SCIENCE

BRAINSTRETCHERS

Creative Problem-Solving Activities in Science

ANTHONY D. FREDERICKS

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Illustrated by Phyllis Disher Fredericks

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To Holly — for sharing rainbows,
love, and sibling revelry.

CONTENTS

INTRODUCTION

Science Brainstretchers provides your students with critical thinking activities in each of the three basic science areas: Life Science, Earth and Space Science, and Physical Science. This book is designed for students in grades 4 through 6 and includes varied thinking activities and problems that extend and enrich your science curriculum. Students are challenged to use their science knowledge in intriguing and challenging worksheets throughout the entire year.

Each of the basic science areas (Life Science, Earth and Space Science, and Physical Science) contains a variety of one-page duplicable worksheets organized into the following categories: Which Doesn't Belong?, Sequences, Analogies, What's Right?, Groups and Categories, Something's Wrong, and Your Order Please. These categories of worksheets are not organized according to difficulty; thus they provide you with the option of selecting activities in any order you wish, according to your preferences, your students' preferences, or the design of your science program. In short, these activities complement any or all portions of your science curriculum by providing students with opportunities to process information and data through a host of problem-solving activities. Students should also be allowed to select activities in keeping with *their* interests and abilities. Throughout, be sure to encourage students to use a multitude of problem-solving skills in making inferences, drawing conclusions, and seeking solution patterns. Initially, students may wish to work in pairs or small groups in order to share ideas and develop appropriate problem-solving techniques. Later, you may want to have pupils complete worksheets individually. Whatever options you select, you will discover these problems to be a stimulating addition to your entire science program.

This book is composed of three parts, each containing twenty-three worksheets. The worksheets are divided into the following categories:

1. **Which Doesn't Belong?** Here students determine a unifying relationship among three of four listed items. They then identify the one word that does not share the feature or features characteristic of the other three.

Example: dolphin whale porpoise (flounder)

2. **Sequences.** Students are presented with a line containing three words and four blank spaces. They must determine the type of sequence indicated by the three

words (size, degree, order, rank, and so on) and write one additional word on one of the blanks to complete the sequence.

Example: _____ coral _____ reef atoll island _____

3. **Analogies.** Students are provided with two items that are related in some way, a third item, and a blank space. They must determine the relationship between the two related items and then complete each analogy by supplying a fourth word that is related to the third in the same manner as the first two words are related.

Example: doorknob : wheel and axle :: flagpole : pulley

4. **What's Right?** Four statements are presented, only one of which contains correct information. Students must decide which of the four statements is the correct one.

Example: All mammals have four feet.
All insects have six feet.
All birds have two feet.
All reptiles have no feet.

5. **Groups and Categories.** Students are presented with a line of items that all share a common characteristic (and that have been categorized under a make-believe term). A second line of items is also presented, none of which has the characteristic displayed by items in the first line. Students then look at a third line of items and select the one item that could be included with the items in the first line.

Example: These are JIMFAMS:
lobster clam crab oyster

These are not JIMFAMS:
trout shark jellyfish bass

Which of these is a JIMFAM?
herring salmon scallop tuna

6. **Something's Wrong Here.** In this section, students are given a series of statements with an incorrect fact located somewhere in each statement. Pupils must be able to identify the incorrect item and replace it with the appropriate fact.

Example: 1. Changes in air pressure are measured with anemometers barometers When

air pressure decreases, the mercury falls in the tube. On the other hand, when the air pressure increases, the mercury in the tube rises.

7. **Your Order Please.** This section presents students with a series of events (and one unrelated distracter) that are in scrambled order. Students must be able to identify the correct sequence of the four related events by placing appropriate numerals (1, 2, 3, 4) in front of each statement. In addition, students must identify the single unrelated item.

Example: 4 The brain flashes a response along the motor nerves.
____ Oxygen is exhaled from the lungs.
1 The nerve ending is stimulated.
2 The message reaches the brain.
3 The message is sent along the sensory nerves to the spinal cord.

All the activities in this book are designed to foster critical-thinking skills within and throughout your entire science curriculum. In turn, students will begin to appreciate science—not as a static subject—but rather as an engaging process of discovery and design. As students become more familiar with the activities in this book, you should encourage them to create their own worksheets for each of the seven groups. These student-designed sheets can be included in a class notebook for duplication and use throughout the year. Providing youngsters with varied opportunities to create and use curricular materials based on their interests can be a powerful adjunct to your science program.

It is important to note that all these activities are designed as reinforcing activities; they are not intended for the initial learning of science information. The activities are most appropriate as a follow-up to the skills traditionally taught via your science text. You should plan to assign them after you have presented basic concepts to your students. Thus, students will be able to strengthen those skills and use their newfound knowledge in realistic, practical, and instructionally sound activities. In that regard, all of these activities can be used to promote important ideas enumerated in the text. Thus, they will serve as a valuable and important adjunct to your entire science curriculum.

An Answer Key with suggested responses for each activity is located at the end of the book. As students develop and refine their problem-solving abilities, they may suggest plausible answers not indicated in the Key. Be sure to plan some time for

students to share the rationale behind any new answers they suggest. You may need to consult additional sources such as science texts, encyclopedias, and science professionals (high school teachers, scientists, and so on) before you record any additional answers. Above all, keep an open mind to all possible answers, whether indicated in the Key or not. Helping students understand that the world of science allows for several explanations or definitions will be an important by-product of these activities.

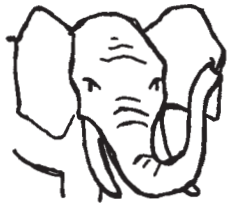
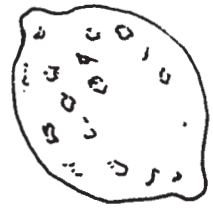
LIFE SCIENCE

Which Doesn't Belong?
Sequences
Analogies
What's Right?
Groups and Categories
Something's Wrong Here
Your Order Please

Which Doesn't Belong?

Read the words and look at the pictures in the following lines. Circle the word or picture in each line that doesn't belong with the others.

Name _____

hermit crab	snail	turtle	mouse
			
corn	potato	beans	watermelon
			

Which Doesn't Belong?

Read the words in the following lines. Circle the word in each line that doesn't belong with the others.

Name _____

tongue	nose	nerve	skin
retina	iris	cornea	pupil
sweet	creamy	sour	bitter
dermis	hair	fingernail	epidermis

Which Doesn't Belong?

Read the words and look at the pictures in the following lines. Circle the word or picture in each line that doesn't belong with the others.

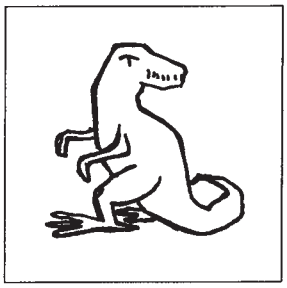
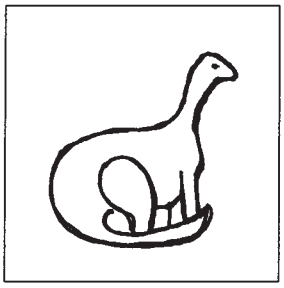
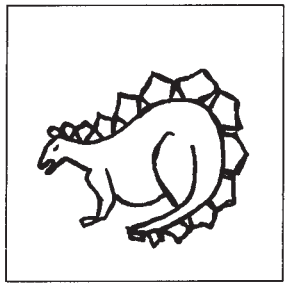
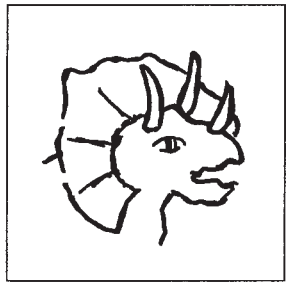
Name _____

sponges	shark	echinodern	mollusk
			
head	thorax	abdomen	compound eyes
			

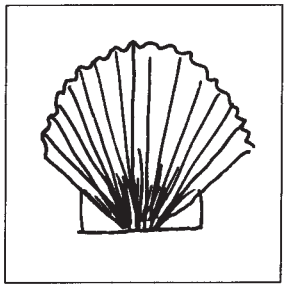
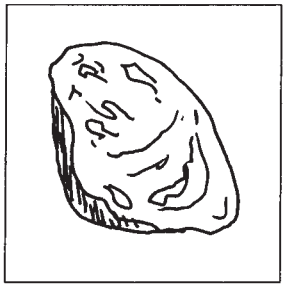
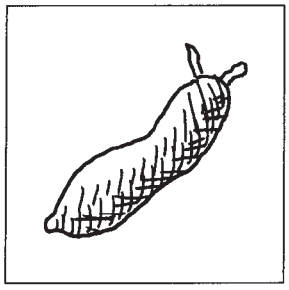
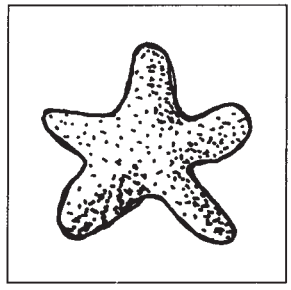
Which Doesn't Belong?

