus Sheet: Lesson 2

FOCUS:

- Life Science: Plant animal and human biology and applying science concepts
- Photosynthesis: backyard experiment
- Ecosystems: Rainforest

ISSUES/ACTIVITIES:

- Introduction to Genetics
- The Human Body Systems
- The Brain
- Nature vs. Nurture

MATERIALS:

- Worksheets:
  - Lesson 2 vocabulary
  - Rainforest worksheet
  - Biology in the Kitchen: Activity 1
  - The Human Brain
  - Fetal Alcohol Syndrome handout

TEXTS:

- Contemporary's GED Science:
  - Ecosystems, pp. 206-207
  - Human Biology, pp. 221
  - The Human Brain, pp. 225-228
  - Applying Science Concepts, pp. 49-66

- Steck-Vaughn's GED Science:
  - Genetics, pp. 50-57
  - Human Body Systems, pp. 58-65
  - The Brain (Nervous system), pp. 66-73

SKILLS AND STANDARDS:

- SCANS
  - Workplace Competencies
    Resources: C1, C3
    Information: C5, C7

Systems: C15
- ❖ Foundation Skills
  Basic Skills: F1-F6
  Thinking Skills: F7-F12

- CASAS
  - ❖ Health:
    3.1.1 identify body parts/systems
    3.4.5 recognize problems associated with drugs and tobacco
    3.5.9 identify practices that promote physical well-being

SITE FACILITATOR TASKS:

- Assign homework and copy, distribute handouts
- Encourage students to do science activity
- Encourage students' participation during class and in additional study

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Assignment Sheet: Lesson 2

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Ecosystems, pp. 206-207				
• Human Biology, pp. 221				
• The Human Brain, pp. 225-228				
• Applying Science Concepts, pp. 49-66				
Steck-Vaughn's GED Science:				
• Genetics, pp. 50-57				
• Human Body Systems, pp. 58-65				
• The Brain, pp. 66-73				
Worksheets				
• Vocabulary Worksheet				
• Rainforest Worksheet				
• Biology in the Kitchen				
• The Human Brain				
• Fetal Alcohol Handout				

Ratings

1. I felt confident doing this assignment.
2. I was able to do the assignment, but it took a long time.
3. This assignment was very challenging to me
4. I need more explanation/practice in this area
5. I never want to do this again.

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Lesson 2: Vocabulary Worksheet

1.	abstract thinking	Thought that does not relate to anything practical or applied to anything specific; theoretical thinking
2.	analytical thinking	Thought that divides ideas into parts to get a better understanding of the whole
3.	basal lobe	One of two lobes in the back hemisphere of the brain that processes information taken in through the senses.
4.	brain quadrant	One of the four sections of the thinking part of the brain
5.	circulation	Movement of the blood throughout the body
6.	concrete thinking	Thought that relates to anything practical or to information perceived by the senses
7.	development	The growth of an organism from embryo to adulthood
8.	environment	The combination of all the circumstances that surround an organism
9.	fissure	A groove that divides the brain into lobes or sections
10.	genetics	The study of heredity and how traits are transferred from one generation to the next

11.	gravity	The force that attracts objects towards the center of a massive object such as a planet
12.	hernia	A hole in the wall within the body that allows a part of an organ to stick out
13.	intuitive	The ability to sense that something is true without using rational thought
14.	manipulating	To influence, manage or control, usually through the hands
15.	metamorphosis	Transformation in the habits of an animal during normal development from embryo to adult
16.	neurological	Relating to the brain and the nervous system
17.	prenatal	Refers to the time between conception and birth
18.	respiratory	Relating to the act of breathing
19.	sequential thinking	A type of thinking which follows a planned order or sequence
20.	traits	A genetically determined feature or characteristic

VOCABULARY PRACTICE

Read the following sentences, filling in the blanks with one of the vocabulary word.

1. Biology includes many different fields of study. These include ecology, which studies the relationship between organisms and their _____, and _____, which looks at how _____ are passed from one generation to the next. Scientists

at NASA are even studying the effect of _____ on the human body.

2. When studying the human body, we look at the _____ system, which enables us to breath, the circulatory system, which allows the _____ of the blood, and the _____ system, which enables messages to travel from the brain to every cell in the body.

3. The upper section of the brain is divided into four _____ _____ by two grooves or _____. The left hemispheres of the brain specialize in _____ thinking, which divides ideas into sections, and _____ thinking, which organizes ideas into sequences. The right hemisphere of the brain is best at sensing information through _____ thinking. The frontal lobes of the brain prefers to do _____ thinking, without reference to real objects, while the _____ _____ process sensory information and have a preference for _____ thinking.

4. During the _____ of a frog, it undergoes _____, changing from an egg to a tadpole to an adult frog. Because a tadpole breathes water through gills and a frog breathes air though lungs, the frog is a good example of an _____ (this word is from the Lesson 1 vocabulary list).

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Lesson 2: Vocabulary Answer Key

VOCABULARY PRACTICE

Read the following sentences, filling in the blanks with one of the vocabulary word.

1. Biology includes many different fields of study. These include ecology, which studies the relationship between organisms and their **environment**, and **genetics**, which looks at how **traits** are passed from one generation to the next. Scientists at NASA are even studying the effect of **gravity** on the human body.

2. When studying the human body, we look at the **respiratory** system, which enables us to breath, the circulatory system, which allows the **circulation** of the blood, and the **neurological** system, which enables messages to travel from the brain to every cell in the body.

3. The upper section of the brain is divided into four **brain quadrants** by two grooves or **fissures**. The left hemispheres of the brain specialize in **analytical** thinking, which divides ideas into sections, and **sequential** thinking, which organizes ideas into sequences. The right hemisphere of the brain is best at sensing information through **intuitive** thinking. The frontal lobes of the brain prefers to do abstract thinking, without reference to real objects, while the **basal lobes** process sensory information and have a preference for **concrete** thinking.

4. During the **development** of a frog, it undergoes **metamorphosis**, changing from an egg to a tadpole to an adult frog. Because a tadpole breathes water through gills and a frog breathes air though lungs, the frog is a good example of an **amphibian** (this word is the lesson 1 vocabulary list).

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GED Science

Lesson 2: The Human Brain

The human brain is one of the most amazing organs in the body. Scientists are constantly discovering new things about the way it functions and processes information. In the 1960's and 70's, scientists learned the differences between the left and right hemispheres of the brain. Now they have discovered that the left and right hemispheres of the brain are divided by a second fissure that separates the front half of the brain from the back. Researchers have found that there are significant differences in the way the frontal and basal (back) lobes of the brain process information.

The Frontal Lobes

The frontal lobes of the brain specialize in abstract ideas. This section of the brain can think about things without any reference to real things you could touch. The Left Frontal Lobe is that part of the brain that specializes in logical thinking. It analyzes information, and sets goals and priorities. This section of the brain solves problems by analyzing the important facts and coming to the best conclusion through deductive logic (a special type of thinking).

The Right Frontal Lobe specializes in creative problem solving. It tests new ways of doing things and possible solutions to problems by manipulating constantly changing pictures in the imagination. This section of the brain is very intuitive about how things work and about overall patterns and trends.

The Basal Lobes

The basal, or back, lobes of the brain like to deal with concrete information about things it can see or touch. In fact, the basal lobes are divided into three sections that interpret information through the eyes, through the ears and through touch. The Left Basal Lobe specializes in sequential thinking. It follows schedules and procedures well, and can do something over and over with consistent accuracy. It is very concerned about keeping things in order.

Right Basal Lobe is the part of the brain that is most concerned with feelings. It is very intuitive about people, and is expert at picking up non-verbal communication such as body-language and tone of voice. It also seeks to establish harmony in all areas, including music, dress, interior design and relationships.

There are many things humans do that are very complex and involve orchestrating contributions from several parts of the brain. For example, each brain quadrant helps us use language. It was thought that language was centered in the Left Frontal lobe of the brain, and this is where the brain constructs grammar and meaning. However, it is now known that the Left Basal Lobe remembers our

vocabulary, while the Right Basal Lobe interprets tone of voice and inflection, and the Right Frontal Lobe adds gestures and facial expressions.

QUESTIONS

1. According to the above passage, language is processed in which part of the brain?
   a) the left hemisphere
   b) the left frontal quadrant
   c) the left basal quadrant
   d) all four quadrants of the brain

2. Sarah is very artistic and is constantly coming up with new ways of doing things. She says her thinking is like several movies playing in her head at once. What brain quadrant is she likely using to do this?
   a) the left frontal
   b) the right frontal
   c) the right basal
   d) the left basal

3. Rosa is an excellent typist and never overlooks details. She can be counted on to know all the rules and schedules. What brain quadrant is she likely using to do this?
   a) the left frontal
   b) the right frontal
   c) the right basal
   d) the left basal

4. John uses his intuitive understanding of people a lot in his work as a teacher. He is also a talented musician and actor. What brain quadrant is she likely using to do this?
   a) the left frontal
   b) the right frontal
   c) the right basal
   d) the left basal

5. Brad is someone who always knows what his goals are and how to prioritize things in his life so he can meet those goals. He loves to debate using deductive logic. What brain quadrant is he likely using to do this?
   a) the left frontal
   b) the right frontal
   c) the right basal
   d) the left basal

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Lesson 2: Human Brain Answer Key

QUESTIONS

1. According to the above passage, language is processed in which part of the brain?
   d) all four quadrants of the brain

2. Sarah is very artistic and is constantly coming up with new ways of doing things. She says her thinking is like several movies playing in her head at once. What brain quadrant is she likely using to do this?
   b) the right frontal

3. Rosa is an excellent typist and never overlooks details. She can be counted on to know all the rules and schedules. What brain quadrant is she likely using to do this?
   d) the left basal

4. John uses his intuitive understand of people a lot in his work as a teacher. He is also a talented musician and actor. What brain quadrant is she likely using to do this?
   c) the right basal

5. Brad is someone who always knows what his goals are and how to prioritize things in his life so he can meet those goals. He loves to debate using deductive logic. What brain quadrant is she likely using to do this?
   a) the left frontal

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Lesson 2: The Rainforest

The tropical rainforest is a highly specialized ecosystem which exists in areas that are on the equator and have a very hot, humid climate, and a great deal of rainfall. There are several rainforests around the world, but the largest and best known is the Amazon Rainforest. This ecosystem is about half the size of Europe and is one of the most diverse. It is estimated that the Amazon Rainforest has between 5 million and 30 million plants, most of which are unique to this area. The 30,000 plants that have been classified account for about 10% of all plants worldwide. In addition, scientists have identified almost 3000 species of fish and 324 types of mammals that are native to this area.

This diversity is one reason the protection of the rainforest is so important. A small area of the rainforest may contain hundreds of different species, but very few specimens of each specie. Furthermore, each specie of tree has an entire ecosystem associated with it. Often, cutting as little as one acre will destroy the habitat of dozens of plants and animals, threatening them with extinction.

One of the reasons there is such a variety of species in the rainforest is that many of them are adapted to a highly specialized environment. Many species are specialized for life in treetops, known as the canopy of the rainforest, while others dwell on the ground. Some animals depend on a specific plant. For example, one type of praying mantis looks like the petal of a pink orchid, allowing it to hide inside the flower to wait for prey. The avocado tree depends on the quetzal bird, which mainly eats avocados, to disperse its seeds. There are 900 different types of fig trees in the rainforest, and each one relies on a different specie of fig wasp for pollination. There is a type of caterpillar that only feeds on an alga that grows on the fur of sloths. The sloth, in turn, spends its entire life in the rainforest canopy, even giving birth in the treetops.

Since the plants and animals of the rainforest are so highly adapted to a specialized environment, and because species are so highly interconnected, the exploitation of the rainforest without care to conserve the ecology can have devastating consequences. One of the most tragic aspects of the deforestation is that the land under the rainforest is nutrient poor with a very shallow layer of topsoil. Most of the plants in the rainforest get their nutrients from decomposing foliage. However, once the forest is gone, the heavy rains wash away the topsoil and nutrients, so that the land is useless for farming within five years. As a result, itinerant farmers move to a new piece of land to begin the process again. Often the land they leave behind is so nutrient poor, even

when young trees are planted, the land may not have enough nutrients to allow the forest to be reestablished.

Most of the economy in the Amazon depends on extractivism, or harvesting the natural resources. Researchers are looking for ways that this type of economic activity can be sustained while preserving the rainforest.

Question

According to the above passage, the Amazon Rainforest

a) has thousands of species that can be found anywhere throughout the forest.

b) has thousands of species, most of which live in a highly specialized part of the forest

c) has very few species that are not found in other parts of the world

d) is dying because of the poor nutrient level in the soil

e) is excellent for farming

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Lesson 2: Rainforest - Answer Key

Question:

According to the above passage, the Amazon Rainforest

a) has thousands of species that can be found anywhere throughout the forest.

b) has thousands of species, most of which live in a highly specialized part of the forest

c) has very few species that are not found in other parts of the world

d) is dying because of the poor nutrient level in the soil

e) is excellent for farming

ANSWER:

b) has thousands of species, most of which live in a highly specialized part of the forest

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Lesson 2: Biology in the Kitchen: Activity #1

Plants Give Off Oxygen

Purpose: To show that plants give off oxygen.

Materials:

- bowl or tank
- pond plant
- water (preferably non-chlorinated)
- modeling clay or florist putty

Procedure:

1. Fill a bowl or glass tank with water. Put a glass or jar into the water and tip it up so that all the air escapes.

2. Place some pondweed, or other plant that grows underwater (you can get one from a pet store), in the glass without letting any air back in.

3. Turn the glass upside down in the water and set it on three small blobs of modeling clay. Make sure you leave a small gap underneath the glass.

4. Leave the tank for a few days in a warm sunny place. Watch the gas bubbling off the plant and collecting at the top of the glass. This gas is oxygen, produced by the plant as it makes food.

Observations: Watch what happens over a period of a few days. Record your observations.

Note: Record your observations or create a picture (photo or drawing) to demonstrate your findings.

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Lesson 2: The Effects of Prenatal Exposure to Alcohol

When a pregnant woman consumes alcoholic beverages, it can have devastating consequences on her unborn child. These can include a greater chance that the baby will be stillborn or born pre-maturely with a reduction in birth size and weight. There are also long-term effects from prenatal exposure to alcohol, which researchers have divided into two categories: Fetal Alcohol Syndrome (FAS) and Fetal Alcohol Effects (FAE) or Alcohol-Related Birth Defects (ARBD).

Fetal Alcohol Syndrome (FAS)

Fetal Alcohol Syndrome, the more severe of the two categories, consists of a characteristic set of symptoms. In order for a child to be diagnosed with FAS, it is required that signs from all three categories be present. These consist of the following:

- Facial Abnormalities, consisting of head circumference in lower third of percentile ranking, narrow eye slits, long, flat upper lip, underdeveloped midface, and flattened nose bridge. To be diagnosed with FAS, the child must have at least two of these. These facial abnormalities may become less distinctive as the child grows.
- Retarded rate of growth before or after birth. This means that the baby's weight, length and/or head circumference is below the tenth percentile. FAS children never catch up in size with their peers. Other physical problems, such as heart and lung and kidney problems, shortened fingers, and hernias, can also effect these children.
- Problems with the Central Nervous System. This would include neurological abnormalities, such as acute sensitivity to sound, attention problems and jitteriness. Children with FAS often have delays in development, especially in motor development. They are also more likely to have hearing and sight problems. Finally, people with FAS suffer from intellectual impairment, including difficulties in using and understanding language, memory loss, and low IQ levels. In fact, FAS may be the leading cause of mental retardation.

