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S C I E N C E

BRAINSTRETCHERS

*Creative Problem-Solving
Activities in Science*

ANTHONY D. FREDERICKS

Illustrated by Phyllis Disher Fredericks

 GOOD YEAR BOOKS

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C O N T E N T S

INTRODUCTION / ix



LIFE SCIENCE / 1

Which Doesn't Belong?	2
Sequences	6
Analogies	9
What's Right?	13
Groups and Categories	16
Something's Wrong Here	19
Your Order Please	22



PHYSICAL SCIENCE / 25

Which Doesn't Belong?	26
Sequences	29
Analogies	32
What's Right?	35
Groups and Categories	39
Something's Wrong Here	43
Your Order Please	46



EARTH AND SPACE SCIENCE / 49

Which Doesn't Belong?	50
Sequences	53
Analogies	57
What's Right?	60
Groups and Categories	63
Something's Wrong Here	66
Your Order Please	70

ANSWER KEY / 75

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.

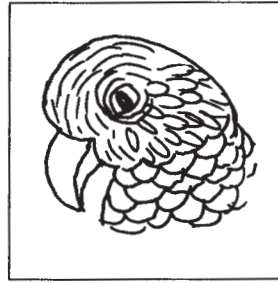
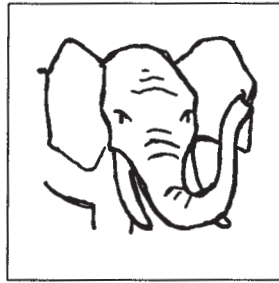
Name _____

hermit crab

snail

turtle

mouse

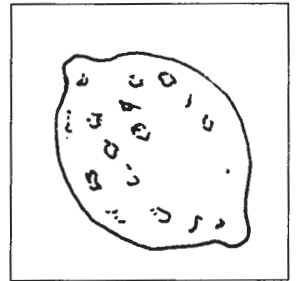
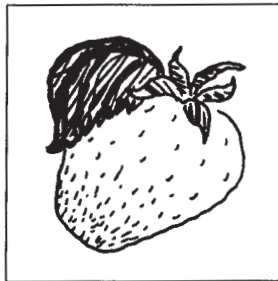
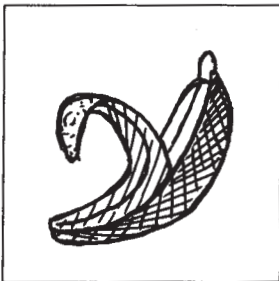


corn

potato

beans

watermelon





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 _____



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