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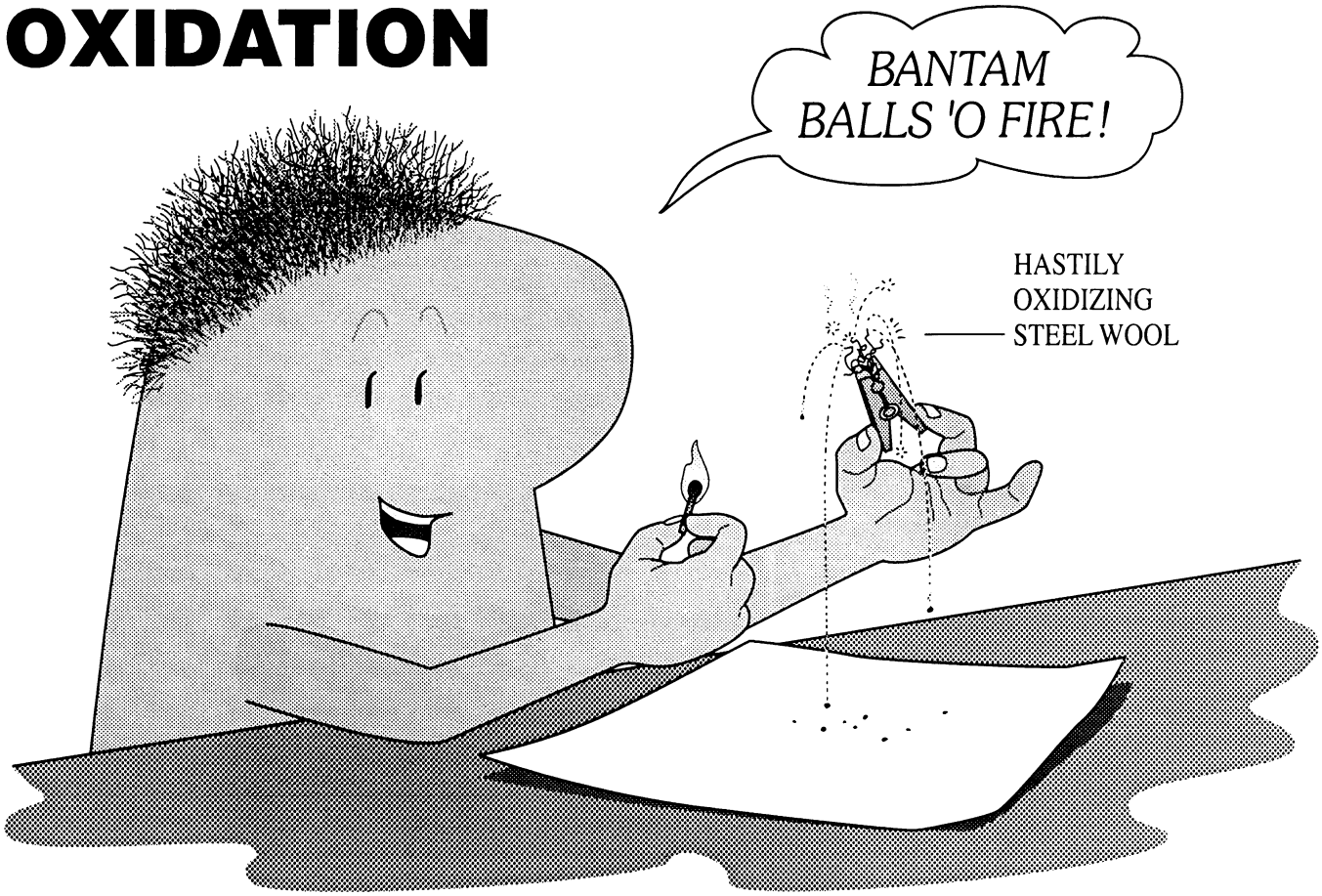

TASK CARD SERIES

Conceived and
written by

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TOPS LEARNING SYSTEMS

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ISBN 978-0-941008-81-5

CONTENTS

INTRODUCTION

TEACHING NOTES

REPRODUCIBLE MATERIALS

Gathering Materials

Listed below is everything you'll need to teach this module. You already have many of these items. The rest are available from your supermarket, drugstore and hardware store. Laboratory supplies may be ordered through a science supply catalog.