Fetal Alcohol Effects (FAE) or Alcohol-Related Birth Defects (ARBD)

Many children suffer from the effects of prenatal exposure to alcohol, but do not have severe enough symptoms to be diagnosed with FAS. In fact there are about twice as many people with ARBD than there are with FAS. Someone can be diagnosed with ARBD if they display one or more of the symptoms of FAS, or the same symptoms to a lesser degree. Children with ARBD often are easily distracted, disorganized and have an inflexible approach to solving problems. It is not known whether the symptoms of ARBD are less severe because the mother consumed less alcohol or drank less frequently, or because of genetic factors.

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GED Science
Focus Sheet: Lesson 3

FOCUS:

- Earth Science
- Structure of the Earth - layers and crustal plates
- Types of rocks
- Earth and volcanoes: Ring of Fire
- Geology - on land and under the sea

ISSUES/ACTIVITIES:

- The story that geology has to tell -Red Rock Cliffs of Arizona
- Ring of Fire

MATERIALS:

- Vocabulary worksheet

TEXTS:

- Contemporary's GED Science:
  - Structure of the Earth, pp. 339-352
  - Changing Earth-earthquakes, pp. 361-368

- Steck-Vaughn's GED Science:
  - Rock types, earth layers, volcanic activity, pp. 151-153
  - Earth Science Review, pp. 98-107
  - Earth Layers, pp. 110-117
  - Earthquakes, pp. 118-125
  - Earth resources, pp. 136-141

SKILLS AND STANDARDS:

- SCANS
  - Foundation Skills
    Basic Skills: F1-F5
    Thinking Skills: F7-F12

- CASAS
  - Consumer Economics
    1.1.3 interpret maps and graphs

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GED Science
Assignment Sheet: Lesson 3

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Structure of the Earth, pp. 339-352				
• Changing Earth-earthquakes, pp. 361-368				
Steck-Vaughn's GED Science:				
• Rock types, earth layers, volcanic activity, pp. 151-153				
• Earth Science Review, pp. 98-107				
• Earth Layers, pp. 110-117				
• Earthquakes, pp. 118-125				
• Earth Resources, pp. 136-141				
Worksheets				
• Vocabulary Worksheet				

Ratings

1. I felt confident doing this assignment.
2. I was able to do the assignment, but it took a long time.
3. This assignment was very challenging to me
4. I need more explanation/practice in this area
5. I never want to do this again.

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Lesson 3: Vocabulary Worksheet

VOCABULARY LIST

axis	An imaginary center line that a geometric object rotates around
condensation	The process that changes a gas into a liquid
erosion	The process that wears away a material, such as soil, a little at a time
evaporation	The process that changes a liquid into a gas
galaxy	A large group of stars, dust and gas that form part of the universe.
hemisphere	Half of a sphere (a geometric shape)
igneous	Rocks formed from lava
metamorphic	Rocks that are changed by extreme heat, pressure or the addition of a new substance
meteorologist	Someone who reports and forecasts the weather
orbit	Path of a celestial body (e.g. a planet) as it goes around another body
poles	The ends of the axis going though a sphere
revolution	An orbital motion around a point
rotation	To turn around on an axis
saturate	Soak or fill to capacity
sedimentary	Rocks formed from sediment deposits
solar	Relating to the sun
stalactite	An icicle-shaped mineral deposit hanging from the roof of a cave
stalagmite	A cone-shaped mineral deposit that builds up from the floor of a cave

VOCABULARY QUESTIONS

1. NOTE: SEVERAL OF THE VOCABULARY WORDS ARE USED MORE THAN ONCE IN THIS PASSAGE. The universe is made up of many galaxies which contain an average of 100 billion stars. Our sun is actually one of the stars in the Milky Way _____. The _____ system consists of nine planets that _____ the sun. The earth makes one _____ around the sun in a year. The earth spins on an _____ that goes from the north to the south _____. The earth is tilted at an angle so that the sun is closest to the earth's southern _____ in the winter months and to the northern _____ in the summer months. The earth makes one _____ each 24-hour period, creating day and night. However, the moon completes one _____ on its axis in the same time that it makes one _____ around the earth. As a result, only one side of the moon can be seen from the earth.

2. Rocks can be divided into three different classifications. They are _____, which are formed from lava, _____, which are formed from sediment and _____, which have undergone some type of change. What vocabulary word from lesson 2 does this remind you of? _____ (Note both these words are formed from the Greek words meta, which means beside or after, and morphas, meaning thing or form.)

3. What is the difference between stalactites and stalagmites?

4. When I make soup in the winter, I notice that I get water droplets forming on my kitchen windows. Write a brief essay explaining why this happens, using the following vocabulary words: condensation, evaporation, and saturate.

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Lesson 3: Answer Key

VOCABULARY QUESTIONS

1. (NOTE: SEVERAL OF THE VOCABULARY WORDS ARE USED MORE THAN ONCE IN THIS PASSAGE.) The universe is made up of many galaxies which contain an average of 100 billion stars. Our sun is actually one of the stars in the Milky Way Galaxy. The Solar system consists of nine planets that orbit the sun. The earth makes one revolution around the sun in a year. The earth spins on an axis that goes from the north to the south poles. The earth is tilted at an angle so that the sun is closest to the earth's southern hemisphere in the winter months and to the northern hemisphere in the summer months. The earth makes one rotation each 24-hour period, creating day and night. However, the moon completes one rotation on its axis in the same time that it makes one revolution around the earth. As a result, only one side of the moon can be seen from the earth.

2. Rocks can be divided into three different classifications. They are igneous, which are formed from lava, sedimentary, which are formed from sediment and metamorphic, which have undergone some type of change. What vocabulary word from lesson 2 does this remind you of? Metamorphosis Note that both these words are formed from the Greek words meta, which means beside or after, and morphas, meaning thing of form.

3. What is the difference between stalactites and stalagmites?
   Stalactites are formed down from the roof of a cave.
   Stalagmites are formed up from the bottom of the cave.

4. When I make soup in the winter, I notice that I get water droplets forming on my kitchen windows. Write a brief essay explaining why this happens, using the following vocabulary words: condensation, evaporation, and saturate.

   Answers will vary but should include:

   liquid evaporates from the pot
   air gets saturated with water vapor
   water droplets condense on the cold windows

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GED Science
Focus Sheet: Lesson 4

FOCUS:
- Earth Science: The Earth in Space
- Planets and the Solar System
- Gravity, orbits and Newton's Laws of Motion
- Human Body in space

ISSUES/ACTIVITIES:
- Planet's game, Solar system videotape
- NASA tape of Newton's Law and orbits

MATERIALS:
- Planet Puzzle & Earth in Space worksheet

TEXTS:
- Contemporary's GED Science:
  - ❖ Earth and Space Science, pp. 369-385
- Steck-Vaughn's GED Science:
  - ❖ Earth in Space Science, pp. 142-150

SKILLS AND STANDARDS:
- SCANS
  - ❖ Workplace Competencies
    Resources: C1
    Information: C5-C7
    Interpersonal: C9, C10, C12, C13
  - ❖ Foundation Skills
    Basic Skills: F1-F6
    Thinking Skills: F7-F12

SITE FACILITATOR TASKS:
Encourage students to do additional activities

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Assignment Sheet: Lesson 4

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Earth and Space Science, pp. 369-385				
Steck-Vaughn's GED Science:				
• Earth in Space Science, pp. 142-150				
Worksheets				
• Planet Puzzle				

Ratings

1. I felt confident doing this assignment.
2. I was able to do the assignment, but it took a long time.
3. This assignment was very challenging to me
4. I need more explanation/practice in this area
5. I never want to do this again.

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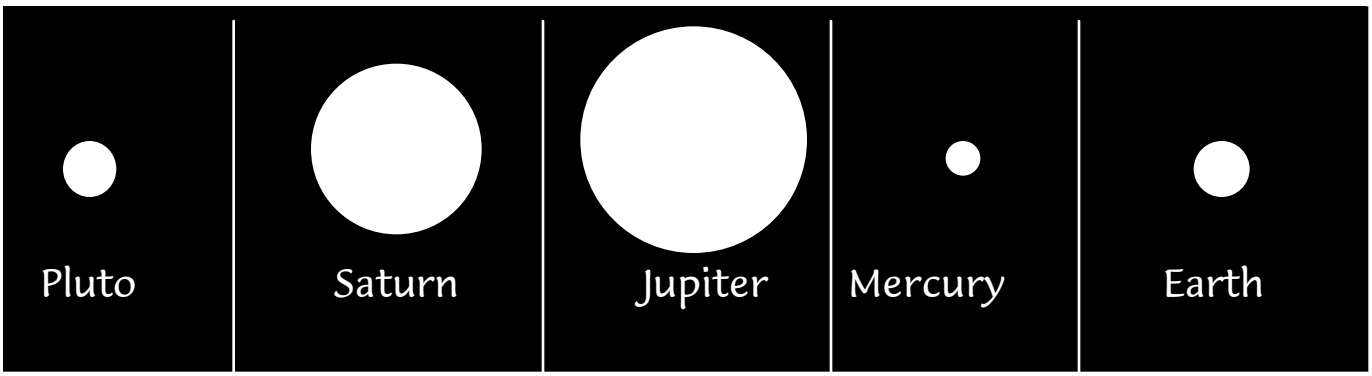
Lesson 4: Planet Puzzle Activity/Earth Science

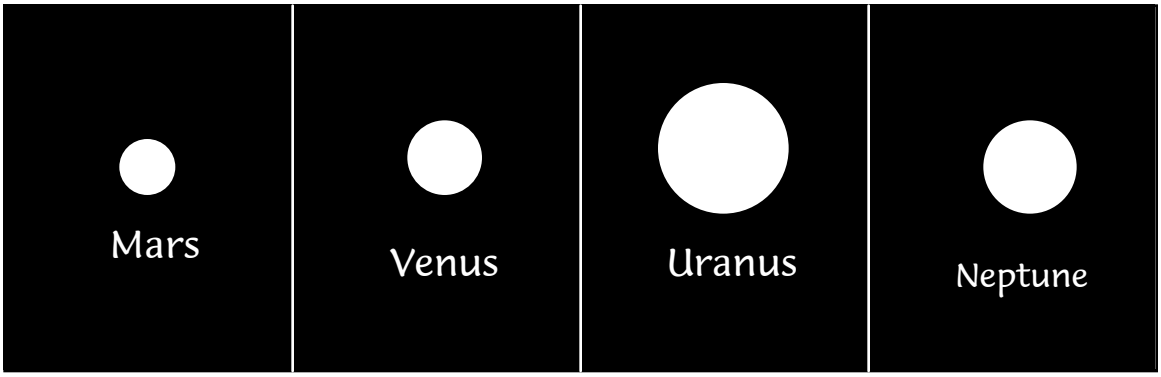
Activity: Problem Solving. Arranging the planets in order according to their distance from the sun.

Skills:
- Teamwork
- Problem solving
- Evaluating information
- Sequencing

Instructions:
1. Cut apart the clue cards and distribute among the students.
2. Each card contains 2 clues. Students should take turns reading the clues on their card to the group. (Do not show them to the others.)
3. Cut the planet cards apart and begin to arrange them in order according to the information on the cards.
4. Check solutions with answer key.

REMEMBER: This is a group project. If you already know the answer, let the group figure it out.





Clue Card #1 • The planets that are furthest from the sun are, in alphabetical order, Jupiter, Neptune, Pluto, Saturn & Uranus. • The largest planets have a lower density than the smaller plants.	Clue Card #2 • The planets closest to the Sun are, in alphabetical order, Earth, Jupiter, Mars, Mercury & Venus. • When astronomers first observed Uranus they thought it had an irregular orbit, but a mathematician proved they were actually seeing two planets: Uranus and the more distant Neptune.
Clue Card #3 • Uranus is between Pluto and Saturn. • Mars, Mercury, Pluto and Venus are called terrestrial planets because their composition is similar to earth.	Clue Card #4 • The Egyptians observed that Mercury and Venus were the only planets between the Earth and the Sun. • Neptune is further from the sun than Saturn.
Clue Card #5 • There is only one planet between Pluto and Uranus. • If you traveled from Mercury to Pluto, you would pass by seven planets.	Clue Card #6 • The Romans were only aware of the six planets closest to the Sun: Earth, Jupiter, Mars, • The earth is 93 million miles from the sun.

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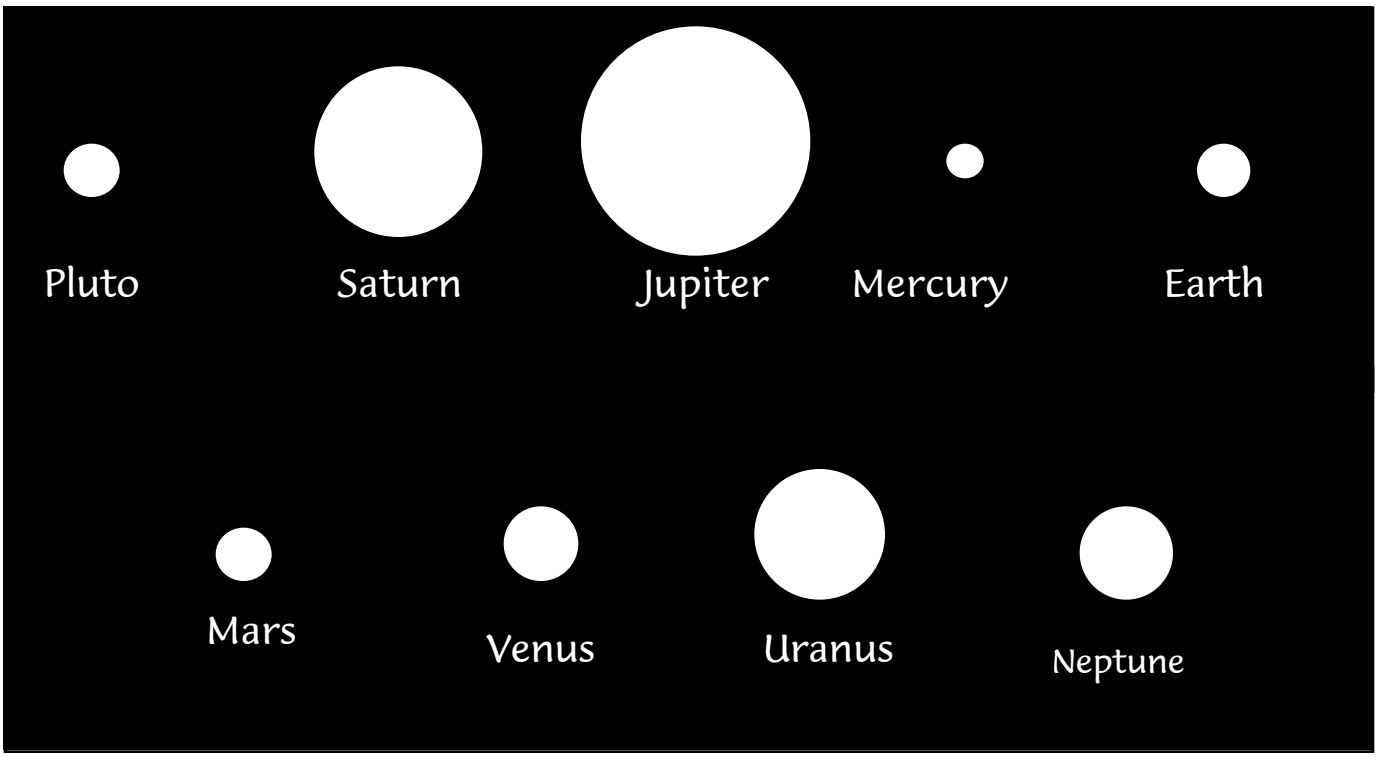
Lesson 4: Planet Puzzle Activity (Key)

Activity: Problem Solving. Arranging the planets in order according to their distance from the sun.