Read the words and look at the pictures in the following lines. Circle the word or picture in each line that doesn't belong with the others.

Name _____

nucleus	cytoplasm	chromo-somes	cell wall

fir	pine	oak	spruce

Sequences

Here are some sequence puzzles. Think about how the three words in each line are related. Then add another word to one of the blanks to complete each sequence.

Name _____

_____ egg _____ larva _____ adult _____

_____ root _____ branch _____ leaves _____

_____ mouse _____ snake _____ eagle _____

_____ germinate _____ grow _____ harvest _____

Sequences

Here are some sequence puzzles. Think about how the three words in each line are related. Then add another word to one of the blanks to complete each sequence.

Name _____

_____ esophagus _____ stomach _____ large intestine _____

_____ cells _____ organs _____ systems _____

_____ heart _____ arteries _____ veins _____

_____ canines _____ premolars _____ molars _____

Sequences

Here are some sequence puzzles. Think about how the three words in each line are related. Then add another word to one of the blanks to complete each sequence.

Name _____

_____ mouth _____ lungs _____ alveoli _____

_____ eggs _____ tadpole _____ young adult _____

_____ phylum _____ class _____ order _____

_____ protists _____ fungi _____ plants _____

Analogies

Look at each line. The two words on each line that are separated by a single colon are related. Fill in the blank space with a word that shares that same relationship with the third word in the line.

Name _____

tadpole : frog : : peep : _____

elephant : ivory : : _____ : wool

ham : _____ : : beef : cattle

_____ : bald eagle : : extinct : dodo

Analogies

Look at each line. The two words on each line that are separated by a single colon are related. Fill in the blank space with a word that shares that same relationship with the third word in the line.

Name _____

fish : school : : termites : _____

elephants : herd : : _____ : pod

pride : _____ : : covey : quail

_____ : pig : : pack : tiger

Analogies

Look at each line. The two words on each line that are separated by a single colon are related. Fill in the blank space with a word that shares that same relationship with the third word in the line.

Name _____

frog : amphibian : : snake : _____

fuel : car : : _____ : body

spruce : _____ : : oak : deciduous

_____ : ant : : arachnid : spider

Analogies

Look at each line. The two words on each line that are separated by a single colon are related. Fill in the blank space with a word that shares that same relationship with the third word in the line.

Name _____

meat : carnivore : : plants : _____

annual : petunia : : _____ : shrub

pistil : _____ : : stamen : male

_____ : oyster : : univalve : snail

What's Right?

Read all four sentences in each group. Then circle the one correct statement in each group.

Name _____

All plants need food.
Every plant has some green coloring.
All plants have leaves and stems.
Oxygen and carbon dioxide are by-products of all plants.

All eggs come from females.
Mammals do not lay eggs.
All birds lay the same number of eggs.
Eggs are always colored white.

No mammals live in the polar regions.
Mammals always bear live young.
Some mammals live in the sea.
All mammals are covered with hair.

What's Right?

Read all four sentences in each group. Then circle the one correct statement in each group.

Name _____

Living things are composed of cells.
Plant and animal cells are alike.
The chromosomes are found in the cytoplasm.
Blood is stored in the vacuoles.

The roots of plants grow downward as a result of phototropism.
A tropism is a plant's response to light.
Plant growth occurs in special places called growth regions.
The biological clock is found in a plant's chlorophyll cells.

Hibernation is the phenomenon that occurs when animals move from one region to another for feeding.
Many cold-blooded and warm-blooded animals survive by hibernating.
For all species to survive, they must migrate at some time in their life cycle.
Hibernation and migration are learned behaviors.

What's Right?

Read all four sentences in each group. Then circle the one correct statement in each group.

Name _____

All living things depend on plants for survival, either directly or indirectly.
Green plants get food through respiration.
Energy is released in the process of phototropism.
Both water and food are transported through the same tubes in the stem of a plant.

A sponge is a vertebrate whose body is full of pores.
Nearly all sponges live in fresh water.
Sponges are stationary.
Sponges are plants.

An amphibian's body is usually covered with scales.
Frogs, toads, salamanders, and snakes are amphibians.
An amphibian is a cold-blooded animal that lives in water and on land.
A tadpole is considered a fish during one stage of its life cycle.

Groups and Categories

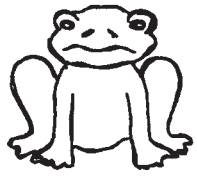
Study the words and pictures in the following groups. Notice the attributes shared by members of the first group. Draw a circle around the word or picture in the last group in each set that has the same attribute(s) as those in the first group.

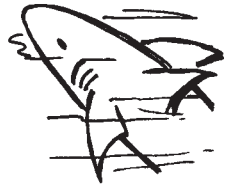
Name _____

These are CRIMERS:



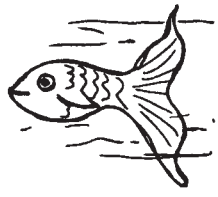

These are not CRIMERS:



Which of these is a CRIMER?






These are CHILTERS:

crocodile deer mouse frog otter

These are not CHILTERS:

swan porpoise human earthworm

Which of these is a CHILTER?

armadillo monkey toucan wasp

Groups and Categories

Study the words in the following groups. Notice the attributes shared by members of the first group. Draw a circle around the word in the last group in each set that has the same attribute(s) as those in the first group.

Name _____

These are PERWORDS:

larch cedar hemlock spruce

These are not PERWORDS:

maple nectarine walnut ash

Which of these is a PERWORD?

poplar sycamore fir eucalyptus

These are DISTEMS:

rust smut mushroom yeast

These are not DISTEMS:

algae moss morel spore

Which of these are DISTEMS?

conifer mold dicot juniper

Groups and Categories

Study the words and pictures in the following groups. Notice the attributes shared by members of the first group. Draw a circle around the word or picture in the last group in each set that has the same attribute(s) as those in the first group.

Name _____

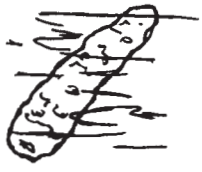
These are SETDIGS:




These are not SETDIGS:




Which of these is a SETDIG?

These are SINGRENS:

colony herd pack flock

These are not SINGRENS:

workers parasite caribou roost

Which of these is a SINGREN?

host solitary game school

Something's Wrong Here

One fact is incorrect in each of the following examples. Circle the incorrect part and then write in the correct fact.

Name _____

1. Plants whose petals come in groups of two and whose seeds have a single section are known as monocots.

2. A sycamore tree is an example of a conifer, a type of plant that produces its seeds in cones.

3. Fungi are examples of nonseed plants that have no roots, stems, or color.

4. Algae is usually classified by its color. This makes it a complex type of plant.

5. Ferns are a type of nonseed plant that take in necessary nutrients through a plant part known as spores.

Something's Wrong Here

One fact is incorrect in each of the following examples. Circle the incorrect part and then write in the correct fact.

Name _____

1. In a food chain, one living thing is eaten by another living thing. Producers and conductors are a part of this chain.

2. Green plants are examples of producers. They are known as producers because of their inability to make their own food.

