

TABLE OF CONTENTS

INTRODUCTION	vii
UNIT 1—PROCESS SKILLS	1
 Activities 1–5	
1 Observation, Inference, and Opinion	4
2 Classification Stretch!.....	8
3 Classification – One Property.....	11
4 Classification – Two Properties	13
5 Classification – Venn Diagrams.....	15
1–5 Connections	20
UNIT 2—FORCE, MOVEMENT, WORK, SYSTEMS, AND WEIGHT	22
 Activities 6–9	
6 Force, Movement, and Work	24
7 Forces in a System.....	27
8 Earth Pull.....	28
9 Forces in Other Systems.....	32
6–9 Connections	35
UNIT 3—STATES OF MATTER	37
 Activities 10–13	
10 Change of State – Ice Cube Melt.....	39
11 Change of State – Dissolving Seltzer Tablet	42
12 Condensation – Changing Gases to Liquids.....	44
13 Making a Gas.....	47
10–13 Connections	49
UNIT 4—MASS, VOLUME, AND DENSITY.....	51
 Activities 14–19	
14 Population Density	55
15 Squashed Cotton.....	58
16 The Density of Oil and Water.....	61
17 Wave Machines	63
18 Colorful Layered Liquids	65
19 Floating and Sinking – Ice, Alcohol, and Water.....	67
14–19 Connections	69

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UNIT 5—AIR PRESSURE & THE PRESSURE OF THE ATMOSPHERE..... 72

Activities 20–26

20	Air Pressure	74
21	The Pressure of the Atmosphere.....	77
22	The Cup and the Card.....	80
23	The Burning Candle	83
24	The Rising Water	85
25	Pressure – Force and Area	87
26	The Cartesian Diver Submarines.....	90
20–26	Connections	93

UNIT 6—HEAT, EXPANSION, AND THE MOVEMENT OF MOLECULES 95

Activities 27–30

27	Expanding Air With Heat – the Rising Balloon	97
28	Heat and the Movement of Molecules	100
29	The Egg in the Bottle.....	104
30	The Collapsed Can	106
27–30	Connections	109

UNIT 7—TRANSFER OF HEAT 111

Activities 31–35

31	Heat – the Density of Hot and Cold Water.....	113
32	Heat Transfer – Convection.....	116
33	Heat Transfer – Conduction	120
34	Heat Transfer – Radiation.....	123
35	Heat and Insulation.....	127
31–35	Connections	130

UNIT 8—FLIGHT AND AERODYNAMICS 132

Activities 36–42

36	Speed and Force of Air.....	134
37	The Ball and the Funnel	136
38	The Card and the Spool.....	138
39	Airplane Wings – the Flight of Airplanes.....	140
40	The Flattened Card	144
41	Tornado in a Bottle.....	146
42	The Atomizer.....	148
36–42	Connections	151

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UNIT 9—THE SPEED OF FALLING BODIES..... 153