Answer:

1. Mercury
2. Venus
3. Earth
4. Mars
5. Jupiter
6. Saturn
7. Uranus
8. Neptune
9. Pluto

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GED Science
Focus Sheet: Lesson 5

FOCUS:

- Earth Science: Weather and Climate
- Seasons of the Earth
- Weather and meteorology

ISSUES/ACTIVITIES:

- Vocabulary
- Visit with meteorologists at the US Weather Service
- Seasons demonstration
- Science in the Kitchen: making rain
- Rain shadow effect, deserts

MATERIALS:

- El Nino - Vocabulary / Worksheet
- Earth Science in the Kitchen: Making Rain
- Weather Systems, Weather and Forecasts worksheets

TEXTS:

- Contemporary's GED Science:
  - Earth's Seasons, pp. 356-357
  - Earth's Weather, pp. 353-355
  - Analyzing Science Material, pp. 67-94

- Steck-Vaughn's GED Science:
  - Weather and Climate, pp. 126-135

SKILLS AND STANDARDS:

- SCANS
  - Workplace Competencies
    Information: C5, C7
  - Foundation Skills:
    Basic Skills: F1-F6
    Thinking Skills: F7, F12

- CASAS
  - Community Resources
    2.3.3 interpret information about weather conditions

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GED Science
Assignment Sheet: Lesson 5

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Earth's Seasons, pp. 356-357				
• Earth's Weather, pp. 353-355				
• Analyzing Science Material, pp. 67-94				
Steck-Vaughn's GED Science:				
• Weather and Climate, pp. 126-135				
Worksheets:				
• El Nino - Vocabulary / Worksheet				
• Weather Systems, Weather and Forecasts worksheet				
• Earth Science in the Kitchen Activities (Rain in a Jar, Stalactites & Stalagmites and What causes Deltas)				

Ratings

1. I felt confident doing this assignment.
2. I was able to do the assignment, but it took a long time.
3. This assignment was very challenging to me
4. I need more explanation/practice in this area
5. I never want to do this again.

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Lesson 5: El Nino - Vocabulary / Worksheet

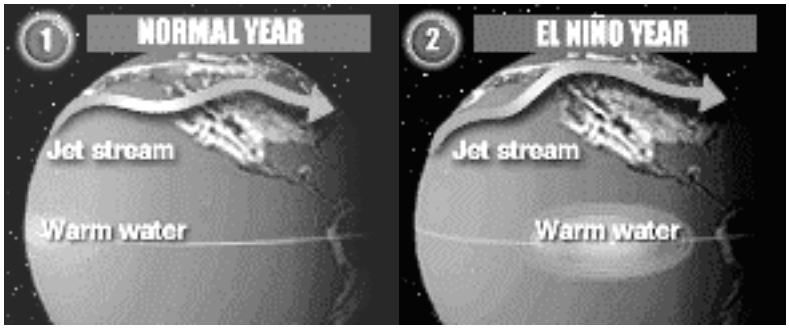
A. Match the following words with the correct definitions:

_____	La Nina	a)	Originally referred to warmer than normal sea temperatures in the Pacific Ocean off the coast of South America.
_____	El Nino	b)	A sea-saw shift in surface air pressure between Australia and Tahiti. If the air pressure is high in Australia then it is low in Tahiti, and vice-versa.
_____	ENSO	c)	"Cold event" where the waters of the Pacific are colder than normal that frequently follows a "warm event."
_____	Jet Stream	d)	Imaginary line dividing warm water on the surface of the ocean from the cold water below.
_____	Southern Oscillation	e)	Winds traveling over 57 mph at high altitudes above the earth.
_____	Thermocline	f)	Any consistent system of prevailing winds that blow at low altitudes across the surface of the earth.
_____	Tradewinds	g)	Scientists use this term to refer to a warm climatic event that happens every 2-8 years.

1. In the narrowest sense, an El Nino is a giant pool of warm water 1 1/2 times the size of the United States. Because the water is so warm, there are continuous rain and thunderstorms over an El Nino. This water is like an iceberg in that it floats on the surrounding ocean and is piled up about 150 centimeters (almost 5 feet) above sea level. Give two reasons why the El Nino water is less dense than the surrounding ocean.

2. The Pacific tradewinds near the equator push the El Nino waters against Indonesia and Australia, bringing the rainy season to these areas. However, every 2-10 years the winds are not strong enough to "hold the wall of water up, and it begins flowing back 'downhill.' Like a teeter-totter, what was high becomes low, and what was low becomes high. Water levels actually dip below sea level near Australia, and as the pile traverses the Pacific, waters rise in the east near South America. ...In a sense, El Nino is like a slow-motion explosion of pent-up heat that makes a violent killer out of a small tropical storm..." It can bring drought Australia or life-giving rains to a Chilean desert.

   From the above passage we can infer that:
   a) El Nino is caused by global warming
   b) El Nino is Spanish for "the Christ child."
   c) El Nino causes warm ocean water to flow down hill from the Western to the Eastern Pacific and back again.
   d) El Nino brings unseasonably wet weather around the world.



3. Look at this diagram of the changes in the path of the jet stream from a normal year to an El Nino year. Keeping in mind that the jet stream divides the cold Arctic air from the warm equatorial air, and that it is usually raining over El Nino waters, how do you think the weather will be affected?

   a) in Peru (on the West Coast of South America)

   b) in the continental United States

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Lesson 5: El Nino - Vocabulary / Worksheet

Answer Key

A. Match the following words with the correct definitions:

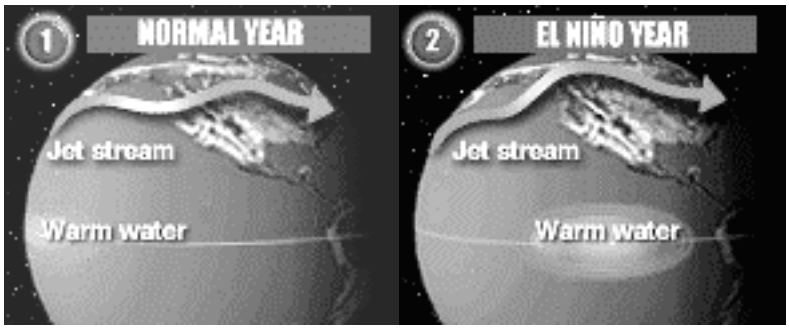
c	La Nina	a)	Originally referred to warmer than normal sea temperatures in the Pacific Ocean off the coast of South America.
a	El Nino	b)	A sea-saw shift in surface air pressure between Australia and Tahiti. If the air pressure is high in Australia then it is low in Tahiti, and vice-versa.
g	ENSO	c)	"Cold event" where the waters of the Pacific are colder than normal that frequently follows a "warm event."
e	Jet Stream	d)	Imaginary line dividing warm water on the surface of the ocean from the cold water below.
b	Southern Oscillation	e)	Winds traveling over 57 mph at high altitudes above the earth.
d	Thermocline	f)	Any consistent system of prevailing winds that blow at low altitudes across the surface of the earth.
f	Tradewinds	g)	Scientists use this term to refer to a warm climatic event that happens every 2-8 years.

QUESTIONS:

1. Give two reasons why the El Nino water is less dense than the surrounding ocean.

   Answers will vary. Possible answers might include:
   Warmer water is less dense than cooler water.
   El Nino water is less salty because of all the rain that falls on it.

2. From the above passage we can infer that:
   c) El Nino causes warm ocean water to flow down hill from the Western to the Eastern Pacific and back again.



3. Look at this diagram of the changes in the path of the jet stream from a normal year to an El Nino year. Keeping in mind that the jet stream divides the cold Arctic air from the warm equatorial air, and that it is usually raining over El Nino waters, how do you think the weather will be affected?
   a) in Peru (on the west coast of South America)
   It will be rainy in Peru when El Nino is near.

   b) in the continental United States
   It will be warmer than usual when El Nino is by South America

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Lesson 5: Weather Systems / Weather Forecasts - Worksheet

You have probably noticed that weather can change dramatically overnight. One day is hot, humid and drizzling, and the next day is clear and dry. It feels as if the air has changed. In fact, the air has changed. One large body of air has replaced another.

AIR MASSES

Large areas of air near Earth's surface take on the same temperature and moisture as the surface. For example, the air over a tropical ocean becomes warm and humid. A large body of air with a specific temperature and moisture is called an **air mass.** The term used to describe an air mass tells you where it came from. The word *continental* refers to a continent. The word *maritime* refers to the sea. There are four types of air masses:

Continental polar air masses are cold and dry. They form over Canada and the Northern United States.

Continental tropical air masses are warm and dry. They form over southwestern United States.

Maritime polar air masses form over the northern Atlantic Ocean and the northern Pacific Ocean. These air masses are cold and moist.

Maritime tropical air masses form over the Caribbean Sea, the middle of the Atlantic Ocean, and the middle of the Pacific Ocean. These air masses are warm and moist.

Air masses do not stay where they form. They may move thousands of miles. Think of a moving air mass as a large flattened bubble of air. In the United States, air masses are usually pushed from west to east by winds. As the air mass moves, it may keep nearly the same temperature and moisture.

Fronts

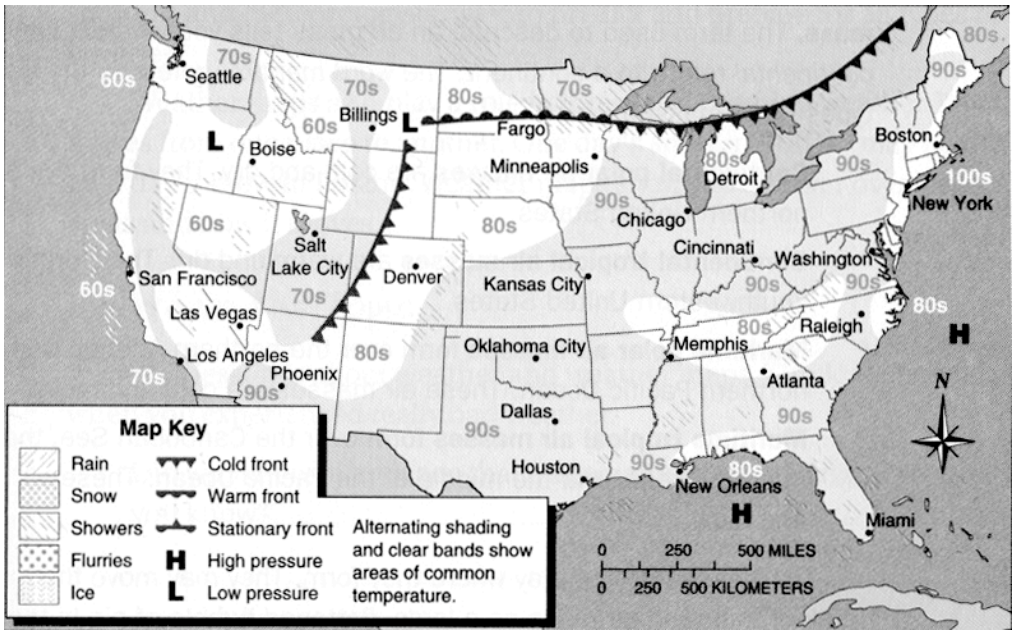
The weather changes when one air mass moves out of an area and another moves in. The leading edge of a moving air mass is called a **front**. A cold front is at the front of a cold air mass. A warm front is at the front of a warm air mass. The weather can change quickly when a front passes through. A front often brings rain or snow to an area as it passes. When air masses stop moving for a while, the zone between them is called a **stationary front**.

What does a Weather Map Show?

Most newspapers print a **weather map** each day. A weather map shows where cold, warm and stationary fronts are. It shows temperature and **precipitation**, such as rain, snow, and sleet.

Weather maps also show areas of high and low pressure. These areas of pressure are important because certain types of weather go with each. Most of the time, a high pressure means fair weather and no clouds. A low-pressure area is often cloudy with rain or snow.

High Temperatures and Precipitation for June 28



Reading a Map. When you read a map, look at the title first. That gives you the main idea of the map. This map shows the weather for June 28, with high temperatures in degrees Fahrenheit, the temperature scale we usually use in the United States. It also shows precipitation. Next, look at the map key to see how information is shown. On this weather map, for example, cold fronts are shown by a line of triangles. The triangles point in the direction in which the front is moving. Finally, look at Dallas. Dallas is in the shaded area that shows places with a high temperature in the 90s. There is no precipitation shading over Dallas. On this day Dallas is very hot and dry.

Questions:

1. The symbol for a warm front looks like
   a. a row of semicircles. b. a row of triangles.

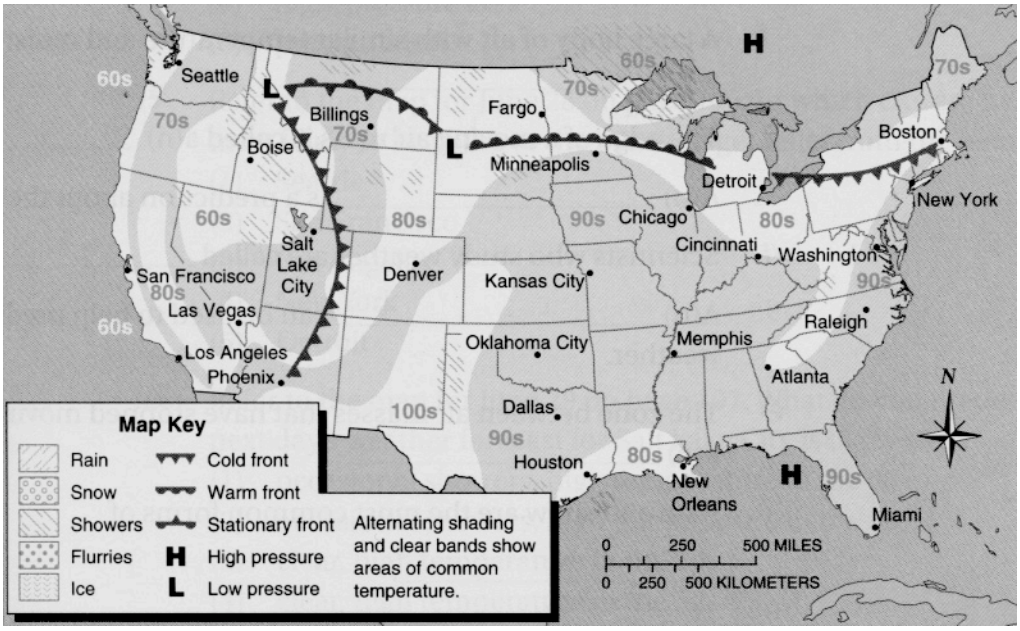
2. The city closest to a warm front is
   a. Fargo b. Chicago

3. A cold air mass is behind a cold front. The high temperature in the cold air mass over the western United States is in the
   a. 80s and 90s. b. 60s and 70s.

Weather Forecasts

Meteorologists are scientists who study the weather. Meteorologists study present weather conditions. Then they decide where the air masses and fronts will probably be the next day. From this data they **forecast,** or predict, the next day's weather. Suppose a meteorologist in Dallas studied the June 28 map. Her forecast for the next day might have said the high temperature would again be in the 90s and there would be no rain. Look at the map for June 29 below. Was the forecast correct?

High Temperatures and Precipitation for June 29



Making Predictions. Like a meteorologist, you can us what you know to predict what will happen to the weather. Look at the map for June 28. In the upper right, there is a cold front moving south toward the northeastern United Sates. Now look

at the map for June 29. The cold front has reached Boston. You can predict that soon the high temperature in the Boston area will drop from the 80s to the 70s. Use the map to answer these questions.

1. What is the weather like in New York City on June 29?

   a. high temperature in the 70s, rain
   b. high temperature in the 90s, dry

2. What kind of weather would you predict for New York City on June 30?

   a. high temperature in the 70s, dry
   b. high temperature in the 90s, rain

People often make jokes about the accuracy of weather forecasts. Yet, meteorologists are pretty good at predicting tomorrow's weather. However, their long-range forecasts are not so accurate. Many factors can affect the weather. So, forecasting more than a few days in advance involves guessing as well as predicting.