3. Animals can make their own food. They are dependent upon other living things for food.

4. In a predator-prey relationship, the hunters are known as the prey.

5. In another part of the food chain, small animals live on large animals. The small animals are known as hosts.

Something's Wrong Here

One fact is incorrect in each of the following examples. Circle the incorrect part and then write in the correct fact.

Name _____

1. The arthropods are a large group of invertebrates. They have a hard inner skeleton known as an exoskeleton.

2. Other features of this group include jointed legs and a segmented body. Groups of arthropods include spiders, insects, and worms.

3. The largest group of arthropods are the insects. They have three pairs of legs and six body sections.

4. The antennae enable an insect to smell and feel. They are usually joined to the thorax.

5. When an insect outgrows its exoskeleton, it sheds it. This is known as molding.

Your Order Please

Four of the five sentences in each set are not in the correct order (one sentence does not belong with the other four). Write the numbers 1, 2, 3, or 4 before the sentences to indicate the right order (one sentence will be left blank).

Name _____

1. ____ Food then passes through the small intestine.
   ____ It travels to the left side of the heart.
   ____ After being chewed, food passes down your esophagus.
   ____ While food is in the stomach, acids begin to break it down.
   ____ The chemical particles can then pass into the bloodstream.

2. ____ The brain flashes a response along the motor nerves.
   ____ Oxygen is exhaled from the lungs.
   ____ The nerve ending is stimulated.
   ____ The message reaches the brain.
   ____ The message is sent along sensory nerves to the spinal cord.

3. ____ It then moves through the larynx to the trachea.
   ____ Air is taken in through the nose and hollow nasal passages to be warmed and filtered.
   ____ There the air goes to the two bronchial tubes that are attached to each lung.
   ____ Blood is pumped from the heart to the lungs.
   ____ The tiny balloon-like sacs are filled with air.

Your Order Please

Four of the five sentences in each set are not in the correct order (one sentence does not belong with the other four). Write the numbers 1, 2, 3, or 4 before the sentences to indicate the right order (one sentence will be left blank).

Name _____

1. _____ Producers manufacture their own food.
   _____ Frogs consume large amounts of grass.
   _____ Sunlight and oxygen provide energy.
   _____ Carnivores use other animals as a food source.
   _____ Herbivores consume different types of plants.

2. _____ Herbivore → grains
   _____ Crocodile → fish
   _____ Wheat → solar energy
   _____ Clover → rabbit
   _____ Trout → grasshopper

3. _____ Omnivores go into hibernation.
   _____ Herbivores seek alternate food sources.
   _____ Varieties of flowering plants wither and die.
   _____ Carnivores find it difficult to survive.
   _____ Lack of rainfall produces drought conditions.

Your Order Please

Four of the five sentences in each set are not in the correct order (one sentence does not belong with the other four). Write the numbers 1, 2, 3, or 4 before the sentences to indicate the right order (one sentence will be left blank).

Name _____

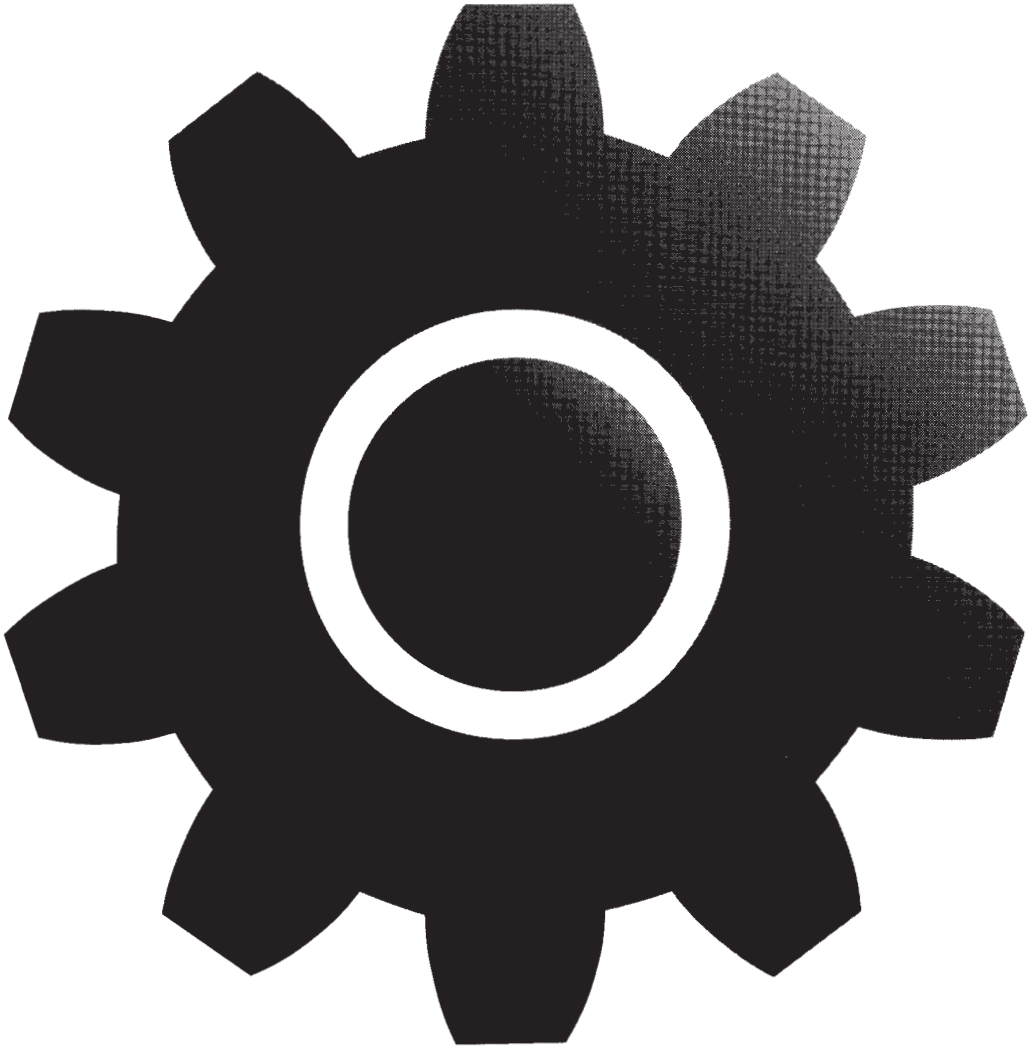
1. ____ Tadpoles hatch from the eggs.
   ____ Legs and lungs develop and a frog comes out on land.
   ____ Eggs are laid in the water.
   ____ Birds begin to leave lakes to migrate southward.
   ____ A tail develops as it grows.

2. ____ The primary consumer is eaten by a frog.
   ____ The tertiary consumer is consumed by a hawk.
   ____ A grasshopper feasts on a dandelion.
   ____ The secondary consumer is eaten by a snake.
   ____ Spring begins as soon as the ice pack melts.

3. ____ Excess sugar is turned into starch.
   ____ Rain water provides necessary nutrients.
   ____ Chlorophyll absorbs the energy and changes water into two gases.
   ____ Sunlight strikes the leaf.
   ____ Oxygen escapes through stomata and hydrogen joins with carbon dioxide to make sugar.

PHYSICAL SCIENCE

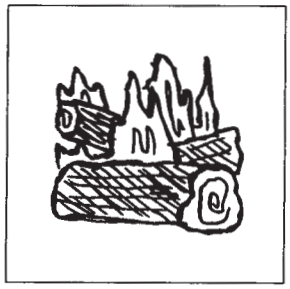
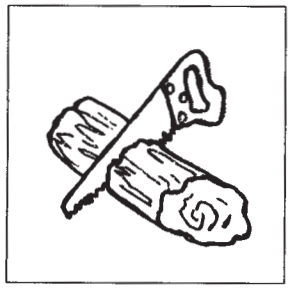
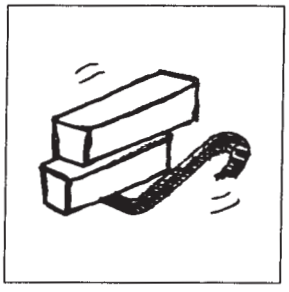
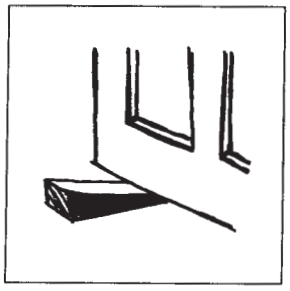
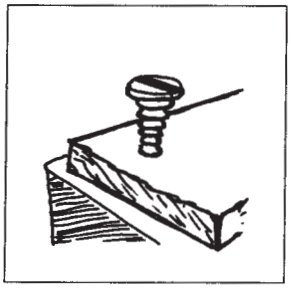
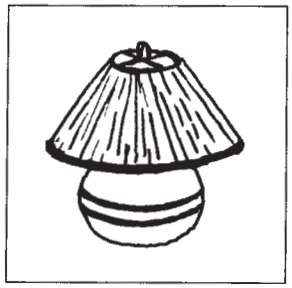
Which Doesn't Belong?
Sequences
Analogies
What's Right?
Groups and Categories
Something's Wrong Here
Your Order Please



Which Doesn't Belong?