Activities 43–47

43 Falling Bodies – Does Weight Make a Difference?154

44 Falling Bodies – Do Size, Shape, or Weight
Make a Difference?156

45 Falling Bodies and Air Resistance.....158

46 Swinging Pendulums – the Length.....160

47 Swinging Pendulums – the Weight.....163

43–47 Connections168

UNIT 10—VARIABLES..... 170

Activities 48–49

48 Twirling Copters!.....172

49 More Twirling Copters!175

48–49 Connections178

UNIT 11—THE FLIGHT OF ROCKETS..... 180

Activities 50–52

50 Rocket Power182

51 More Rocket Power!187

52 Two-stage Balloon Rockets!.....189

50–52 Connections192

UNIT 12—INERTIA AND THE FLIGHT OF SATELLITES..... 193

Activities 53–58

53 Inertia – Riding in Cars195

54 The Nickel, the Card, and the Cup.....198

55 Tricky Nickels200

56 The Glass of Water and the Paper202

57 The Sock on the String.....204

58 Whirling Water!207

53–58 Connections209

UNITS 13 & 14—SURFACE TENSION AND BUBBLES 211

Activities 59–63

59 Domed Pennies.....212

60 Sticky Water!214

61 Less Sticky Water!.....216

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62	The Funnel and Soapy Water.....	218
63	Racing Pepper!	220
59–63	Connections	222
Activities 64–65		
64	Big Bubbles	223
65	Enormous Bubbles	226
UNIT 15 – SOUND.....		229
Activities 66–68		
66	Sound Vibrations	231
67	Traveling Sound	234
68	Variations in Sound	238
66–68	Connections	240
UNIT 16—REFLECTION AND REFRACTION OF LIGHT		243
Activities 69–73		
69	How We See Objects	245
70	The Path of Light.....	248
71	The Rising Nickel.....	252
72	The Broken Pencil.....	257
73	Changing an Arrow’s Direction.....	260
69–73	Connections	263
UNIT 17—MAGNETISM AND ELECTRICITY		264
Activities 74–80		
74	A Magnet’s Poles.....	266
75	Magnetic Fields	271
76	What Kinds of Objects Are Magnetic?.....	275
77	Making an Electromagnet	279
78	Static Electricity	282
79	Electrical Circuits.....	287
80	What Completes a Circuit?.....	292
74–80	Connections	294
GLOSSARY.....		296
TEACHER HELP SHEETS		300

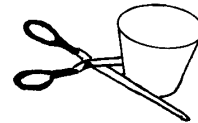
ACTIVITY 52: TWO-STAGE BALLOON ROCKETS!

Goal: To understand that the first stage of a two-stage rocket gives the initial thrust, then the thrust of the second stage keeps the rocket in motion

Skills: Observing, inferring, predicting, controlling variables, generalizing

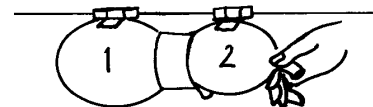
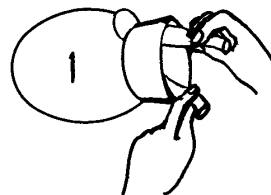
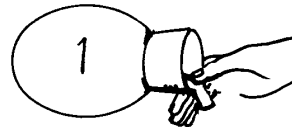
Materials:

- 2 round sturdy balloons (about 18" inflated)
- Twine or fishing line long enough to stretch across the room
- Paper cups for hot and cold drinks, 8 oz.
- 2 pieces of 2"-wide masking tape, 3" to 4" long
- Drinking straw, cut in half
- Scissors



Preparation:

1. Cut the bottom off the paper cup.
2. Thread the twine through the two half sections of the straw and leave both sections at one end of the twine.
3. Have two students stretch the twine across the room and hold each end so it's taut.
4. Blow up Balloon 1, stretching the neck of the balloon through the hollow cup.
5. Hold the balloon neck closed against the inside bottom of the open edge of the cup.
6. Hold the neck of Balloon 1 against the cup while you insert Balloon 2 about 2/3 of the way into the back end of the cup. Ask a student to inflate Balloon 2 until it feels secure in the cup. (Balloon 2 will be smaller than Balloon 1.) Inflated Balloon 2 should hold Balloon 1 in position, keeping Balloon 1's neck closed against the side of the cup.
7. Still holding the neck of Balloon 2 closed, have a student position one section of straw on top of each balloon and tape the balloons and straws together.



Preparation Time: 10 minutes

Lesson Time: 25–30 minutes

— Procedure and Questioning Strategy —

1. What do you predict will happen first when the balloons are released?
 Air will be released from the smaller balloon (the first stage of the rocket) and the balloon rocket will travel along the string.

2. What do you predict will happen next?

Air will come out of the larger balloon (the second stage of the rocket) and the balloon will keep traveling along the string.

3. Why will the first stage of the rocket balloon need to deflate before the second stage can take over?

The smaller balloon keeps the mouth of the larger balloon closed.

4. What do you think will happen to the first stage of the balloon rocket when it deflates?

It will separate from the second stage.

Release the balloons.

5. What happened?

The first stage gave the first push to the balloon rocket, then it separated from the second stage of the balloon rocket. The second stage then kept the balloon rocket moving forward.

6. What do you think would happen if we used larger balloons and larger cups?

The balloon rocket would go faster and farther.

7. What reason can you think of for the rocket going faster and farther?

More air would come out of the balloon, giving the balloon more force to go forward.

8. What do you think might happen if we used fishing line instead of twine?

The balloon rocket might go faster and farther.

9. For what reason?

The fishing line isn't as thick as twine and it's smoother, so it wouldn't catch on the straw.

— Practical Application —

1. Why do rockets have stages?

To reduce weight.

2. How would a two-stage rocket reduce the rocket's weight?

When the first stage separated and dropped off, the rest of the rocket would be lighter in weight.

3. How would this affect the rocket's flight?

It would be able to go faster and farther with less weight.