Practice Vocabulary

The words below are in the passage in bold type. Study the way each word is used. Then complete each sentence by writing the correct word.

air mass **stationary front** **front** **weather map**
precipitation **meteorologists** **forecast**

1. A large body of air with similar temperature and moisture is called a(n) _____ .

2. The edge of a moving air mass is called a(n) _____ .

3. A(n) _____ is a prediction about the weather.

4. Scientists who study weather are called _____.

5. A(n) _____ can be used to help predict the coming weather.

6. The zone between air masses that have stopped moving is called a(n) _____ .

7. Rain and snow are the most common forms of _____ .

Understand the Article

Match the air mass with its characteristics. You may have more than one answer for each air mass.

	Air mass	Characteristic
_____	8. continental polar	a. cold
_____	9. continental tropical	b. warm
_____	10. maritime polar	c. dry
_____	11. maritime tropical	d. moist

Write the answer to each question.

12. In what directions does weather in the United States generally move?

_____ .

13. Why are long-range weather forecasts often inaccurate?

_____ .

Apply Your Skills

Circle the number of the best answer for each question.

14. On a weather map, there is a line of alternating triangles and half circles pointing in opposite directions. Look at the map key on page 2. What does this symbol indicate?
    (1) cold front
    (2) warm front
    (3) stationary front
    (4) high-pressure area
    (5) precipitation

15. Refer to the map for June 28 on page 2. In which city are people most likely to be going?
    (1) Seattle
    (2) San Francisco
    (3) Los Angeles
    (4) New York
    (5) Detroit

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Lesson 5: Weather Systems/Weather Forecasts
Worksheet Answer Key

Reading a Map

Questions:

1. The symbol for a warm front looks like
   a. a row of semicircles.

2. The city closest to a warm front is
   a. Fargo

3. A cold air mass is behind a cold front. The high temperature in the cold air mass over the western Unites Sates is in the
   b. 60s and 70s.

Weather Forecasts

Making Predictions

1. What is the weather like in New York City on June 29?
   b. high temperature in the 90s, dry

2. What kind of weather would you predict for New York City on June 30?
   a. high temperature in the 70s, dry

Practice Vocabulary

1. air mass	2. front	3. forecast
4. meteorologists	5. weather map	6. stationary front
7. precipitation		

Understand the Article

Match the air mass with its characteristics. You may have more than one answer for each air mass.

8. **a, c**
9. **b, c**
10. **a, d**
11. **b, d**

Write the answer to each question.

12. from west to east

13. There are too many factors affecting the weather over a long period of time for accurate predictions to be possible.

Apply Your Skills

Circle the number of the best answer for each question.

14. On a weather map, there is a line of alternating triangles and half circles pointing in opposite directions. Look at the map key on page 2. What does this symbol indicate?
    (3) stationary front

15. Refer to the map for June 28 on page 2. In which city are people most likely to be going?
    (4) New York

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Lesson 5: Weather Systems/Weather Forecasts
Worksheet Answer Key

Reading a Map

Questions:

1. The symbol for a warm front looks like
   a. a row of semicircles.

2. The city closest to a warm front is
   a. Fargo

3. A cold air mass is behind a cold front. The high temperature in the cold air mass over the western Unites Sates is in the
   b. 60s and 70s.

Weather Forecasts

Making Predictions

1. What is the weather like in New York City on June 29?
   b. high temperature in the 90s, dry

2. What kind of weather would you predict for New York City on June 30?
   a. high temperature in the 70s, dry

Practice Vocabulary

1. air mass	2. front	3. forecast
4. meteorologists	5. weather map	6. stationary front
7. precipitation		

Understand the Article

Match the air mass with its characteristics. You may have more than one answer for each air mass.

8. **a, c**
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10. **a, d**
11. **b, d**

Write the answer to each question.

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13. There are too many factors affecting the weather over a long period of time for accurate predictions to be possible.

Apply Your Skills

Circle the number of the best answer for each question.

14. On a weather map, there is a line of alternating triangles and half circles pointing in opposite directions. Look at the map key on page 2. What does this symbol indicate?
    (3) stationary front

15. Refer to the map for June 28 on page 2. In which city are people most likely to be going?
    (4) New York

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Focus Sheet: Lesson 6

FOCUS:
- Chemistry - structure of matter, atoms
- Table of elements & molecular models

ISSUES/ACTIVITIES:
- Vocabulary - Chemistry
- Molecular model demonstration
- Periodic Table of Elements chart
- Activity: Chemistry in the Kitchen - 3 Phases of Water

MATERIALS:
- Periodic Table of Elements handout
- Chemistry in the Kitchen activities

TEXTS:
- Contemporary's GED Science:
  - Structure of Matter and Periodic Table, pp. 258-266
  - Behavior of Matter, pp. 276-278
- Steck-Vaughn's GED Science:
  - Structure of Matter (solid, liquid, gas), Atoms and Molecules, pp. 158-175

SKILLS AND STANDARDS:
- SCANS
  - Workplace Competencies
    Information: C5, C7
    Systems: C15-C16
  - Foundation Skills
    Basic Skills: F1-F6
    Thinking Skills: F7, F12
- CASAS
  - Learning to Learn
    7.2.3 make comparisons
    7.2.4 make inferences

SITE FACILITATOR TASKS:
- Help students with Periodic Table
- Copy and distribute activity sheets

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Assignment Sheet: Lesson 6

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Structure of matter and Periodic Table, pp. 356-357				
• Behavior of matter, pp. 276-278				
Steck-Vaughn's GED Science:				
• Structure of matter (solid, liquid, gas), Atoms and Molecules, pp. 158-175				
Worksheets:				
• Periodic Table of Elements • Chemistry in the Kitchen Worksheet				

Ratings

1. I felt confident doing this assignment.
2. I was able to do the assignment, but it took a long time.
3. This assignment was very challenging to me
4. I need more explanation/practice in this area
5. I never want to do this again.

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Lesson 6: The Arrangement of Elements on the Periodic Table

At first glance, it may appear the elements are arranged on the Periodic Table in a random order. However, the elements are arranged according to several principles. The purpose of this sheet is to explain some of those principles, so that you will understand the Periodic Table better. You can find the table on page 262-263 of the Contemporary's GED Science textbook or p. 168 of Steck-Vaughn's GED text.

The elements are arranged in horizontal rows, referred to as Periods, and vertical columns known as Groups. The elements in each group consistently exhibit similar values for certain properties

Group 1 is also called the alkali metal group. These are strong metals that are unusually soft and highly reactive toward oxygen and water. This means that when they are exposed to oxygen, they form oxides out of the metal, and when they are exposed to water, they form hydroxides of the metal. These elements are so reactive toward oxygen and water vapor that they are stored under an inert liquid to protect them from oxygen and water vapor.

Group 2 is called the alkaline earth metals. These metals are not as soft as Group 1 metals. They also react more mildly with oxygen to produce oxides of the metals and only react with water at temperatures high enough to create steam.

Groups 3-12 are referred to as the transition metal groups. These metals are not as predictable because of the shielding effect of the inner electrons. The shielding effect refers to the inner electrons found in the transition state elements and the inner transition or rare earth elements. The inner electrons have a tendency to block the electrical effect of the positive nucleus on the atoms outer valence electrons. This shielding effect partially explains the erratic placement of the electrons in the d and f orbitals relative to the s and p orbitals.

Groups 1-2 and 13-18 are referred to as the representative elements.

Group 17 is referred to as the halogen group.

Group 18 is referred to as the Noble gas group, previously known as the inert gas group.

There are two special series of elements; the first, called the Lathanides, occurs immediately following the metal element Lanthanum and the second, known as the Actinides, occurs right after the transition metal Actinium. These special inner transition state metals were first rearranged by Dr. Glen Seaborg in the 1950's. This arrangement was accepted because it helps to predict the properties of several newly synthesized man-made elements.

When elements are combined to form compounds (a compound consists of two or more elements that have combined in such a way that they cannot be separated by physical means) or go through chemical changes, their atoms either gain or lose electrons in a fairly predictable way. Metals, which are generally found in groups 1 to 13, tend to loose their electrons during chemical changes. Non-metals, generally found in Groups16-17 and the lower part of 15, tend to gain electrons during chemical changes. Metalloids, which are mostly in Groups 14-16, lose electrons during some chemical changes but gain electrons during others. The Noble gases are unique since they tend to neither lose nor gain electrons. There are only a handful of compounds that involve Noble Gases; the most common involve Xenon.

As you move down the periods within a group, the elements are influenced by two factors: the atom's increasing nuclear charge and the increasing shielding effect of the atom's inner electrons. Normally, one would predict that the electrons would be more tightly bound to the atom as its nuclear charge increased. However the valence shell actually moves farther away from the positive nucleus because of the increasing shielding effect of the inner electrons. This is caused by the increasing layers of electrons between the electrons in the outer valence and the nucleus. These inner electrons will shield the valence electrons from the attractive influence of the positive nucleus. As the distance between the nucleus and valance of an atom increases, it takes increasingly less energy to remove a valence electron from the atom.

As you move left in a Period or Down in a group, the following effects are observed:

- Metallic strengths tend to increase

    - Non-metallic strengths tend to decrease

- The atomic radii tend to increase. The atomic radius is the distance from the atom's nucleus to the outermost region the atom occupies. Atomic radii are used to determine the average bond length between two atoms. Generally, metallic elements have the largest atomic radii and non-metallic elements the smallest. Ionic radii of positively charged ions (cations) are always smaller than the corresponding atomic radii because the positive charge pulls the remaining electrons closer to the nucleus. On the other hand, negative ions tend to have larger ionic radii then the corresponding atomic radii because the negative charge tends to repel the electrons causing the outer shell to expand.

- The ionization potential, or the energy required to remove an electron from an atom, decreases as you move left in a period or down in a group. As you proceed to the left in a period, the nuclear charge decreases, making it easier to remove electrons from the atom.

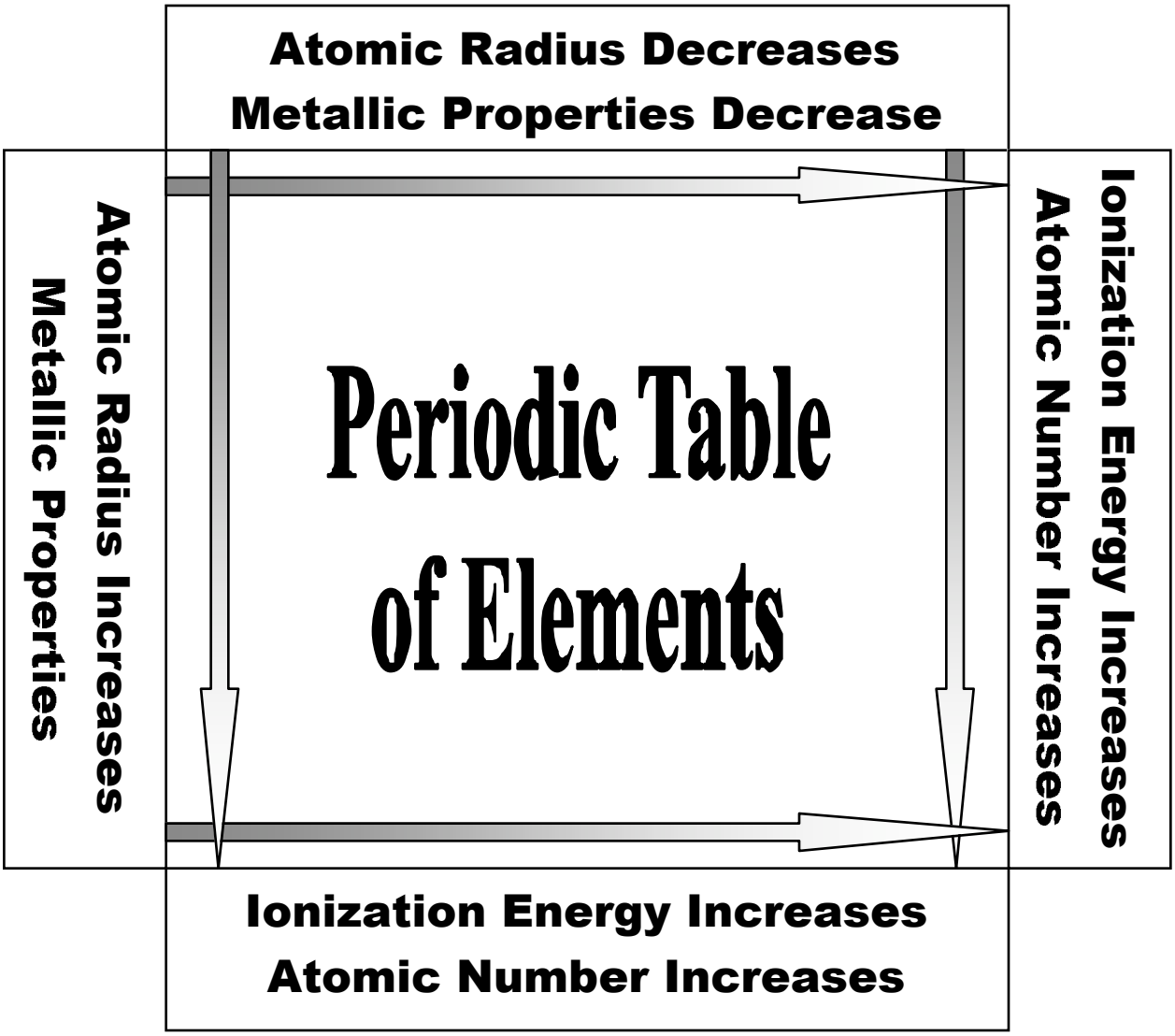
- The electron affinity (energy released when an electron is picked up by an atom) decreases.

- The electronegativity (the electron attracting ability of an atom) decreases.

Questions:

1) Metals will be found
   a) only in elements with the largest atomic radii
   b) only in Group 1 and Group 2
   c) in the left side of the periodic table
   d) in the right side of the periodic table
   (CORRECT ANSWER IS "c")

2) The energy required to remove an electron from an atom is known as
   a) electron affinity
   b) electronegativity
   c) ionization potential
   d) the Noble Gas effect
   (CORRECT ANSWER IS "c")


Atomic Radius Decreases
Metallic Properties Decrease
Atomic Radius Increases
Metallic Properties
Periodic Table of Elements
Ionization Energy Increases
Atomic Number Increases
Ionization Energy Increases
Atomic Number Increases

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Lesson 6: The Arrangement of Elements on the Periodic Table
Answer Key

Answers:

1) Metals will be found
   a) only in elements with the largest atomic radii
   b) only in Group 1 and Group 2
   c) in the left side of the periodic table
   d) in the right side of the periodic table

2) The energy required to remove an electron from an atom is known as
   a) electron affinity
   b) electronegativity
   c) ionization potential
   d) the Noble Gas effect

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GED Science
Focus Sheet: Lesson 7

FOCUS:

- Chemistry of Life
- Carbon based life forms
- Environmental concerns: the Greenhouse Effect
- Application of topic: Global Warming

ISSUES/ACTIVITIES:

- Demonstration of Greenhouse Effect (Science in the Kitchen)
- Science at work in the world: tropical rainforest

MATERIALS:

- Science in the Kitchen worksheet (Rain in a Jar / Greenhouse effect)

TEXTS:

- Contemporary's GED Science:
  - Chemistry of Life, pp. 272-275
- Steck-Vaughn's GED Science:
  - Chemical Reactions, pp. 176-181

SKILLS AND STANDARDS:

- SCANS
  - Workplace Competencies
    Information: C5-C7
    Systems: C15 & C16
  - Foundation Skills
    Basic Skills: F1-F6
    Thinking Skills: F7-F12
- CASAS
  - Learning to Learn
    7.2.2 analyze a process, cause and effect

SITE FACILITATOR TASKS:

- Discuss written passages with students
- Assist with correction of questions

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Assignment Sheet: Lesson 7

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Chemistry of Life, pp. 272-275				
Steck-Vaughn's GED Science:				
• Chemical Reactions, pp. 176-181				
Worksheets:				
• Science in the Kitchen (Rain in a jar)				

Ratings

1. I felt confident doing this assignment.
2. I was able to do the assignment, but it took a long time.
3. This assignment was very challenging to me
4. I need more explanation/practice in this area
5. I never want to do this again.