Read the words and look at the pictures in the following lines. Circle the word or picture in each line that doesn't belong with the others.

Name _____

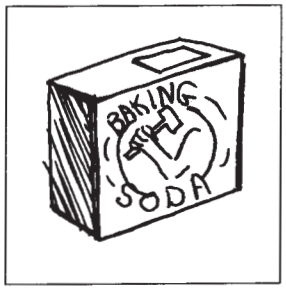
gold	mercury	iron	silver
			
friction	light	heat	sound
			

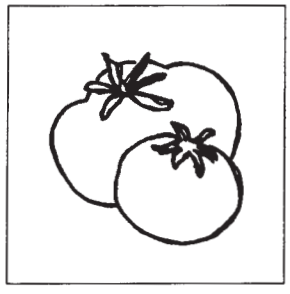
Which Doesn't Belong?

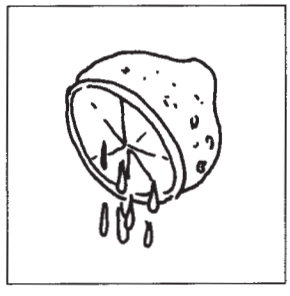
Read the words and look at the pictures in the following lines. Circle the word or picture in each line that doesn't belong with the others.

Name _____

elements	neutron	proton	electron
crest	wavelength	pitch	frequency
conduction	absorption	radiation	convection





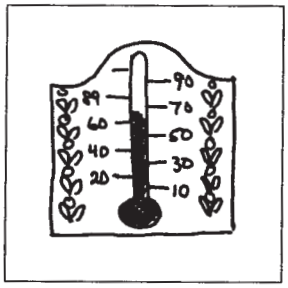


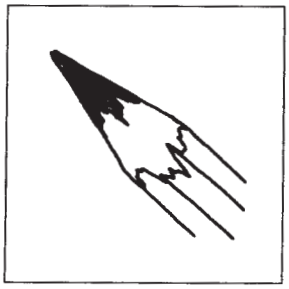
Which Doesn't Belong?

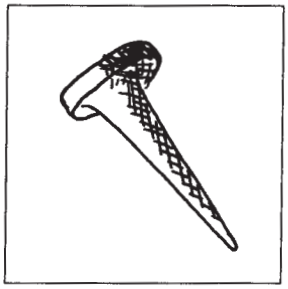
Read the words and look at the pictures in the following lines. Circle the word or picture in each line that doesn't belong with the others.

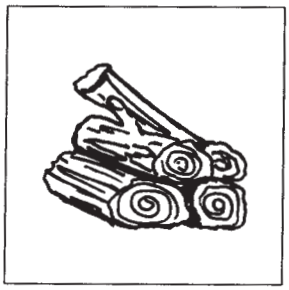
Name _____

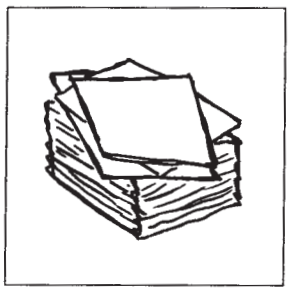
decaying leaves	rusting iron	digesting food	mixing oil and vinegar

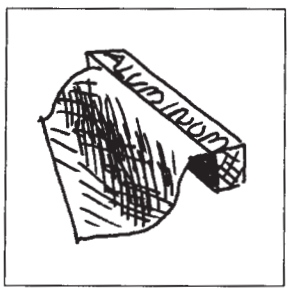












Sequences

Here are some sequence puzzles. Think about how the three words in each line are related. Then add another word to one of the blanks to complete each sequence.

Name _____

_____ tuning fork _____ waves _____ echo _____

_____ flute _____ trumpet _____ bassoon _____

_____ water _____ turbine _____ clock _____

_____ cold _____ rubbing hands _____ friction _____

Sequences

Here are some sequence puzzles. Think about how the three words in each line are related. Then add another word to one of the blanks to complete each sequence.

Name _____

_____ cup _____ quart _____ gallon _____

_____ millimeter _____ centimeter _____ decimeter _____

_____ ton _____ pound _____ dram _____

_____ 100 years _____ 12 months _____ 4 weeks _____

Sequences

Here are some sequence puzzles. Think about how the three words in each line are related. Then add another word to one of the blanks to complete each sequence.

Name _____

_____ plucking _____ vibration _____ auditory nerve _____

_____ sound _____ cliff _____ reflection _____

_____ tuba _____ trumpet _____ flute _____

_____ jackhammer _____ automobile _____ whisper _____

Analogies

Look at each line. The two words on each line that are separated by a single colon are related. Fill in the blank space with a word that shares that same relationship with the third word in the line.

Name _____

weight : scale : : mass : _____

100°C : boiling point : : _____ : freezing point

apple falling : _____ : : picking up a nail : magnetism

_____ : evaporation : : gas : condensation

Analogies

Look at each line. The two words on each line that are separated by a single colon are related. Fill in the blank space with a word that shares that same relationship with the third word in the line.

Name _____

generator : electricity : : friction : _____

zinc : dry cell : : _____ : wet cell

copper : _____ : : rubber : insulator

_____ : energy unit : : heat : energy form

Analogies

Look at each line. The two words on each line that are separated by a single colon are related. Fill in the blank space with a word that shares that same relationship with the third word in the line.

Name _____

north to south : attract : : south to south : _____

lever : seesaw : : _____ : paper cutter

ice : _____ : : steam : gas

_____ : hydrogen : : compound : water

What's Right?

Read all four sentences in each group. Then circle the one correct statement in each group.

Name _____

Jack does work when he pushes against a wall.
Jerry does work when he pulls a wagon uphill.
Jane does work when she pulls on a door that is nailed shut.
Jeff does work when he tries to lift a 1000-pound rock.

The particles of matter in a balloon are farther apart than the particles of matter in a glass of iced tea.
The particles of matter in a rock are farther apart than the particles of matter in a balloon.
The particles of matter in a glass of iced tea are closer together than the particles of matter in a rock.
The particles of matter in a balloon are closer together than the particles of matter in a rock.

A lever is used to push a load.
An inclined plane is used to pull a load.
A screw is used to push a load.
A pulley is used to pull a load.

What's Right?

Read all four sentences in each group. Then circle the one correct statement in each group.

Name _____

Baking bread is an example of a physical change.
Burning wood is an example of a chemical change.
Chopping carrots is an example of a chemical change.
Melting cheese is an example of a chemical change.

A neutron is a combination of an electron and a proton.
A proton is larger than an atom yet smaller than a neutron.
An electron is smaller than an atom and has a positive charge.
A molecule is made of only one atom.

A gas can change to a solid through evaporation.
A liquid can change to a solid through condensation.
A solid can change to a liquid through evaporation.
A liquid can change to a gas through evaporation.

What's Right?

Read all four sentences in each group. Then circle the one correct statement in each group.

Name _____

Aluminum, copper, and gold will attract a magnet.
A permanent magnet is made from lodestone.
A bar magnet's strength is found in its south pole.
When opposite poles of a magnet are placed together, they attract.

The weight of matter is known as its mass.
All matter has mass and takes up space.
The smallest particle of mass is the atom.
The center part of the atom is called the neutron.