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Lesson 7: Earth Sciences in the Kitchen
Rain in a Jar / Greenhouse Effect

ACTIVITY: RAIN IN A JAR

Materials:

- green twig
- glass
- large glass jar
- oil
- water

Instructions: Place a green twig in a glass of water in sunlight. Pour a layer of oil on to the surface of the water and invert a large jar over the top of it. After a short while, drops of water collect on the walls of the jar. What does this demonstrate?

What has happened: Since the oil is impermeable, the water must come from the leaves. The water which the plant absorbs is given off into the air through tiny pores in the epidermis of the leaf. Air saturated with moisture and warmed by the sun deposits drops like fine rain on the cool glass.

Implication: What does this infer about the role of trees and plants in an environment? Name a specific example.

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GED Science
Focus Sheet: Lesson 8

FOCUS:
- Chemistry principles at work in the world around us
- Evaluating Science materials: charts, graphs and illustrations, listing pros and cons
- Using the Scientific Method

ISSUES/ACTIVITIES:
- Demonstration of "Chemistry in the Kitchen" Experiments: oxidation of metal, extinguishing fire, candle in a jar and dry-ice
- Practice test questions for each item
- Ecosystem feature: Puget Sound

MATERIALS:
- Chemistry in the Kitchen worksheet (see lesson #6)
- Handout: Mixtures, Energy and Chemical Reactions
- GED Science mini Practice Test

TEXTS:
- Contemporary's GED Science:
  - Evaluating Science materials, pp. 81-93
- Steck-Vaughn's Pre-GED Science:
  - Chemistry Review, pp. 170-175

SKILLS AND STANDARDS:
- SCANS
  - Workplace Competencies
    Resources: C1
    Information: C5-C7
    Systems: C15 & C16
  - Foundation Skills
    Basic Skills: F1-F6
    Thinking Skills: F7-F12
    Personal Qualities: F14-F17

- CASAS
  - ❖ 1.1.3, 7.2.5 evaluate a statement or process, make judgments and provide evidence

SITE FACILITATOR TASKS:

- Discuss written passages with students

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GED Science
Assignment Sheet: Lesson 8

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Evaluating Science Materials, pp. 81-93				
Steck-Vaughn's GED Science:				
• Chemistry Review, pp. 170-175				
Worksheets:				
• Chemistry in the Kitchen (see lesson 6) • Worksheet: Mixtures, energy and chemical reactions • GED Science mini practice test				

Ratings

1. I felt confident doing this assignment.
2. I was able to do the assignment, but it took a long time.
3. This assignment was very challenging to me
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5. I never want to do this again.

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GED Science
Lesson 8: Chemistry

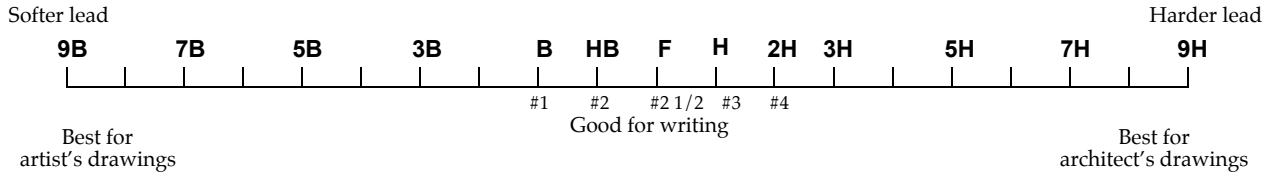
Mixtures

The "lead" in your pencil is not actually made of the metal lead. It is made mostly of a form of carbon called graphite. Graphite is very soft. As a result, anything you write with graphite will easily smudge. To solve this problem, graphite is mixed with clay.

A **mixture** is a combination of two or more substances. The properties of a mixture vary depending on the make-up of the mixture. For example, salt is salty and drinking water is not. A mixture of salt and water is salty but not as salty as salt alone. If you keep adding water to the mixture, the taste gets less salty. The property of saltiness is still there, but the amount of saltiness varies.

In a pencil, the "lead' is a mixture of soft graphite and harder clay. The mixture of the two is harder than graphite but softer than clay. The number or letters stamped on a pencil tell how hard the pencil is. The diagram below shows what the pencil codes mean.

What do the letters and number codes on pencils mean?



Fill in the blank with the word or words that best complete each statement.

1. A(n) _____is a combination of two or more substances that are combined in varying proportions.

2. The lead in a pencil is a combination of _____ and _____.

Circle the number of the best answer.

3. How is the lead in a pencil marked 9H different from the lead in a pencil marked 9B?

(1) The 9H is softer.
(2) The 9H lead is better for drawing.
(3) The 9H lead contains more clay.
(4) The 9H lead contains more graphite.
(5) There is no difference between the two.

Energy and Chemical Reactions

In a **chemical reaction**, one substance or set of substances is changed into another substance or set of substances. In this process, energy may be given off or taken in. An exothermic reaction gives off energy. Burning, or **combustion,** is an example of an **exothermic reaction**. When wood is burned, energy is given off in the form of light and heat.

Photosynthesis is a *chemical reaction* that takes place in plants. In this reaction, plants use the energy in the sunlight to turn carbon dioxide and water into glucose, a type of sugar, and oxygen. This is an example of an **endothermic reaction,** or one that takes in energy.

You may have used an instant hot pack for first aid. These plastic pouches contain chemicals. When you break the seal inside the pouch, the chemicals come together and react. The reaction is exothermic and gives off heat. Once the reaction is finished, no additional heat is given off.

There are also instant cold packs used for first aid. When the chemicals in these pouches react, they do not give heat. Instead, they take in heat. Because the reaction absorbs heat, the pouch feels cold when placed against the skin.

Fill in the blank with the word or words that best complete each statement.

4. A(n) _____ gives off energy.

5. A(n) _____ takes in energy.

6. In a(n) _____ , substances are changed into other substances.

7. One type of exothermic reaction that gives off heat and light energy is _____, or burning.

Circle the number of the best answer.

8. What is the implied main idea of the last paragraph on this page?

(1) Instant cold packs are more useful that instant hot packs.
(2) Instant cold packs feel cold when placed against the skin.
(3) The reaction in instant cold packs is exothermic.
(4) The reaction in instant cold packs is endothermic.
(5) Exothermic reactions usually feel cold to the touch.

9. Which chemical process produces the heat given off by a gas heater?
(1) a physical reaction
(2) combustion
(3) an endothermic reaction
(4) photosynthesis
(5) An instantaneous reaction

Putting Out Fires

Fire, or **combustion**, is a useful chemical reaction. However, sometimes a fire gets out of control and must be put out. There are several ways to do this. All methods of putting out a fire work by removing something the reactions needs in order to continue.

One way of putting out a fire is to take away one of the substances that is used in the reaction. The simplest way to do this is to remove the **fuel**, or the material that is burning. You do this when you turn off the gas on the stove.

In a raging fire, it is hard to remove the fuel. It is easier to remove the oxygen that is needed to keep the reaction going. A small fire can be smothered. Baking soda can be poured on a small grease fire on a stovetop. The layer of baking soda keeps oxygen away from the grease, which is the fuel. Smothering a campfire with dirt works the same way.

Another way to put out a fire is to take away some of its heat. Materials do not burn until they are heated to their **kindling temperature**. Once a fire is burning, it continues to heat its fuel to the kindling temperature. If you can take enough heat from the fuel, it will be below the kindling temperature and will not burn. This is how water puts out a campfire.

A carbon-dioxide fire extinguisher uses two methods at once. The carbon dioxide is heavier than oxygen. It makes a layer below the oxygen but above the fuel, smothering the fire. As the carbon dioxide comes out of the extinguisher, it expands rapidly. This process absorbs heat. So the carbon dioxide also cools the burning material.

Circle the number of the answer.

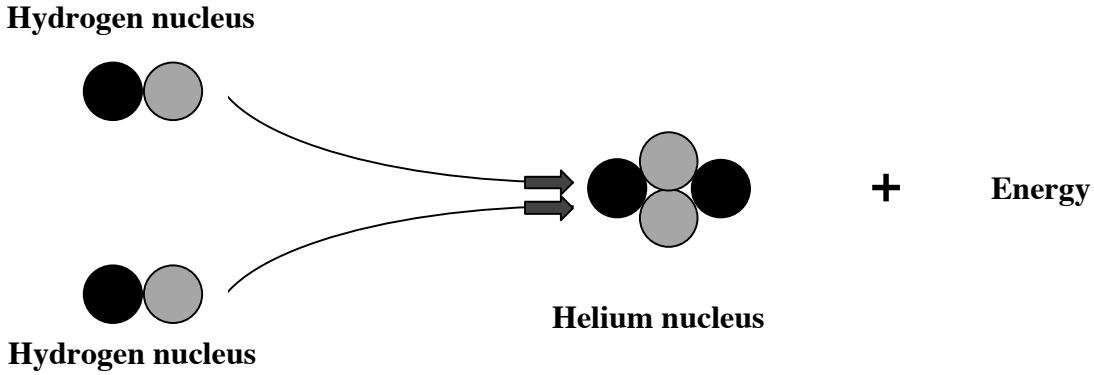
10. If you place a burning candle in a glass jar and seal the lid, the flame goes out after a few seconds. Why does this happen?
(1) The air in the jar becomes too hot.
(2) The burning candle has used up all of the oxygen in the jar.
(3) Too much carbon dioxide has built in the jar.
(4) Not enough carbon dioxide is available.
(5) The glass is not flammable.

11. A heavy blanket thrown on a small fire puts out the fire by
(1) adding carbon monoxide
(2) removing oxygen
(3) removing fuel
(4) removing heat
(5) cooling the fuel

Fusion Reactions

Nuclear Reactions are changes in the nucleus, or center, of an atom. One kind of nuclear reaction that is being studied by many scientists is fusion. **Nuclear fusion** is the reaction in which two nuclei combine. In the process, the nucleus of a larger atom is formed.

In nuclear fusion, hydrogen nuclei fuse, or join, and form a helium nucleus. A huge amount of energy is released. This reaction takes place only under conditions of great pressure and high temperature. Such conditions are found on the sun. Fusion reactions are the source of the energy that the sun gives off.



Fusion reactions do not take place naturally on Earth. There is no place on the planet as hot as the sun. Scientists are looking for ways to make fusion occur at lower temperatures. If scientists could make such "cold fusion" reactions work, they would have a powerful energy source.

Fill in the blank with the word or words that best complete each statement.

12. A nuclear reaction in which two nuclei combine is called a _____ _____ .

13. Fusion reactions take place naturally on the _____.

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GED Science
Lesson 8: Chemistry

Mixtures (Key)

Fill in the blank with the word or words that best complete each statement.

1. A **mixture** is a combination of two or more substances that are combined in varying proportions.

2. The lead in a pencil is a combination of **graphite** and **clay**.

Circle the number of the best answer.

3. How is the lead in a pencil marked 9H different from the lead in a pencil marked 9B?

(3) **The 9H lead contains more clay.** The passage states that adding clay to graphite makes the pencil lead harder. The diagram shows that 9H is the hardest kind of lead. Therefore, you can infer that 9H lead contains more clay than 9B lead.

Fill in the blank with the word or words that best complete each statement.

4. An **exothermic reaction** gives off energy.

5. An **endothermic reaction** takes in energy.

6. In a **chemical reaction**, substances are changed into other substances.

7. One type of exothermic reaction that gives off heat and light energy is **combustion** or burning.

Circle the number of the best answer.

8. What is the implied main idea of the last paragraph on this page?

(4) The reaction in instant cold packs is endothermic. The passage states that the pack feels cold after the chemical reaction takes place. Thus, the reaction takes in heat. A reaction that takes in heat is an endothermic reaction.

9. Which chemical process produces the heat given off by a gas heater?

(2) combustion A gas heater works by burning gas. The passage states that combustion is another name for burning.

Circle the number of the answer.

10. If you place a burning candle in a glass jar and seal the lid, the flame goes out after a few seconds. Why does this happen?

(2) The burning candle has used up all of the oxygen in the jar. The passage states that fuel, heat, and oxygen are needed for fire. Heat and fuel are still in the jar, so the fire must have consumed all of the oxygen.

11. A heavy blanket thrown on a small fire puts out the fire by

(2) removing oxygen. According to the article, small fires can be smothered. Throwing a heavy blanket on a fire would smother it.

Fill in the blank with the word or words that best complete each statement.

12. A nuclear reaction in which two nuclei combine is called a **nuclear fusion**.

13. Fusion reactions take place naturally on the **sun**.

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GED Science
Lesson 8: Mini-Test

GED Practice

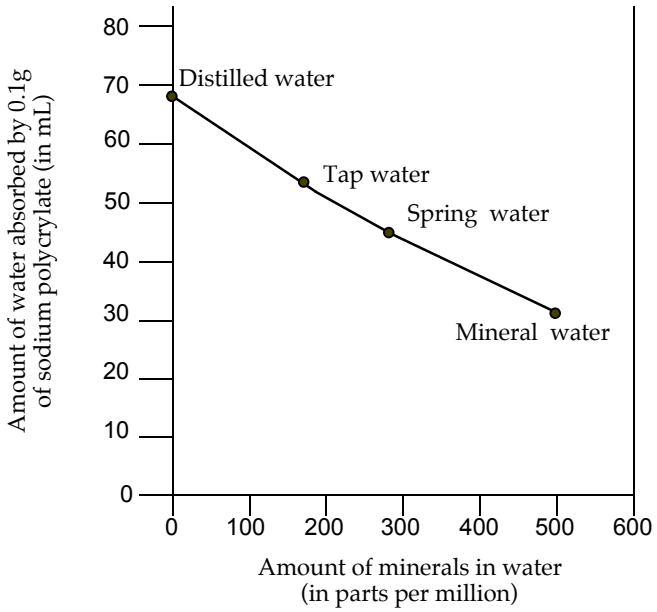
This is a 15-minute practice test. After 15 minutes, mark the last number you finished. Then complete the test and check your answers. If most of your answers were correct but you did not finish, try to work faster next time.

Directions: Choose the one best answer to each question.

Questions 1 through 4 refer to the following information and graph.

Some types of bottled water contain minerals and some do not. One way to measure the amount of minerals in water is to add a known amount of water to a known amount of a white powder called sodium polyacrylate. This powder absorbs water. The graph below compares the amount of water absorbed from four different samples of water.

Mineral Concentration in Water Samples



1. Compare the samples of water tested. Based on the graph, which sample contained the least amount of minerals.
   (1) distilled water
   (2) tap water
   (3) spring water
   (4) mineral water
   (5) Not enough information given.

2. Which of the following can you infer from the graph?
The amount of water absorbed by sodium polyacryate
(1) is the same for all types of water
(2) is lowest for tap water
(3) decreases as mineral content increases
(4) increases as mineral content increases
(5) is not related to mineral content

3. Which of the following would provide evidence that an unlabeled bottle of water contained tap water?

One-tenth of a gram of sodium polyacrylate
(1) absorbs 65 mL of this water
(2) absorbs 50 mL of this water
(3) absorbs 42 mL of this water
(4) releases 65 mL of this water
(5) releases 50 mL of this water

4. Which of the following might be a good use for sodium plyacrylate?
(1) to flavor mineral water
(2) to purify distilled water
(3) to clean up polluted water
(4) to soak up urine in disposable diapers
(5) to give off perfume in disposable towelettes

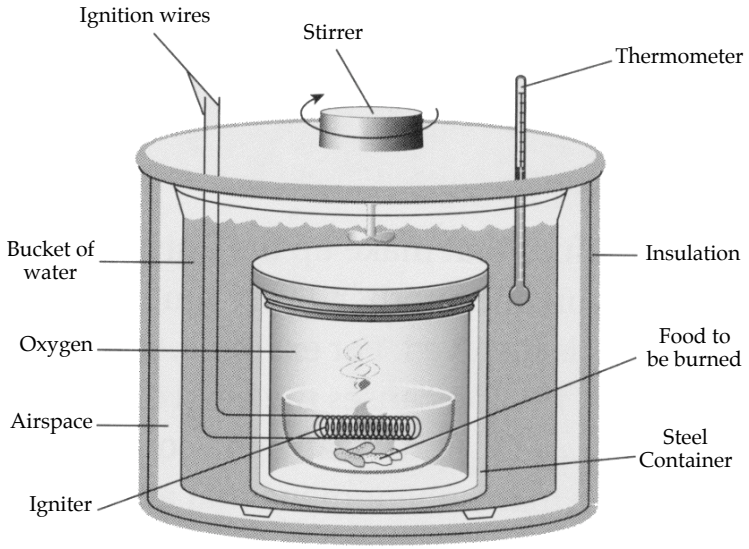
5. A student placed two solid chemicals at room temperature in a test tube and shook the test tube. After a few minutes, the test tube contained a slushy liquid and felt cold. The student concluded that the chemical reaction took in heat.
(1) The test tube contained both chemicals.
(2) The two chemicals mixed together.
(3) The solid chemicals became liquids.
(4) The test tube cooled off after the reaction.
(5) The chemicals melted from the heat.

Continued on next page

Questions 6 through 9 refer to the following information and diagram.

Calories tell us how much energy is in food. Calories are measured using an instrument called a calorimeter, shown below. The food is placed inside the calorimeter and burned. The increase in the temperature of the water surrounding the metal container indicates how much energy the food contained.

A Calorimeter



6. What inference do you need to make to fully understand this paragraph?
   (1) Calories are a measure of food energy.
   (2) A calorimeter is used to calculate the number of calories in food.
   (3) Eating too many calories can cause a person to gain weight.
   (4) A calorimeter burns food the same way that the body does.
   (5) The amount of heat produced by burning food is used to calculate calories.

7. What causes the food in the calorimeter to catch on fire?
   (1) the insulation
   (2) the igniter
   (3) the stirrer
   (4) the air in the air space
   (5) the heated steel container

8. Which of this people would be most likely to use data collected with a calorimeter?
   (1) a farmer
   (2) a restaurant owner
   (3) a nutritionist
   (4) a pediatrician
   (5) a building safety specialist

9. Which statement is a valid conclusion about high-calorie foods placed in a calorimeter?
   (1) They will not catch on fire in the calorimeter.
   (2) They will not float in the calorimeter.
   (3) They will not cause the water in the calorimeter to change temperature.
   (4) They will cause the same temperature change as will low-calorie foods.
   (5) They will cause a greater temperature change than low-calorie foods.

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Lesson 8: Mini-Test (Key)

GED Practice

1. **(1)** **distilled water** ***(Unifying Concepts & Processes: Physical Science: Analysis)*** The graph shows that of the four samples, distilled water contains the lowest concentration of minerals, with close to 0 ppm.

2. **(3)** **decreases as mineral content increases (Science as Inquiry: Physical Science: Comprehension)** The line on the graph shows that as the mineral content in the water increases, the amount of water absorbed by 0.1 g of sodium polyacrylate decreases.

3. **(2)** **absorbs 50 mL of this water** ***(Science as Inquiry: Physical Science: Evaluation)*** The graph shows the amount of water of different types that is absorbed by 0.1 gram of sodium polyacrylate. By looking at the reading for tap water, you can see that 0.1 gram of sodium polyacrylate absorbed 50 mL of tap water. So if 0.1 gram of sodium polyacrylate absorbed 50 mL of the unknown sample of water, this would be strong evidence that the unknown sample consisted of tap water.

4. **(4)** **to wick away urine in a disposable diaper** ***(Science & Technology: Physical Science: Application)*** The paragraph states that sodium polyacrylate absorbs water; urine is mostly water. Therefore, sodium polyacrylate might function well in disposable diapers to absorb urine.

5. **(4)** **The test tube cooled off after the reaction.** ***(Science as Inquiry: Physical Science: Evaluation)*** The paragraph states that the test tube felt cold after the chemical reaction. This supports the conclusion that the reaction took in heat.

6. **(5)** **The Amount of heat produced by burning food is used to calculate calories.** ***(Scientific Understanding & Skills: Physical Science: Comprehension)*** The first part of the paragraph states that calories tell us how much energy is in food and that calories are measured using a calorimeter. The last sentence says that the increase in temperature of the water in the calorimeter indicates how much energy the burning food contains. You have to infer that the

increase in water temperature that occurs when the food is burned indicates a release of a specific amount of heat, which is used to calculate the calories in the burned food.

7. **(2)** **the igniter** ***(Scientific Understanding & Skills: Physical Science: Analysis)*** The diagram sows that the food is in close contact with the igniter; the igniter raises the temperature of the food to its kindling temperature, at which point catches fire.

8. **(3)** **a nutritionist** ***(Scientific Understanding & Skills: Physical Science: Application)*** Nutritionists analyze foods and help plan healthy meals and snacks in part based on the calorie content of the food. They might use the data collected from a calorimeter to compare the calorie content of different brands of prepared foods or snacks.

9. **(5)** **They will cause a greater temperature change that will low-calorie foods.** ***(Science as Inquiry: Physical Science: Analysis)*** The paragraph states calories are a measure of food energy; from this you can infer that a high-calorie food contains more energy than does a low-calorie food. The paragraph also states that the increase in water temperature in a calorimeter is used to calculate the amount of energy (calories) in food. Thus, you can conclude that a high-calorie food, which has more energy, will cause a greater change in the water temperature than will a low-calorie food.

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Focus Sheet: Lesson 9

FOCUS:

- Physical Science - Introduction to Physics
- Properties of Motion: Newton's Law
- Energy & Force: Lever & Fulcrum
- Heat and forms of energy

ISSUES/ACTIVITIES:

- Basic physics at work in the world around us
- Lever & fulcrum demonstration
- Newton's Laws of Motion
- Laws of motion, force demonstrations

MATERIALS:

- Worksheet - Laws of Motion and introduction to physics, vocabulary

TEXTS:

- Contemporary's GED Science:
  - Motion, Force and Energy, pp. 289-314

- Steck-Vaugh's GED Science:
  - Motion and Forces, pp. 184-189
  - Force and Distance, Work and Energy, pp. 190-197

SKILLS AND STANDARDS:

- SCANS:
  - Workplace Competencies:
    Information: C5-C7
    Technology: C18
  - Foundation Skills:
    Basic Skills: F1-F6
    Thinking Skills: F7-F12

- CASAS:
  - Consumer Economics
    1.1.4 select, compute, interpret standard units of measurement

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Assignment Sheet: Lesson 9

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Motion, Force and Energy, pp. 289-314				
Steck-Vaughn's GED Science:				
• Motion and Forces, pp. 184-189 • Force and Distance, Work and Energy, pp. 190-197				
Worksheets:				
• Worksheet: Laws of Motion and introduction to physics vocabulary				

Ratings

1. I felt confident doing this assignment.
2. I was able to do the assignment, but it took a long time.
3. This assignment was very challenging to me
4. I need more explanation/practice in this area
5. I never want to do this again.

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Lesson 9: Physics Vocabulary and Newton's Laws of Motion

Vocabulary

physics:	the science of energy including the properties, interactions and changes of matter and energy
gravity:	the force of attraction that affects all matter, the degree of force between objects depends on their mass and distance apart
weight:	the gravitational pull on objects (the weight of an object can vary depending on the gravitational pull)
mass:	the amount of matter in an object (remains constant)
force:	a push or pull that acts on matter, changing an object's speed or direction of movement
acceleration:	any change in the speed of an object or its direction of motion
inertia:	the tendency of an object to keep moving or remain at rest

Newton's 3 Laws of Motion

1. Law of Inertia - If no force is applied, an object at rest will remain at rest, and an object in motion will continue to move in a straight line at the same speed unless it is acted upon by an unbalanced force.
2. Law of Acceleration - An object's speed will increase in proportion to the amount of force applied.
3. Law of Interaction: For every action, there is an equal and opposite reaction

Formula for force: F = MA

Mass, the amount of matter, times the acceleration or how fast an object changes speed, equals the force or the amount of push or pull on an object. Therefore, a smaller mass and greater acceleration results in greater momentum or faster acceleration.

Fill in the blanks with the correct term:

Isaac Newton proposed that the _____ exerted on an object can be determined by multiplying its _____ by the _____ or its speed. This formula for force implies that a baseball hit slowly and lightly with a bat will _____ as quickly as the same ball when it is hit fast and hard with the same bat. The ball responded differently, but did not change its _____.

Select the best answer for each of these questions from the Steck-Vaughn GED Science text, page 185

1. An engineer designs a racing car with a powerful engine and a lightweight body. What assumption is she making?
    a. An object at rest tends to remain at rest.
    b. An object in motion tends to remain in motion.
    c. Large force and small mass yield rapid acceleration.
    d. Large force and small mass yield constant motion.
    e. Large force and small mass yield great inertia.

2. Football teams use large, heavy players in the defense lines and smaller, lighter players in the backfield to run and catch passes. What is the assumption behind this assignment strategy?
    a. Small players accelerate quickly, while large players apply force to stop opponents.
    b. Large players tend to remain at rest, while light players tend to remain in motion.
    c. Light players can catch passes, while large players can tackle.
    d. Large players tend to move in a straight line, while light players change direction easily.
    e. The force needed to stop a large player is greater than that needed to stop a small one.

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Lesson 9: Physics Vocabulary and Newton's Laws of Motion

Answer Key

Answers:

Fill in the blanks: *force, mass, velocity or acceleration, not accelerate, mass*

Multiple choice questions:

1.) *c. Large force and small mass yield rapid acceleration. The engineer is assuming that a large engine will provide a large force, and a lightweight body will provide small mass. Application of Newton's Second Law of Motion means that the resulting acceleration will be very rapid.*

2.) *a. Small players accelerate quickly, while large players apply force to stop opponents. Therefore, the assignment of player positions relies on Newton's second law of motion.*

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GED Science
Focus Sheet: Lesson 10

FOCUS:
- Physical Science - Waves: Light, Sound and Water
- Examples of physics principles at work in the world

ISSUES/ACTIVITIES:
- Physics in the Kitchen demonstration
- Wave types in action

MATERIALS:
- Worksheet - Physics in the Kitchen: properties of waves

TEXTS:
- Contemporary's GED Science:
  - Properties of Waves, pp. 305-314
  - The Scientific Method, pp. 88-90
- Steck-Vaughn's GED Science:
  - Waves, pp. 206-213
  - Review of Physical Science, pp. 214-217

SKILLS AND STANDARDS:
- SCANS:
  - Workplace Competencies
    Resources: C1
    Information: C5-C7
    Interpersonal: C9-C12
    Systems: C15
  - Foundation Skills
    Basic Skills: F1-F6
    Thinking Skills: F7-F12
    Personal Qualities: F13-F16
- CASAS
  - Learning to Learn
    7.3.1 identify a problem and its causes

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GED Science
Assignment Sheet: Lesson 10

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Property of Waves, pp. 305-314 • The Scientific Method, pp. 88-90				
Steck-Vaughn's GED Science:				
• Waves, pp. 206-213 • Review of Physical Science, pp. 214-217				
Worksheets:				
• Physics in the Kitchen: Properties of waves				

Ratings

1. I felt confident doing this assignment.
2. I was able to do the assignment, but it took a long time.
3. This assignment was very challenging to me
4. I need more explanation/practice in this area
5. I never want to do this again.

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Lesson 10: Physics in the Kitchen / Waves: Light & Sound

INTRODUCTION: TYPES OF WAVES:

TRANSVERSE WAVE:
• Moves at right angles to the direction in which the wave travels.

LONGITUDINAL WAVE:
• Moves back and forth in same direction as the wave.

1. WATER WAVES EXPERIMENT:
   a) Purpose: to show how transverse waves move through water

   b) Supplies:
   • dish to hold water, preferably clear or transparent glass
   • water
   • fan
   • food coloring

   c) Method: Fill dish with water, add a couple drops of food coloring mix, set fan so that it blows across water. Look at water from side to watch waves form.

   d) Comment: Energy from fan (wind) is converted into wave energy and travels across the water. Water moves up and down (at right angles to the direction in which energy is traveling).

   e) Examples:
   Electromagnetic waves
   • Light waves
   • Radio & TV signals
   ***Note**: These types of waves can move through completely empty space.*

   Mechanical Waves: (transverse and compression waves)
   • Water waves

2. SLINKY EXPERIMENT:
   a) Purpose: to show how sound waves move through the air

   b) Supplies:
   • Slinky

c) Method: Stretch-out slinky and give one end a strong knock or jiggle. This will push coils near your hand into the next ones and cause a compression wave to travel down the slinky. At the other end, the compression will rebound back up the coil to your hand.

d) Comment: This compares with an echo. Sound waves push molecules in the same way.

e) Examples:
- Sound waves
- Earthquake tremors

3. SEEING SOUND:

a) Purpose: To show how sound waves act on ear drum

b) Supplies:
- cardboard tube
- plastic
- tape
- candle
- candle holder
- matches
- pin or pen
- rubber band

a) Method: Tape plastic on each end of a cardboard tube & punch a small hole in one end. Hold tube so that hole is an inch or two from a candle flame. Tap on the solid plastic end of the tube. The resulting sound waves will cause the flame to flicker.

4. LIGHT THROUGH CARDBOARD

a) Purpose: To see that light waves travel in straight line

b) Supplies:
- 3 pieces of cardboard
- flashlight
- putty or clay

c) Method: Cut a small hole in the center of the three pieces of cardboard. Use the clay to stand two of them up in a row so that the holes are aligned. Shine the flashlight so that the beam travels though the holes. Move the center card back and forth.

d) Comment: observe how light is only visible when all three cards are aligned.

5. WATER BENDS LIGHT WAVES

a) Purpose: to see how water bends light waves and how we misjudge the position of underwater objects

b) Supplies:
- glass container
- water
- straight object like a pencil
- a coin
- crayon or marker

c) Method:

Part I

Put coin in bottom of container. Looking down from above, mark the side of the container at the level your think the coin is laying. Fill the container half-full of water and repeat this procedure. How accurate are your estimates?

Part 2

Put a pen or other straight object into the container of water. How does the water change its appearance?

d) Comment: The water bends the light rays, but our eye doesn't take this into account. Therefore, it sees the coin where it would be if the beams of light were straight.

6. CREATING A RAINBOW

a) Purpose: To see how light is composed of the color spectrum

b) Supplies:•clear low flat dish to hold water
- water
- mirror
- white card or paper
- bright light or sun

c) Method: Put water in dish. Set up paper at one end at right angle to water. Hold mirror in water at opposite end of the dish and adjust angle so that the light is reflected onto paper. (Most effective in a darkened room)

d) Comment: Water acts as prism and breaks up white light into its spectrum.