Reflection is a change in the direction of light as it passes from one medium to another.
A medium that allows light to pass through it is said to be opaque.
Material that scatters light as it passes through it is refracted material.
Absorption occurs when light is trapped in a medium.

What's Right?

Read all four sentences in each group. Then circle the one correct statement in each group.

Name _____

The energy stored in the electrons of an atom is used to create energy.
One way to release this energy is through nuclear fission—the splitting of atoms.
Nuclear fusion occurs when atoms combine.
The nuclear process used to produce electricity is fusion.

In a physical change, matter is transformed into one or more different kinds of matter.
Dissolving salt in water is an example of a chemical change.
Most physical changes are reversible.
The tearing of paper is an example of a physical change that is reversible.

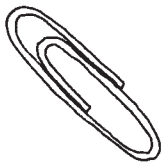
Lithium paper changes color when added to an acid or a base.
Acids turn blue paper red.
Red paper stays red when dipped into a base.
Neutron substances cause no changes in the color of the testing papers.

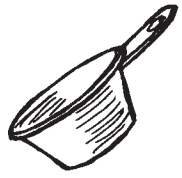
Groups and Categories

Study the pictures in the following groups. Notice the attributes shared by members of the first group. Draw a circle around the picture in the last group in each set that has the same attribute(s) as those in the first group.

Name _____

These are SITDONS:

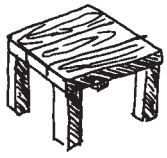
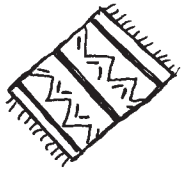
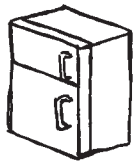
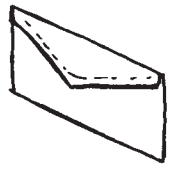


These are not SITDONS:

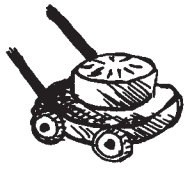



Which of these is a SITDON?

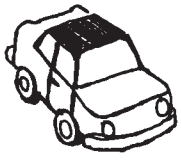
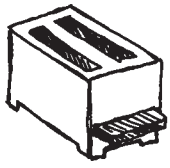
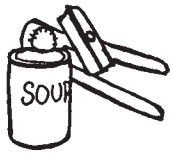





These are BOLDVERS:

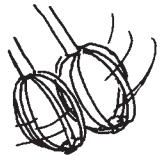


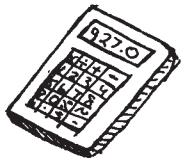



These are not BOLDVERS:

Which of these is a BOLDVER?





Groups and Categories

Study the words in the following groups. Notice the attributes shared by members of the first group. Draw a circle around the word in the last group in each set that has the same attribute(s) as those in the first group.

Name ______________________

These are MISTRANS:

km mm m cm

These are not MISTRANS:

kg dg g l

Which of these is a MISTRAN?

kl ml cg dm

• •

These are YORDITS:

foam wood oil cork

These are not YORDITS:

plastic cardboard iron wool

Which of these is a YORDIT?

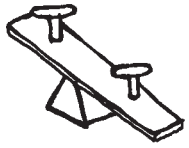
lead glass ice soil

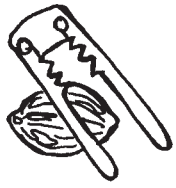
Groups and Categories

Study the words and pictures in the following groups. Notice the attributes shared by members of the first group. Draw a circle around the word or picture in the last group in each set that has the same attribute(s) as those in the first group.

Name _____

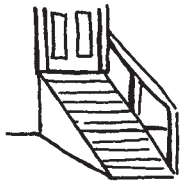
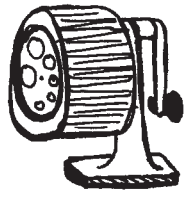
These are GRAMKORS:



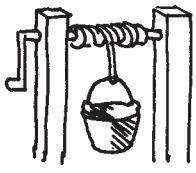


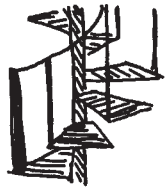

These are not GRAMKORS:



Which of these is a GRAMKOR?



These are CONTALS:

radiator light bulb TV toaster

These are not CONTALS:

pencil bush chair cabinet

Which of these is a CONTAL?

soap electric razor crowbar couch

Groups and Categories

Study the words in the following groups. Notice the attributes shared by members of the first group. Draw a circle around the word in the last group in each set that has the same attribute(s) as those in the first group.

Name _____

These are FIMRABS:

thermos rubber air wood

These are not FIMRABS:

iron steel aluminum silver

Which of these is a FIMRAB?

copper tin glass brass

These are MANTIVES:

plates water lead case

These are not MANTIVES:

paste magnet zinc wire

Which of these is a MANTIVE?

copper acid bulb carbon

Something's Wrong Here

One fact is incorrect in each of the following examples. Circle the incorrect part and then write in the correct fact.

Name _____

1. A wheel and axle is a simple machine used in many ways in everyday life. Examples of wheel-and-axle machines include bicycles, nutcrackers, doorknobs, and can openers.

2. All machines are made from variations of six simple machines: the inclined plane, the wedge, the lever, the screwdriver, the wheel and axle, and the pulley.

3. A lever consists of three parts: the lever, the resistance, and the load.

4. Machines help humans to do work. They are capable of changing the direction, increasing the effort required, and speeding up the force needed to complete the work.

5. There are several forces that must be overcome in order for a machine to do work. To help reduce the effects of gravity, it is best to use some kind of lubricant.

Something's Wrong Here

One fact is incorrect in each of the following examples. Circle the incorrect part and then write in the correct fact.

Name _____

1. Sound travels faster in gases than it does in solids.

2. An echo is a good example of absorbed sound. Both people and machines are capable of creating echoes.

3. Pitch refers to the loudness or softness of a sound after it has been created.

4. Light and sound travel at about the same rate of speed in the Earth's atmosphere.

5. Sound moves in waves in one direction from their source.

Something's Wrong Here

One fact is incorrect in each of the following examples. Circle the incorrect part and then write in the correct fact.

Name _____

1. When electricity flows easily through a substance, that substance is known as a conductor. Good conductors are copper, silver, and paper.

2. The kind of electricity that flows through the lines in our homes and school is current electricity. Lightning is an example of another kind of electricity known as series electricity.

3. Materials that do not allow electricity to flow easily are poor conductors. They do, however, make good inductors.

4. Electricity flows through a pathway known as a current. In a series path, there is only one path through which the charges can flow.

5. In another setup, known as parallel, there is more than one path through which light can flow. If one bulb burns out, the other stays lit.

Your Order Please

Four of the five sentences in each set are not in the correct order (one sentence does not belong with the other four). Write the numbers 1, 2, 3, or 4 before the sentences to indicate the right order (one sentence will be left blank).

Name _____

1. _____ These are forms of potential energy.
   _____ These items are consumed in special machines.
   _____ Heat energy results.
   _____ Substances are mined from the Earth.
   _____ Kinetic energy is a by-product.

2. _____ Chemicals → mechanical energy
   _____ Light → heat energy
   _____ Electrical energy → illumination
   _____ Wind energy → kinetic energy
   _____ Wind turbines → electrical energy

3. _____ Heat energy is added.
   _____ The temperature increases.
   _____ Particles are moving slowly.
   _____ Calories are consumed.
   _____ Particles vibrate rapidly.

Your Order Please

Four of the five sentences in each set are not in the correct order (one sentence does not belong with the other four). Write the numbers 1, 2, 3, or 4 before the sentences to indicate the right order (one sentence will be left blank).

Name _____

1. ____ Centimeter/m
   ____ Meter/km
   ____ Kilogram/kg
   ____ Millimeter/cm
   ____ Kilometer/mi

2. ____ The mass is recorded.
   ____ Both pans are stabilized.
   ____ Mass is added to one pan until balance is achieved.
   ____ An object is placed into one pan.
   ____ The force of gravity is calculated.

3. ____ The volume of the object is recorded.
   ____ The liquid is removed from the vessel.
   ____ A small object is lowered into the liquid.
   ____ The bottom of the meniscus is sighted.
   ____ Water is poured into a graduate.