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GED Science
Focus Sheet: Lesson 11

FOCUS:

- Physical Science-Introduction to Magnetism
- Matter and Electricity
- Static and Current Electricity
- Using Electricity and Electronics

ISSUES/ACTIVITIES:

- Demonstration of principles of magnetism and magnetic field
- Uses of magnets - compass
- Types of magnets
- Current electricity: circuit board model

MATERIALS:

- Worksheet - Electricity and Magnetism

TEXTS:

- Contemporary's GED Science:
  - Electricity and Magnetism, pp. 315-323

- Steck-Vaughn's GED Science:
  - Electricity and Magnetism, pp. 198--201
  - Current Electricity, pp. 204-205

SKILLS AND STANDARDS:

- SCANS
  - Workplace Competencies
    Information: C5-C7
  - Foundation Skills
    Basic Skills: F1-F6
    Thinking Skills: F7-F12

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GED Science
Assignment Sheet: Lesson 11

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Electricity and Magnetism, pp. 315-323				
Steck-Vaughn's GED Science:				
• Electricity and Magnetism, pp. 198-201 • Current Electricity, pp. 204-205				
Worksheets:				
• Physics in the Kitchen: Electricity and Magnetism				

Ratings

1. I felt confident doing this assignment.
2. I was able to do the assignment, but it took a long time.
3. This assignment was very challenging to me
4. I need more explanation/practice in this area
5. I never want to do this again.

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Lessons 11: Physics in the Kitchen - Electricity and Magnetism

I. GENERAL INFORMATION

A. Preparing Wire:

Strip the plastic coating off the ends of the wire. This is most easily done with a pair of wire-strippers, but can be done by cutting the plastic coating around wire about one inch from each end, being careful to not cut the wire. Then pull the plastic end off the wire. Twist the exposed wires so that they form a solid piece.

II. MAKE A SIMPLE ELECTRICAL CIRCUIT

A. Supplies:

- 1.5 or 4.5 volt battery
- metal paper clips
- metal thumb tacks
- light bulb holder (available at a hobby shop)
- small light bulb (of same or higher voltage than your battery)
- 3 plastic-coated wires
- tape
- small screwdriver

B. Method:

1. Prepare 3 pieces of wire.
2. Twist the end of one piece around one of the terminals on the light bulb holder and tighten the terminal screw, making sure the wire is firmly touching the metal of the screw. Twist the other end of the wire around the post of a metal thumbtack and press tack into a small piece of wood or cork.
3. Attach a second piece of prepared wire to the other terminal and screw in a light bulb. Securely attach paper clips to the other wire ends, again being sure that the wire is firmly contacting the metal of the paper clips.
4. Take the third piece of prepared wire and attach a paper clip to each end. Use a thumb tack to attach the one end to the board so that the end of the paper clip presses on the thumb tack that is wired to the light bulb holder. This forms a switch that will turn the light on and off. Move the paper clip so it is not touching the tack.
5. Attach the loose paper clips to the poles of the battery. Use tape to ensure a firm connection if needed.
6. Close the switch. Your light should go on if all your connections are firmly touching.

III. SERIES CIRCUIT VS. PARALLEL CIRCUIT

A. Supplies:

- 4.5 volt battery
- metal paper clips or 4-6 alligator clips
- 2-4 light bulb holders (available at a hobby shop) each with small light bulb (of same or higher voltage than your battery)
- 5-7 prepared plastic-coated wires
- tape
- small screwdriver

B. Method: You can make a parallel circuit, dismantle it, and then make a series circuit or, you can make both circuits and then compare them.

1. Directions for a Parallel Circuit
   a) Fasten a paper clip or alligator clip to one end of all four prepared wires.
   b) Attach two of the wires to the contact screws of the light bulb holder and tighten screws. Attach the other two wires to a second light bulb holder.
   c) Clip all four paper clips or alligator clips to the battery. This will result in two independent circuits that are operating parallel to each other.

2. Directions for a Series Circuit
   a) Attach paper clips or alligator clips to one end of 2 prepared pieces of wire. Attach the first wire to a light bulb holder, and attach the second wire to a different light bulb holder.
   b) Complete the circuit between the two light bulb holders by attaching one end of a third piece of wire to the screws of light bulb holders. You should have a string of items in the following order: clip, wire, light bulb holder, wire, light bulb holder, wire, clip. When you attach the clips to the battery poles, you will have a series circuit in which both light bulbs are lit.
   c) Question: Which type of circuit is used for Christmas tree lights?

IV. ELECTROMAGNETISM

A. Supplies:

- 4.5 volt battery
- metal paper clips or 2 alligator clips
- thumb tacks
- cardboard tube
- long iron nail
- small piece of soft wood or cork
- plastic-coated wire
- small compass

B. Oersted's Experiment

1. Attach a paper clip to one end of a piece of prepared wire and a thumbtack to the other end. Press tack into small piece of wood.
2. Wrap a piece of wire around cardboard tube 15-20 times, so that the coils are pressed against each other. Be sure to leave 6 inches of wire at each end. Strip the plastic coating off each end of the wire and attach a paper clip.
3. Fasten one clip to the wood with a tack so that it forms a switch like the one described in Part I, (Method, step 4). Attach the remaining clips to a battery.
4. Slide a small compass in the middle of the tube. Observe what happens when your turn the switch on and off.

C. Making an Electromagnet:

1. Tightly wrap wire along the length of a long iron nail or spike.
2. Wire the nail to a battery and switch to form a circuit.
3. Switch the circuit on and see if the electromagnet will pick up paper clips or pins.
4. Bring one end of your electromagnet near a compass and observe whether the needle is attracted or repelled. Record your observations. Repeat this with the other end of the magnet.
5. Change the electromagnet's wires so they are attached to the opposite poles on the battery. How does this affect the way the compass needle reacts to each end of the electromagnet?

D. Write your ideas about how negative and positive electrical charges impact the poles of an electromagnet.

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GED Science
Focus Sheet: Lesson 12

FOCUS:

- Nuclear Physics
- Alternative energy sources: Fuel Cells, Bio-Diesel
- Physics principles at work

ISSUES/ACTIVITIES:

- Our energy future - Fuel Cells and Bio-Diesel projects
- Nuclear Power, Wind Power, Hydroelectric Power

MATERIALS:

- Handout: Fuel Cells, Current and Static Electricity

TEXTS:

- Contemporary's GED Science:
  - Nuclear Physics - pp. 324-336
  - Review of Magnetism, pp. 312-313
- Steck-Vaughn's GED Science:
  - Electromagnetism, pp. 202-203

SKILLS AND STANDARDS:

- SCANS
  - Workplace Competencies
    Information: C5-C7
    Interpersonal: C9-C13
    Systems: C15-C16
  - Foundation Skills
    Basic Skills: F1-F6
    Thinking Skills: F7-F12

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Assignment Sheet: Lesson 12

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Nuclear Physics, pp. 324-336 • Review of Magnetism, pp. 312-313				
Steck-Vaughn's GED Science:				
• Electromagnetism, pp. 202-203				
Worksheets:				
• Handout: Future Energy Sources / Fuel Cells				

Ratings

1. I felt confident doing this assignment.
2. I was able to do the assignment, but it took a long time.
3. This assignment was very challenging to me
4. I need more explanation/practice in this area
5. I never want to do this again.

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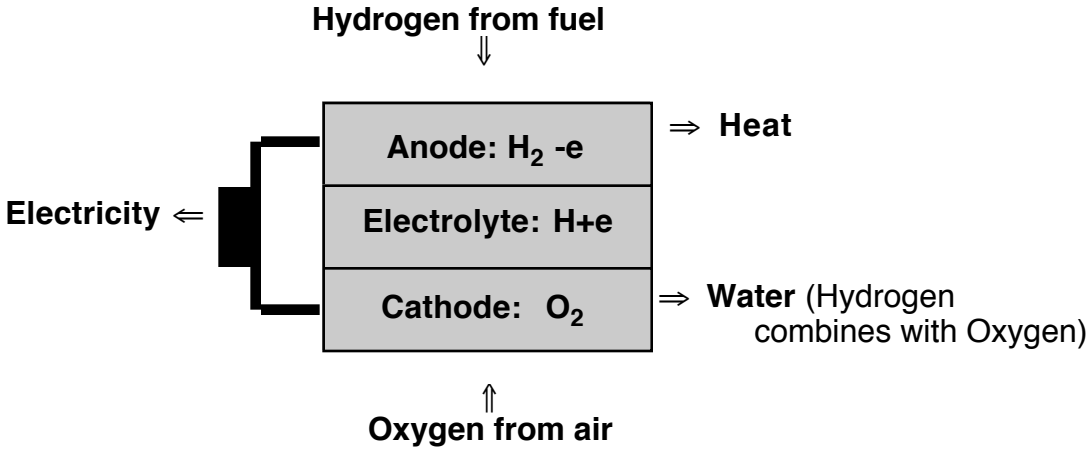
Lesson12: Future Energy Sources / Fuels Cells Handout

What is a Fuel Cell?

- Works on same principle as a battery
- Does not run down like a battery but will continue supplying energy as long as fuel is supplied
- Creates electricity and heat
- Only "exhaust" is pure drinking water

How does a Fuel Cell Work?

- Supplies electricity by combining hydrogen and oxygen electrochemically
- Each cell has 2 electrodes separated by an electrolyte



- Hydrogen loses an electron
  - Hydrogen (H2 -e) goes through electrolyte
  - Loose electron goes through conductor as electricity
- Fuel cells are stacked to generate enough electricity to be useful

Definitions to help you understand the above diagram:

ion	an atom that has an electrical charge because it has gained or lost an electron
electrolyte	a chemical compound that ionizes (turns into ions) when dissolved or molten and becomes an electrical conductor
anode	positively charged electrode
cathode	negatively charged electrode

Types of Fuel Cells

- Different types of Fuel Cells with diverse uses
- Use different electrolytes and run at different temperatures
- Each type has advantages for different uses

Why are Fuel Cells being commercialized now?
Invented by William Grove in 1839
NASA chose fuel cells for the space program in 1960's

1. Increasing reliance on a few energy rich countries and ever decreasing resources
2. Fossil fuels give off harmful emissions
3. Global warming concerns
4. Deregulation of electrical supply industry, allowing small companies to enter field with new technology

What are the advantages of Fuel Cells?

1. High efficiency
    - 40-65% depending on type
    - 85% if steam that is produced is used
    - most efficient Internal Combustion Engine (ICE) runs at 30%
    - efficiency is not reduced by small size or partial load
2. Reliable and durable
    - can run continuously for long time because no moving parts
    - no forced outages
    - is easily refueled like a car
3. Flexible
    - can use hydrogen from many different sources
        - natural gas
        - methanol
        - pure hydrogen
        - wind and solar energy
4. Little or no pollution
    - waste when burning hydrogen: pure drinking water
    - even when powered by natural gas, exhaust is significantly less than with internal combustion engine

5. Low cost
    - no infrastructure required for distribution
    - cell can be where power is needed
    - can be installed in modules
    - greater reliability because each unit can be serviced without shutting down whole system

Applications

1. power for cars & buses
    - several car makers developing prototypes
    - most use methanol as fuel
    - e.g.: Mercedes-Benz car
      Hydro buses
2. electrical generators
    - longest continuously running fuel cell in Tokyo office tower was shut down for government maintenance inspection
    - New York office tower being built with 8 cells to provide heat and power
3. water waste treatment plant
    - cell fueled by anaerobic digested gas at 1.5 ¢
4. military use
    - submarine for Canadian Defense
    - low heat and noise levels means greater stealth
    - longer running time allows for longer dives
5. portable generator
    - for use in wilderness areas
    - laptop use away from power

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GED Science
Focus Sheet: Lesson 13

FOCUS:
- Science principles at work in the world around us
- Ecosystems
- GED Practice Test Questions

ISSUES/ACTIVITIES:
- Ecosystems feature: Arizona Sonoran Desert
- Nuclear Power, Wind Power, Hydroelectric Power

MATERIALS:
- Worksheets: Vocabulary, and review of Physics Principles

TEXTS:
- Contemporary's GED Science:
  - Ecosystems, pp. 206-207, 418
- Steck-Vaughn's GED Science:
  - Ecology, p. 89
  - Ecosystems, pp. 84-87

SKILLS AND STANDARDS:
- SCANS
  - Workplace Competencies
    Information: C5-C7
  - Foundation Skills
    Basic Skills: F1-F6
    Thinking Skills: F7-F12

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Assignment Sheet: Lesson 13

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Ecosystems, pp. 206-207, 418				
Steck-Vaughn's GED Science:				
• Ecology, pp. 89 • Ecosystems, pp. 84-87				
Worksheets:				
• Worksheets: Vocabulary and Review of Physics Principles				

Ratings

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Lesson 13: Vocabulary Worksheet

	1.	adhesion	a)	A unit for measuring cycles or waves
	2.	AM	b)	Measures the number of waves that are transmitted in a period of time.
	3.	amplitude	c)	Forces that allows water to move between small spaces
	4.	capillary action	d)	Force that causes molecules to stick to each other.
	5.	cohesion	e)	Force that presses molecules on the outside of a liquid more tightly together
	6.	FM	f)	a material that has tiny spaces between the molecules
	7.	frequency	g)	Radio waves that transmit sound waves by modifying the amplitude of the wave.
	8.	Hertz	h)	Force that hold molecules in a mass so that they resist being separated
	9.	photon	i)	Radio waves that transmit sound waves by modifying the frequency of the wave.
	10.	porous	j)	electromagnetic waves
	11.	surface tension	k)	Measures the highest point of a wave

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Lesson 13: Vocabulary Worksheet - Key

d	1.	adhesion	a)	A unit for measuring cycles or waves
g	2.	AM	b)	Measures the number of waves that are transmitted in a period of time.
k	3.	amplitude	c)	Forces that allows water to move between small spaces
c	4.	capillary action	d)	Force that causes molecules to stick to each other.
h	5.	cohesion	e)	Force that presses molecules on the outside of a liquid more tightly together
i	6.	FM	f)	a material that has tiny spaces between the molecules
b	7.	frequency	g)	Radio waves that transmit sound waves by modifying the amplitude of the wave.
a	8.	Hertz	h)	Force that hold molecules in a mass so that they resist being separated
j	9.	photon	i)	Radio waves that transmit sound waves by modifying the frequency of the wave.
f	10.	porous	j)	electromagnetic waves
e	11.	surface tension	k)	Measures the highest point of a wave

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Lesson 13: Physics Principles Worksheet

The Venturi Effect

The Venturi Effect is based on the principle that fluid pressure drops as the speed of the fluid increases. If you force a fluid or air down a tube that narrows, two things will happen. First, the fluid will move faster as it travels through the narrow part of the tube. The increased speed causes the fluid pressure to drop. The Venturi Effect has been applied in many ways. It is used in internal combustion engines to help fuel and air to mix better so that the fuel burns more efficiently. It is also been used to reduce the amount of water required to flush a toilet.

One of the earlier uses of the Venturi principle was to keep the mouth of the Mississippi River open to shipping. The Mississippi was an important shipping lane, especially before the advent of an overland transportation system that was efficient, safe and economical. Keeping the mouth of the river accessible to seagoing ships was essential for the American economy. Unfortunately, the Mississippi is a wide, slow-moving river that deposits large quantities of silt at its delta. The US Army Corp of Engineers had to dredge the river frequently to ensure that shipping could continue uninterrupted. However, an American engineer devised a plan to use the force of the water to dredge the river automatically. He built breakwaters on either side of the river mouth, extending several hundred feet into the ocean. These breakwaters, were placed so that the river water flowed through an increasingly narrow channel. As the water sped up, it would gain the force to carry the Mississippi silt far out into the ocean.