Your Order Please

Four of the five sentences in each set are not in the correct order (one sentence does not belong with the other four). Write the numbers 1, 2, 3, or 4 before the sentences to indicate the right order (one sentence will be left blank).

Name _____

1. _____ The molecules begin to move more rapidly.
   _____ Melting begins to take place.
   _____ The molecules get farther and farther apart.
   _____ Heat energy is added to a standing liquid.
   _____ A transformation takes place in which it turns from one state of matter to another.

2. _____ Water power is transformed into electrical energy.
   _____ Light energy is also transmitted as a by-product.
   _____ The room temperature goes up.
   _____ Heat energy occurs through resistance in the thin wires.
   _____ Matter changes into a new form.

3. _____ The matter contracts until a certain temperature is reached.
   _____ Steam rises into the air.
   _____ The molecules slow down considerably.
   _____ Heat is removed from a state of matter.
   _____ The matter expands slightly.

EARTH AND SPACE SCIENCE

Which Doesn't Belong?
Sequences
Analogies
What's Right?
Groups and Categories
Something's Wrong Here
Your Order Please

Which Doesn't Belong?

Read the words in the following lines. Circle the word in each line that doesn't belong with the others.

Name _____

crust	soil	core	mantle
mountain	magma	ash	lava
snow	sleet	frost	rain
Pluto	Neptune	Earth	Uranus

Which Doesn't Belong?

Read the words in the following lines. Circle the word in each line that doesn't belong with the others.

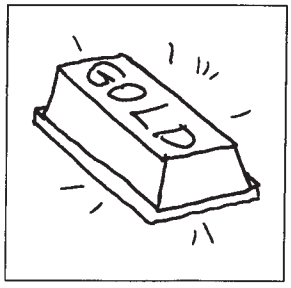
Name _____

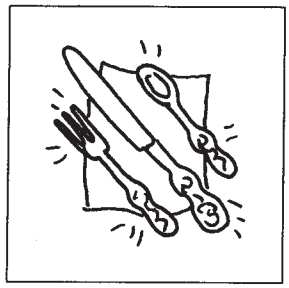
coal	oil	natural gas	solar energy
shale	sandstone	limestone	slate
cirrus	series	cumulus	stratus
hurricane	typhoon	tornado	cyclone

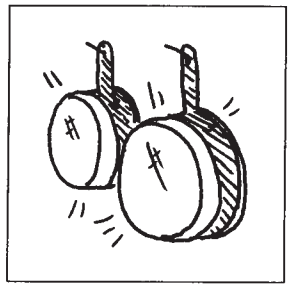
Which Doesn't Belong?

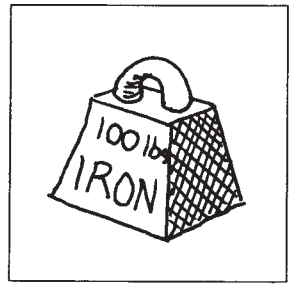
Read the words and look at the pictures in the following lines. Circle the word or picture in each line that doesn't belong with the others.

Name _____

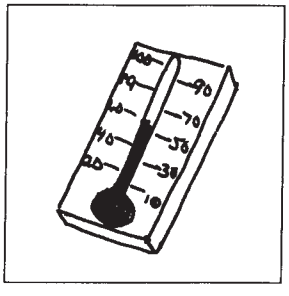


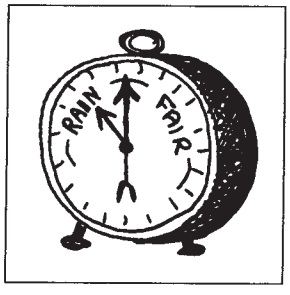


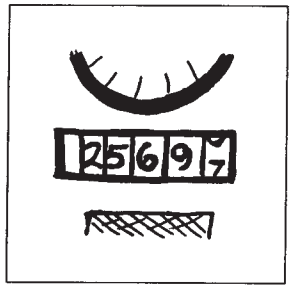


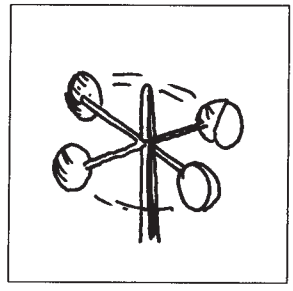


folded mountains	crater mountains	fault-block mountains	dome mountains
Pollux	Draco	Lyra	Great Bear









Sequences

Here are some sequence puzzles. Think about how the three words in each line are related. Then add another word to one of the blanks to complete each sequence.

Name _____

_____ Saturn _____ Jupiter _____ Earth _____

_____ autumn _____ winter _____ spring _____

_____ moon _____ planet _____ solar system _____

_____ new moon _____ full moon _____ last quarter _____

Sequences

Here are some sequence puzzles. Think about how the three words in each line are related. Then add another word to one of the blanks to complete each sequence.

Name _____

_____ Pluto _____ Mercury _____ Mars _____

_____ lake _____ water vapor _____ precipitation _____

_____ light breeze _____ moderate breeze _____ fresh breeze _____

_____ continental shelf _____ continental slope _____ plain _____

Sequences

Here are some sequence puzzles. Think about how the three words in each line are related. Then add another word to one of the blanks to complete each sequence.

Name _____

_____ sand _____ clay _____ humus _____

_____ troposphere _____ ionosphere _____ exosphere _____

_____ mantle _____ outer core _____ inner core _____

_____ nebula _____ red giant _____ white dwarf _____

Sequences

Here are some sequence puzzles. Think about how the three words in each line are related. Then add another word to one of the blanks to complete each sequence.

Name _____

_____ vapor _____ precipitation _____ water _____
forms clouds returns to oceans

_____ water _____ cool _____ cool _____
vapor temperature grass

_____ rain _____ sleet _____ hail _____

_____ fog _____ fluffy _____ feathery _____
clouds clouds

Analogies

Look at each line. The two words on each line that are separated by a single colon are related. Fill in the blank space with a word that shares that same relationship with the third word in the line.

Name _____

wind speed : anemometer : : earthquake : _____

>32°F : dew : : _____ : frost

water : _____ : : wind : weathering

_____ : sun : : soil and rocks : moon

Analogies

Look at each line. The two words on each line that are separated by a single colon are related. Fill in the blank space with a word that shares that same relationship with the third word in the line.

Name _____

shale : slate : : limestone : _____

blackboard : slate : : _____ : limestone

floats : _____ : : sinks : obsidian

_____ : granite : : sedimentary : sandstone

Analogies

Look at each line. The two words on each line that are separated by a single colon are related. Fill in the blank space with a word that shares that same relationship with the third word in the line.

Name _____

temperature : isotherm : : air pressure : _____

meteorology : weather : : _____ : weather conditions

blizzard : _____ : : tornado : wind

_____ : marble : : shale : slate

What's Right?

Read all four sentences in each group. Then circle the one correct statement in each group.

Name _____

Magma comes from the Earth's crust.
Earthquakes are movements of rock in the Earth's mantle.
Volcanoes push hot rock up from the Earth's core.
Earthquakes always happen on land or above sea level.

Coal is the only energy source that comes from the ground.
Sun and coal are renewable energy sources.
Wind, sun, and coal are the only forms of energy.
Wind, water, sun, and coal are forms of energy.

Rain, snow, and sleet are the only forms of precipitation.
Clouds form when warm, moist air cools.
Fog occurs only near lakes, rivers, or streams.
Solar energy changes water vapor into water.

What's Right?

Read all four sentences in each group. Then circle the one correct statement in each group.

Name _____

Cumulus clouds are often seen during rainy weather.
Serious clouds are thin, wispy clouds that signal a change in the weather.
Fog is an example of a stratus cloud.
The type of cloud you see in the sky has no relation to the weather conditions.

A star's magnitude depends on its distance from the Earth, its size, and its temperature.
A large group of stars is known as a constellation.
To measure great distances in space, scientists use a unit called the nebula.
The coolest stars are blue.

A canyon is formed because of wind erosion over hundreds of years.
Moving water, moving ice, and wind are all factors in the erosion process.
A delta is formed when a windbreak is constructed.
The process that causes rocks to break up without changing their chemical makeup is known as chemical weathering.

What's Right?

Read all four sentences in each group. Then circle the one correct statement in each group.

Name _____

Erosion is the process of breaking rock into smaller pieces.
Mosses and lichens grow on rocks and produce chemical erosion.
The end result of physical and chemical weathering is soil.
Frost action is a type of chemical reaction.

A natural resource is a useful man-made material.
All natural resources are nonrenewable.
Humans are unable to use natural resources to benefit themselves.
Air and water are natural resources.

The solar system is part of a galaxy known as the Milky Way.
The sun is not part of the Milky Way.
Scientists are not certain whether any other galaxies exist.
The solar system does not move within the Milky Way.

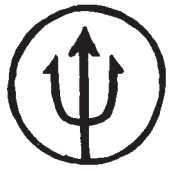
Groups and Categories

Study the words and pictures in the following groups. Notice the attributes shared by members of the first group. Draw a circle around the word or picture in the last group in each set that has the same attribute(s) as those in the first group.

Name _____

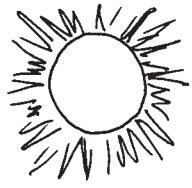
These are DOTMORS:





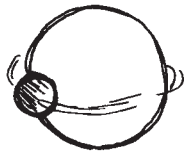

These are not DOTMORS:






Which of these is a DOTMOR?



These are BATCANS:

nine rings | H and He | five moons | side rotation

These are not BATCANS:

great red spot | 64 percent oxygen | 27°C | 120,000 km in diameter

Which of these is a BATCAN?

2867 million km from the sun | fastest moving | one-fourth the size of Earth

Groups and Categories

Study the words in the following groups. Notice the attributes shared by members of the first group. Draw a circle around the word in the last group in each set that has the same attribute(s) as those in the first group.

Name _____

These are RUTRALS:

hygrometer	wind sock	anemometer	barometer

These are not RUTRALS:

air pressure	relative humidity	temperature	precipitation

Which of these is a RUTRAL?

rain gauge	wind speed	humidity	altimeter

These are NATRACS:

tide	breaker	tsunami	wave

These are not NATRACS:

trough	shore	nodules	sand

Which of these is a NATRAC?

current	tidal pool	crest	island

Groups and Categories

Study the words in the following groups. Notice the attributes shared by members of the first group. Draw a circle around the word in the last group in each set that has the same attribute(s) as those in the first group.

Name _____

These are GIBDUCS:

marble quartzite graphite slate

These are not GIBDUCS:

sandstone shale limestone clay

Which of these is a GIBDUC?

gneiss granite coal obsidian

These are DOGRIPS:

ash pumice lava obsidian

These are not DOGRIPS:

talc quartz sediment graphite

Which of these is a DOGRIP?

diamond magma galena paraffin

Something's Wrong Here

One fact is incorrect in each of the following examples. Circle the incorrect part and then write in the correct fact.

Name _____

1. Changes in air pressure are measured with an anemometer. When air pressure decreases, the mercury falls in the tube. On the other hand, when the air pressure increases, the mercury in the tube rises.

2. The kinds of clouds in the sky are indicators of weather. Cirrus clouds are white and fluffy clouds and are usually a sign of fair weather.

3. The dewdrops that we see glistening on our lawns are not rain. They were formed as a result of evaporation when the ground cooled to a temperature below that of the air.

4. A hurricane is an example of a snowstorm during which a great deal of snow falls in a short period of time.

5. Winds are caused by equal heating and cooling of the upper layers of the atmosphere.

Something's Wrong Here

One fact is incorrect in each of the following examples. Circle the incorrect part and then write in the correct fact.

Name _____

1. The interaction of the sun, moon, and Earth causes time zones. This attraction also causes the oceans to bulge.

2. Unusually high and low tide ranges are known as super tides. Tides that have less variation between high and low tide are called neap tides.

3. The moon receives and reflects light from the sun. It also rotates around the Earth every twenty-eight days.

4. As the moon moves around the Earth, it wanes. This means that more of it appears to be lighted.

5. An eclipse can occur when the moon moves into the Earth's shadow. This is known as a solar eclipse.

Something's Wrong Here

One fact is incorrect in each of the following examples. Circle the incorrect part and then write in the correct fact.

Name _____

1. The core, the hottest part of the Earth, is made mostly of lava.

2. Some of the deepest wells in this country extend into the Earth's mantle in order to tap large reserves of oil.

3. Volcanoes occur when great pressures under the Earth's surface cause slippage of rock layers.

4. One of the great forces of nature—weathering—occurs when soil and rocks are moved from one place to another by wind and water.

5. New Orleans is an example of a city situated on a great plateau.

Something's Wrong Here

One fact is incorrect in each of the following examples. Circle the incorrect part and then write in the correct fact.

Name _____

1. The air we breathe is composed of a large amount of oxygen and a small amount of nitrogen.

2. Although air is an important natural resource, it does not have many uses as a source of power.

3. Air that moves very rapidly can cause a great deal of damage. The most powerful wind is known as a gale.

4. Air can be easily polluted if we don't take care of it. Major sources of air pollution include automobiles and volcanoes.

5. When green plants make their own food, they release nitrogen into the atmosphere.

Your Order Please

Four of the five sentences in each set are not in the correct order (one sentence does not belong with the other four). Write the numbers 1, 2, 3, or 4 before the sentences to indicate the right order (one sentence will be left blank).

Name _____

1. ____ The weight of the top layers presses down on layers deposited earlier.
   ____ The particles are then carried into oceans and lakes.
   ____ Extreme heat turns the rocks into magma.
   ____ Rain washes dust and other sediment into rivers.
   ____ The sediment settles to the bottom and forms layers.

2. ____ Great pressure and heat caused physical and chemical changes to occur.
   ____ Layers were compressed until water and gases escaped, leaving solid-carbon deposits of coal.
   ____ Masses of organic matter in swampy forests were covered by mud, silt, and sediments.
   ____ Gradually, stony layers were formed.
   ____ These erode and the sediments are carried by water and compressed into layers to form new rocks.

3. ____ Molten magma thrusts up through weak spots and cracks in the Earth's surface.
   ____ Great fissures appear over the Earth's surface.
   ____ Sometimes, gases and magma accumulate over time.
   ____ When the pressure becomes too great, the molten rock shoots up to the surface and the volcano erupts.
   ____ When the magma cools, it forms an igneous rock known as lava or pumice.

Your Order Please

Four of the five sentences in each set are not in the correct order (one sentence does not belong with the other four). Write the numbers 1, 2, 3, or 4 before the sentences to indicate the right order (one sentence will be left blank).

Name _____

1. ____ Water soaks into the ground and runs off into water sources.
   ____ Vapor rises and cools into liquid.
   ____ Water falls to Earth in the form of precipitation.
   ____ Water evaporates from the surface of ponds, lakes, and oceans.
   ____ Fog forms over streams and rivers.

2. ____ It seeps through porous rock.
   ____ Nonporous rock stops it from sinking any deeper.
   ____ The upper layer is known as the water table.
   ____ Oil is sometimes formed as a natural by-product.
   ____ It is here that ground water begins to collect.

3. ____ Water condenses into clouds.
   ____ Water must be treated before humans can use it.
   ____ Fish are killed in large numbers.
   ____ Large amounts of waste materials are deposited into rivers by upstream factories.
   ____ Contaminants are consumed by several types of wildlife.

Your Order Please

Four of the five sentences in each set are not in the correct order (one sentence does not belong with the other four). Write the numbers 1, 2, 3, or 4 before the sentences to indicate the right order (one sentence will be left blank).

Name _____

1. _____ Layers of dead plants and animals build up over the years.
   _____ Coal was formed.
   _____ Long ago, great swamps covered the Earth.
   _____ Sediment built up and pressed down on the decaying materials.
   _____ Rivers spread materials over large areas.

2. _____ The island cooled and was populated by living organisms.
   _____ A volcano spewed lava into the surrounding area.
   _____ A cone broke through the ocean surface.
   _____ Aftershocks caused tremendous tidal activity.
   _____ Fissures opened in the ocean floor.