QUESTION:

a. According to the above passage, the Venturi effect happens when:
b. fluid starts moving quickly
c. liquid fuels burn more efficiently
d. fluid pressure drops
e. fluid is forced down a narrowing tube

Capillary Action

Capillary action is the movement of water within a porous material. Something is porous if it has tiny spaces within the material. The forces of adhesion, cohesion, and surface tension allow chains of water molecules to move through the spaces of a porous material. Adhesion means that the water molecules are sticky. They stick to each other and other materials, such as cloth or soil. Water molecules are also cohesive, which means that they hold together in a mass and resist being separated. Surface tension refers to the fact that water molecules tend to contract more tightly together at the surface. As a result of these forces, a water molecule moving through a narrow space pulls a second molecule behind it, which in turn, pulls a third molecule. In this way, water molecules form a chain that can move through narrow spaces found in porous materials.

Plants use capillary action to draw water up from the soil. The water, in which all the nutrients needed for life are dissolved, and are carried to every part of the plant. Capillary action also helps the heart keep your blood circulating by pulling the blood (mainly water) through the network of minute blood vessel.

ACTIVITIES:

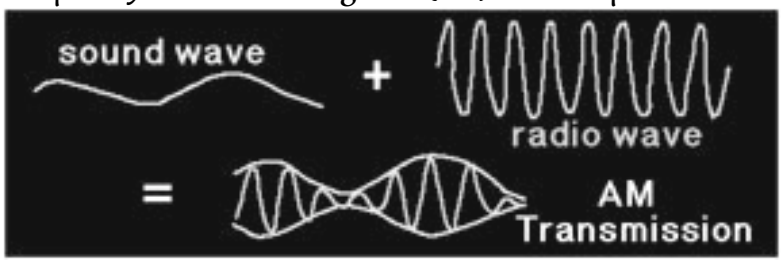
1. To see capillary action for yourself, get a bowl or a glass and fill it with colored water. (Color the water by adding a few drops of red food coloring. If you don't have food coloring, you can use cold tea or coffee instead.) Cut two-inch strips from a variety of papers, including paper toweling, newspaper, and a high finish paper that might be used from printers or notebooks. Dip one end of the paper toweling into the water and watch the water move up the toweling. Observe the movement of the water carefully and make a note of your observations. Repeat the experiment using the different kinds of paper.
   a) Do you see any relationship between the type of paper used and the distance traveled by the water?
   b) How far does the water continue to climb up the toweling?
   c) Dip the other end of the paper into the water, and hold it there until the water stops climbing. Carefully remove the strip and hold it flat. Does the water continue to move across the paper? Does the water move differently through the paper when it is flat than it did when the paper was held upright?
   d) Based on you observations, why do you think the water stops climbing?

2. You can also try this experiment using a stalk of celery. Cut the bottom end off the celery and put it into the glass of colored water as if it was a flower in a vase. Check the appearance of the celery after a few minutes. You should see the red liquid move up the veins of the celery.

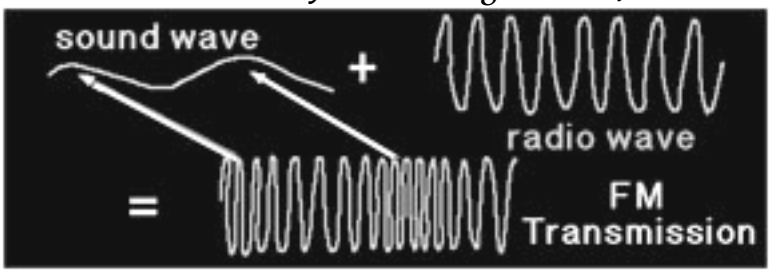
AM & FM Radio Waves

Radio waves are actually electromagnetic waves (photon). They have the longest wavelength and smallest energy level of any electromagnetic wave. Since radio waves, like all photons, move at the speed of light (about 186,000 per second), they are usually measured by their frequency, or number of wave crests that pass a given point within a given time. The more energy a wave contains, the higher the frequency. Usually, radio signals are referred to by their frequency. For example, say a radio station that transmits a signal at 101,500,000 Hz (Hertz is a unit for measuring cycles or waves). This would be written as 101.5 M Hz (101.5 million Hertz), and the station would be known as 101.5 FM (FM stands for frequency-modulated signal).

We are able to produce understandable sounds using radio waves because sound waves only move at about one fifth of a mile per second. Sound waves are carried by radio waves by modifying the amplitude or frequency of the radio waves. There are two types of radio transmissions: frequency-modulated signals (FM) and amplitude-modulated (AM).



AM signals are transmitted between 535 kHz and 1605 kHz (k = 1000), and are used by both radio and television transmission. AM signals are created by changing the amplitude or height of the radio waves. The amplitude of the radio waves are modified to duplicate the sound wave being broadcast. The main problem with AM signals is that they can be picked up by a wide variety of things, including telephones and braces. They are also subject to interference from other electronic devices or any alternating current, which. usually transmit radio waves at very low energy. FM signals transmit sound waves by varying in frequency. As the sound wave rises, the FM waves increase



in frequency, and as the sound wave dips, the FM waves decrease in frequency. Because FM waves are not modified in amplitude, much of the static interference, that interferes with AM reception, is eliminated.

A radio antenna picks up radio waves by vibrating at the frequency of the radio signal. When you tune into a particular radio station, you change the resonant frequency of the radio's tank, or main circuit. Then the tank circuit will only respond to vibrations on the antenna that are moving at tank circuit's resonant frequency. The tank circuit then vibrates the radio speakers in the same way as the vibrations of the radio signal.

QUESTIONS:

1. According to the above passage, FM radio waves:
   a) are transmitted at a higher frequency than AM radio waves.
   b) are transmitted at a lower frequency than AM radio waves.
   c) travel faster than AM radio waves.
   d) are more popular than AM radio waves.

ACTIVITY:

This activity will help you to understand how a radio tuner works. You will need several large cardboard tubes (tubes that were used to roll carpet or fabric are best). Cut the tubes to different lengths. The tubes should be the same diameter but different lengths.

⇒ Put your ear against the open end of the longest tube and listen. You should hear something that sounds like the ocean roar you might hear in a seashell.
⇒ Listen at a second tube. How does the sound compare to what you heard in the first tube? Do you think there is a correlation between the length of the tubes and the pitch of the sound? Based on your observations, do you think you could predict the sound in a third tube would be higher or lower than the second tube?
⇒ Go to the third tube and check if your prediction is correct.
⇒ When you have listened to all the tubes, and tested your predictions, write a general rule about the relationship between the length of the tubes and the pitch of the sounds.

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Lesson 13: Physics Principles Worksheet
Answer Key

THE VENTURI EFFECT

QUESTION:
According to the above passage, the Venturi effect happens when:

a. fluid starts moving quickly
b. liquid fuels burn more efficiently
c. fluid pressure drops
d. fluid is forced down a narrowing tube

ANSWER:
According to the above passage, the Venturi effect happens when ***FLUID STARTS MOVING QUICKLY.***

AM & FM RADIO WAVES

QUESTION:
According to the above passage, FM radio waves:

a. are transmitted at a higher frequency than AM radio waves.
b. are transmitted at a lower frequency than AM radio waves.
c. travel faster than AM radio waves.
d. are more popular than AM radio waves.

ANSWER:
According to the above passage, FM radio waves ***ARE TRANSMITTED AT A HIGHER FREQUENCY THAN AM RADIO WAVES.***

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GED Science
Focus Sheet: Lesson 14

FOCUS:

- GED Science Course Review
- GED Overview of GED Test
  - Content
  - Format
  - Hints and Strategies

MATERIALS:

- GED Science Review and Practice Test Questions

TEXTS:

- Contemporary's GED Science:
  - Practice Test, pp. 281-301
  - Post-test, pp. 253-275

- Steck-Vaughn's GED Science:
  - Post Test, pp. 219-238
  - Simulated Test, pp. 239-259

SKILLS AND STANDARDS:

- SCANS
  - Foundation Skills
    Personal Qualities: F13-F17

- CASAS
  - Demonstrate study skills
    7.4.7 identify or utilize test-taking skills
    7.4.8 interpret visual representations
    8.3.2 use support services

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Assignment Sheet: Lesson 14

Assignment	Date Due	Done	Score	Comments
Textbooks:				
Contemporary's GED Science:				
• Practice Test, pp. 281-301 • Post test, pp. 253-275				
Steck-Vaughn's GED Science:				
• Post test, pp. 219-238 • Simulated Test, pp. 239-259				
Worksheets:				
• GED Science Review and Practice Test Questions				

Ratings

1. I felt confident doing this assignment.
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Lesson 14: GED Test Review and Practice Questions

TEST REVIEW

The GED Science Test consists of 50 multiple-choice questions and an 80-minute time limit. Like the Social Studies test, many of the questions will be based on reading passages of up to 250 words each, and about half will include graphic stimuli such as maps, charts, or graphs. The test will not require you to remember isolated facts, but you will be asked to answer questions based on a passage or illustration. In addition, success will require that you understand basic science concepts, and interpret illustrations and reading passages correctly. You will also need to demonstrate that you are able to understand what you read, apply the information you have read, analyze relationships between ideas, and make judgments about the material presented.

The content on the GED Science Test is divided into two general areas. Nearly half of the questions deal with Life Sciences, particularly biology. The rest of the questions concern the Physical Sciences, which is subdivided into earth science, chemistry and physics.

One of the goals of the Science GED Test is to assess your ability to think about certain ideas and concepts, rather than your ability to pick answers out of a passage. One of the thinking skills that will be tested is the ability to understand ideas (about 20% of the questions), which involves picking out the main point in a passage, restating the information given, and identifying any implications, ideas that are suggested but not directly stated by the writer. Fifty percent of the questions test your ability to apply ideas, both ideas that are given in a passage and those that you will be expected to know from prior knowledge. Another thirty percent of the questions will ask you to analyze information in at least five ways. This might include distinguishing facts from opinions and hypotheses, understanding unstated assumptions, identifying cause and effect relationships, drawing conclusions from supporting details, and drawing inferences from the materials given.

PRACTICE QUESTIONS

Question 1:

Scientists have long felt that tool making is a skill that separates human beings from other animals. Now they've learned that chimpanzees also make and use tools, in ways that perhaps are similar to the tool making of the earliest known human cultures. Through observation, scientists have discovered that chimpanzees in the wild use broken branches to attack predators. They also use stones to crack nuts, and they have learned to make a sort of sponge from a wad of leaves to hold drinking water.

Perhaps their most clever use of a tool, though, is the use of a stick to go after ants and termites. The chimpanzee finds or makes a long thin stick be removing leaves and their stems. He or she then breaks the stick to a suitable length and inserts it into the ant or termite nest. The angry insects swarm onto the stick, only to be removed from the nest and eaten.

If a chimpanzee can find no suitable branch or stick nearby, he or she will travel for up to half a mile to find a suitable branch that can be fashioned into a probe.

Scientists point out that chimpanzees are demonstrating the remarkable skills of searching for tools, making tools, and using tools. Research continues in an effort to learn more about this remarkable primate.

Which of the following best summarizes the main point of the passage?

1) Chimpanzees are as intelligent as human beings.
2) Chimpanzees are not strict vegetarians because they eat termites and ants.
3) People in primitive cultures were no more intelligent than chimpanzees
4) Chimpanzees have developed a skill once thought possible only of human beings.
5) Chimpanzees may have many skills that we don't yet know of.

Question 2:

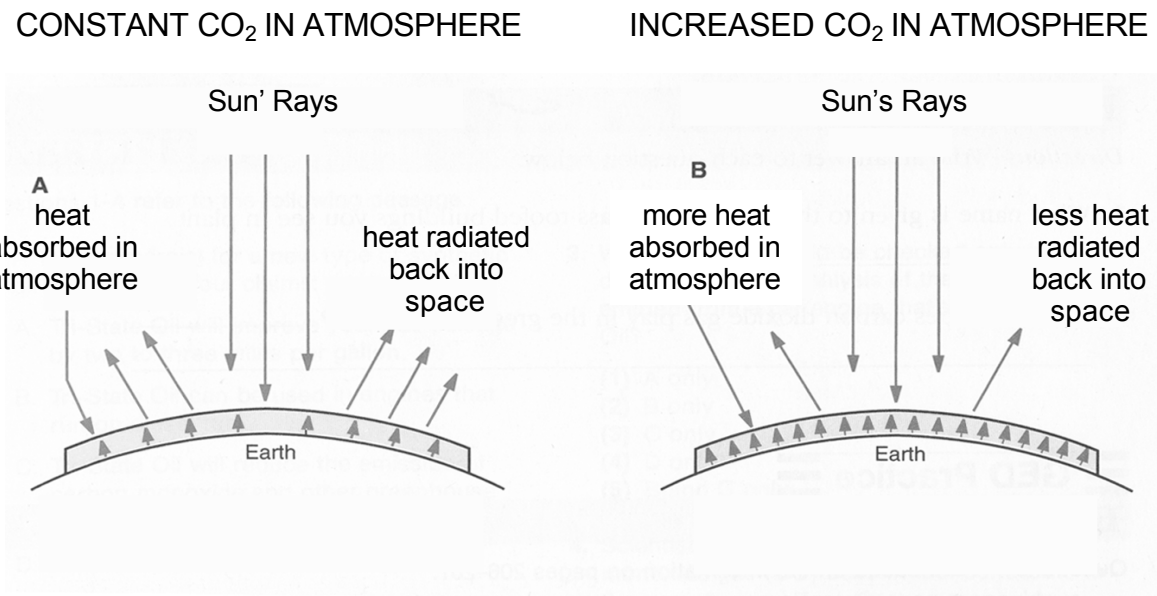
A sound wave causes the atoms and molecules of a substance to vibrate. By bumping into their neighbors, vibrating atoms and molecules transmit the sound wave throughout the entire substance. Sound waves cannot travel through outer space or any other space that does not contain air or some kind of matter.

The speed that sound travels depends on the density and temperature of a substance. Dense substances such as solids have a tightly packed structure and transmit sound at higher speeds. Substances at higher temperatures have faster-moving particles and also transmit sound at higher speeds. Loosely-packed substances such as cool gases transmit sound at slower speeds.

In which substance would you expect the speed of sound to be the greatest?

1) warm water at 120°F
2) a piece of iron at 212°F
3) boiling water at 212°F
4) a piece of iron at 120°F
5) a piece of wood at 212°F

Question 3:



Which of the following is given as the cause of the greenhouse effect that's starting to occur on earth?

1) the increasing average temperature
2) the success of the Industrial Revolution
3) the fact that a single atmosphere covers the whole planet
4) the slow rising of the ocean levels
5) the increasing levels of carbon dioxide in the atmosphere

Question 4:

Two different elements may combine in more than one way and form compounds with very different properties. For example, the elements carbon and oxygen can combine to form carbon monoxide, CO, or carbon dioxide, CO_2.

Carbon monoxide is an odorless gas given off by automobile engines. Breathing concentrated carbon monoxide gases can quickly lead to unconsciousness and death. Many people have died from carbon monoxide

poisoning after falling asleep while parked in the garage with their car engine running.

Carbon dioxide gas, on the other hand, is very much part of the life process. It is given off when people breathe, and it is used by plants during photosynthesis.

Runners often complain of feeling light-headed or dizzy while running on or near busy city streets. A possible cause of the dizziness is that, near busy streets, there tends to be a high level of

1) carbon dioxide
2) oxygen
3) carbon monoxide
4) traffic noise
5) very dry air

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Lesson 14: GED Test Review and Practice Questions

Answers

Question 1:
Which of the following best summarizes the main point of the passage?

4) ***Chimpanzees have developed a skill once thought possible only of human beings.***

Question 2:
In which substance would you expect the speed of sound to be the greatest?

2) a piece of iron at 212°F

Question 3:
Which of the following is given as the cause of the greenhouse effect that's starting to occur on earth?

5) the increasing levels of carbon dioxide in the atmosphere

Question 4:
Runners often complain of feeling light-headed or dizzy while running on or near busy city streets. A possible cause of the dizziness is that, near busy streets, there tends to be a high level of

3) carbon monoxide

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