3. _____ Approximately six hours later, low tide occurs.
   _____ Large amounts of water build up under the ice caps.
   _____ Water moves to the part of the Earth closest to the moon.
   _____ Water level rises along the coast.
   _____ The moon exerts a gravitational pull.

Your Order Please

Four of the five sentences in each set are not in the correct order (one sentence does not belong with the other four). Write the numbers 1, 2, 3, or 4 before the sentences to indicate the right order (one sentence will be left blank).

Name _____

1. ____ Water vapor was squeezed from spaces between air particles.
   ____ Moist air rises.
   ____ Droplets of water form on bits of dust.
   ____ A cloud begins to form.
   ____ Frost forms when the air is below 0°F.

2. ____ Cool air masses meet with clouds.
   ____ Warm air masses settle in low-lying areas.
   ____ Water is changed into water vapor.
   ____ Condensation occurs over large bodies of water.
   ____ Clouds form over land surfaces.

3. ____ Heat energy is absorbed and reflected.
   ____ Light energy is changed to heat energy.
   ____ The sun radiates light energy.
   ____ The Earth is tilted 23 1/2 degrees.
   ____ The light travels through space in waves.

ANSWER KEY

LIFE SCIENCE

PAGE

2. mouse
   parrot
   potato
   lemon

3. nerve
   retina
   creamy
   fingernail

4. shark
   spider
   compound eyes
   stem

5. Tyrannosaurus rex
   cell wall
   starfish
   oak

6. egg, larva, pupa, adult
   root, stem, branch, leaves
   grain, mouse, snake, eagle
   plant, germinate, grow, harvest

7. esophagus, stomach, small intestine, large intestine
   cells, tissues, organs, systems
   heart, arteries, capillaries, veins
   incisors, canines, premolars, molars

8. mouth, trachea, lungs, alveoli
   eggs, tadpole, young adult, adult
   kingdom, phylum, class, order
   monerans, protists, fungi, plants

9. chicken
   sheep
   pigs
   endangered

10. colony
whales
lion
litter

11. reptile
food
conifer
insect

12. herbivore
perennial
female
bivalve

13. All plants need food.
All eggs come from females.
Some mammals live in the sea.

14. Living things are composed of cells.
Plant growth occurs in special places called growth regions.
Many cold-blooded and warm-blooded animals survive by hibernating.

15. All living things depend on plants for survival, either directly or indirectly.
Sponges are stationary.
An amphibian is a cold-blooded animal that lives in water and on land.

16. porpoise
armadillo

17. fir
mold

18. periwinkle
school

19. . . . in groups of three and whose . . .
A pine tree is an example . . .
. . . stems, or leaves.
. . . makes it a simple type of . . .
. . . part known as roots.

20. Producers and consumers are a part . . .
. . . because of their ability to make their . . .
Animals cannot make their own food.
. . . relationship, the hunted are known as . . .
. . . are known as parasites.

21. They have a hard outer skeleton . . .
. . . include spiders, insects, and centipedes.
. . . legs and three body sections.
. . . joined to the head.
. . . is known as molting.

22.

3		1	2	4
4		1	3	2
2	1	3		4

23.

2		1	4	3
2	4	1		3
	3	2	4	1

24.

2	4	1		3
2	4	1	3	
4		2	1	3

PHYSICAL SCIENCE

PAGE

26. mercury
burning wood
friction
lamp

27. elements
pitch
absorption
baking soda

28. mixing oil and vinegar
mercury
Coca Cola
iron nail

29. tuning fork, vibration, waves, echo
flute, trumpet, bassoon, tuba
water, turbine, electricity, clock
cold, rubbing hands, friction, heat

30. cup, pint, quart, gallon
millimeter, centimeter, decimeter, meter
ton, pound, ounce, dram
100 years, 12 months, 4 weeks, 7 days

31. plucking, vibration, sound wave, auditory nerve
sound, cliff, reflection, echo
tuba, trombone, trumpet, flute
rocket, jackhammer, automobile, whisper

32. balance
0°C
gravity
liquid

33. static electricity
lead
conductor
calorie

34. repel
wedge
solid
element

35. Jerry does work when he pulls a wagon uphill.
The particles of matter in a balloon are farther apart than the particles of matter in a glass of iced tea.
A pulley is used to pull a load.

36. Burning wood is an example of a chemical change.
A neutron is a combination of an electron and a proton.
A liquid can change to a gas through evaporation.

37. When opposite poles of a magnet are placed together, they attract.
All matter has mass and takes up space.
Absorption occurs when light is trapped in a medium.

38. Nuclear fusion occurs when atoms combine.
Most physical changes are reversible.
Acids turn blue paper red.

39. refrigerator
egg beater running

40. dm
ice

41. wheelbarrow
electric razor

42. glass
acid

43. . . . doorknobs, and cars.
. . . the lever, the screw, the wheel and axle . . .
. . . the lever, the fulcrum, and the load.
. . . the direction, decreasing the effort . . .
. . . the effects of friction, it is best . . .

44. . . . travels slower in gases . . .
. . . example of reflected sound.
Volume refers to the . . .
. . . and sound do not travel at about . . .
. . . waves in many directions from their . . .

45. . . . copper, silver, and gold.
. . . is an example of static electricity.
. . . make good insulators.
. . . known as a circuit.
. . . path through which electricity can flow.

46.

2	3	4	1	
	4	3	1	2
2	4	1		3

47.

2	3		1	4
4	1	3	2	
4		3	2	1

48.

2		3	1	4
1	3	4	2	
3		2	1	4

EARTH AND SPACE SCIENCE

PAGE

50. soil
mountain
rain
Earth

51. solar energy
slate
series
tornado

52. iron
crater mountains
Pollux
odometer

53. Saturn, Jupiter, Mars, Earth
summer, autumn, winter, spring
moon, planet, solar system, galaxy
new moon, first quarter, full moon, last quarter

54. Pluto, Mercury, Mars, Venus
lake, water vapor, clouds, precipitation
light breeze, gentle breeze, moderate breeze, fresh breeze
continental shelf, continental slope, plain, trench

55. sand, silt, clay, humus
troposphere, stratosphere, ionosphere, exosphere
crust, mantle, outer core, inner core
nebula, red giant, white dwarf, black dwarf

56. evaporation, vapor forms clouds, precipitation, water returns to oceans
water vapor, cool temperature, cool grass, dew
rain, sleet, snow, hail
fog, layered clouds, fluffy clouds, feathery clouds

57. seismograph
<32°F
erosion
gases

58. marble
chalk
pumice
igneous

59. isobar
climatology
snow
limestone

60. Magma comes from the Earth's crust.
Wind, water, sun, and coal are forms of energy.
Clouds form when warm, moist air cools.

61. Fog is an example of a stratus cloud.
A star's magnitude depends on its distance from the Earth, its size, and its temperature.
Moving water, moving ice, and wind are all factors in the erosion process.

62. The end result of physical and chemical weathering is soil.
Air and water are natural resources.
The solar system is part of a galaxy known as the Milky Way.

63. Mercury
2867 million km from the sun

64. rain gauge
current

65. gneiss
magma

66. . . . measured with a barometer.
Cumulus clouds are white . . .
. . . formed as a result of condensation . . .
A blizzard is an example . . .
. . . are caused by unequal heating and . . .

67. . . . and Earth causes tides.
. . . are known as spring tides.
It also revolves around the . . .
. . . the Earth, it waxes.
. . . is known as a lunar eclipse.

68. . . . is made mostly of iron.
. . . into the Earth's crust in order to tap . . .
Earthquakes occur when great . . .
. . . of nature—erosion—occurs . . .
. . . situated on a great delta.

69. . . . composed of a small amount of oxygen and a large amount . . .
. . . resource, it does have many . . .
. . . is known as a hurricane.
. . . include automobiles and factories.
. . . they release oxygen into the . . .

70.

4	2		1	3
2	3	1	4	
3		1	2	4

71.

4	2	3	1	
1	2	4		3
	4	3	1	2

72.

2	4	1	3	
4	2	3		1
4		2	3	1

73.

2	1	3	4	
4		2	1	3
4	3	1		2