Keep this classification key in mind as you review what's needed:

special in-a-box materials:	general on-the-shelf materials:
Italic type suggests that these materials are unusual. Keep these specialty items in a separate box. After you finish teaching this module, label the box for storage and put it away, ready to use again the next time you teach this module.	Normal type suggests that these materials are common. Keep these basics on shelves or in drawers that are readily accessible to your students. The next TOPS module you teach will likely utilize many of these same materials.
(substituted materials):	*optional materials:
Parentheses enclosing any item suggests a ready substitute. These alternatives may work just as well as the original, perhaps better. Don't be afraid to improvise, to make do with what you have.	An asterisk sets these items apart. They are nice to have, but you can easily live without them. They are probably not worth an extra trip to the store, unless you are gathering other materials as well.

Everything is listed in order of first use. Start gathering at the top of this list and work down. Ask students to bring recycled items from home. The teaching notes may occasionally suggest additional student activity under the heading "Extensions." Materials for these optional experiments are listed neither here nor in the teaching notes. Read the extension itself to find out what new materials, if any, are required.

Needed quantities depend on how many students you have, how you organize them into activity groups, and how you teach. Decide which of these 3 estimates best applies to you, then adjust quantities up or down as necessary:

$Q_1 / Q_2 / Q_3$

- **Single Student:** Enough for 1 student to do all the experiments.
- **Individualized Approach:** Enough for 30 students informally working in 10 lab groups, all self-paced.
- **Traditional Approach:** Enough for 30 students organized into 10 lab groups, all doing the same lesson.

KEY: *special in-a-box materials* (substituted materials) general on-the-shelf materials *optional materials

1/10/10	*pkgs birthday candles, not dripless*	2/20/20	medium test tubes
.1/1/1	cup modeling clay	1/1/1	source of water and sink or large tub
4/40/40	tall baby food jars, 6 ounce size	1/1/1	*pkg calcium hydroxide – see notes 6*
1/10/10	pint jars with lids	1/1/1	roll plastic wrap
2/20/20	books matches	1/2/10	teaspoons
1/10/10	household candles — see notes 1	1/1/1	*pkgs active dry yeast – see notes 9*
1/10/10	tuna fish cans for match disposal	1/2/2	*bottles hydrogen peroxide*
1/1/1	wall clock (watch with a second hand)	1/10/10	Popsicle sticks
1/10/10	empty toilet paper rolls	1/3/10	graduated cylinder, 100 mL size
1/10/10	scissors	1/1/1	pkg fine-grade, pure steel wool balls
1/10/10	plastic produce bags	1/1/1	bottle chlorine bleach
1/10/10	plastic sandwich bags	2/15/20	wooden clothespins
2/20/20	rubber bands	1/3/10	*hand calculators
1/10/10	rubber tubes, at least .5 cm dia and 30 cm long	1/10/10	*large test tubes
1/10/10	rolls masking tape	1/2/10	medium-sized nails
1/10/10	large tubs	1/3/10	magnets
1/10/10	pieces easy-to-bend wire, at least 30 cm long	1/1/1	roll aluminum foil
1/10/10	metric rulers	1/10/10	medium-sized washers
1/2/4	*wire cutters	1/3/10	plastic lids from margarine tubs
2/20/20	size-D batteries, dead or alive	1/3/10	quart jars
1/4/10	tablespoons	1/1/1	bottle liquid soap
1/1/1	bottle vinegar	1/3/10	shallow saucers
1/1/1	box baking soda	1/1/1	bottle 70% isopropyl alcohol – see notes 16
1/2/2	rolls paper towels	1/10/10	eye droppers and * eye-dropper bottles
1/10/10	*index cards	1/2/10	dictionaries

Sequencing Task Cards

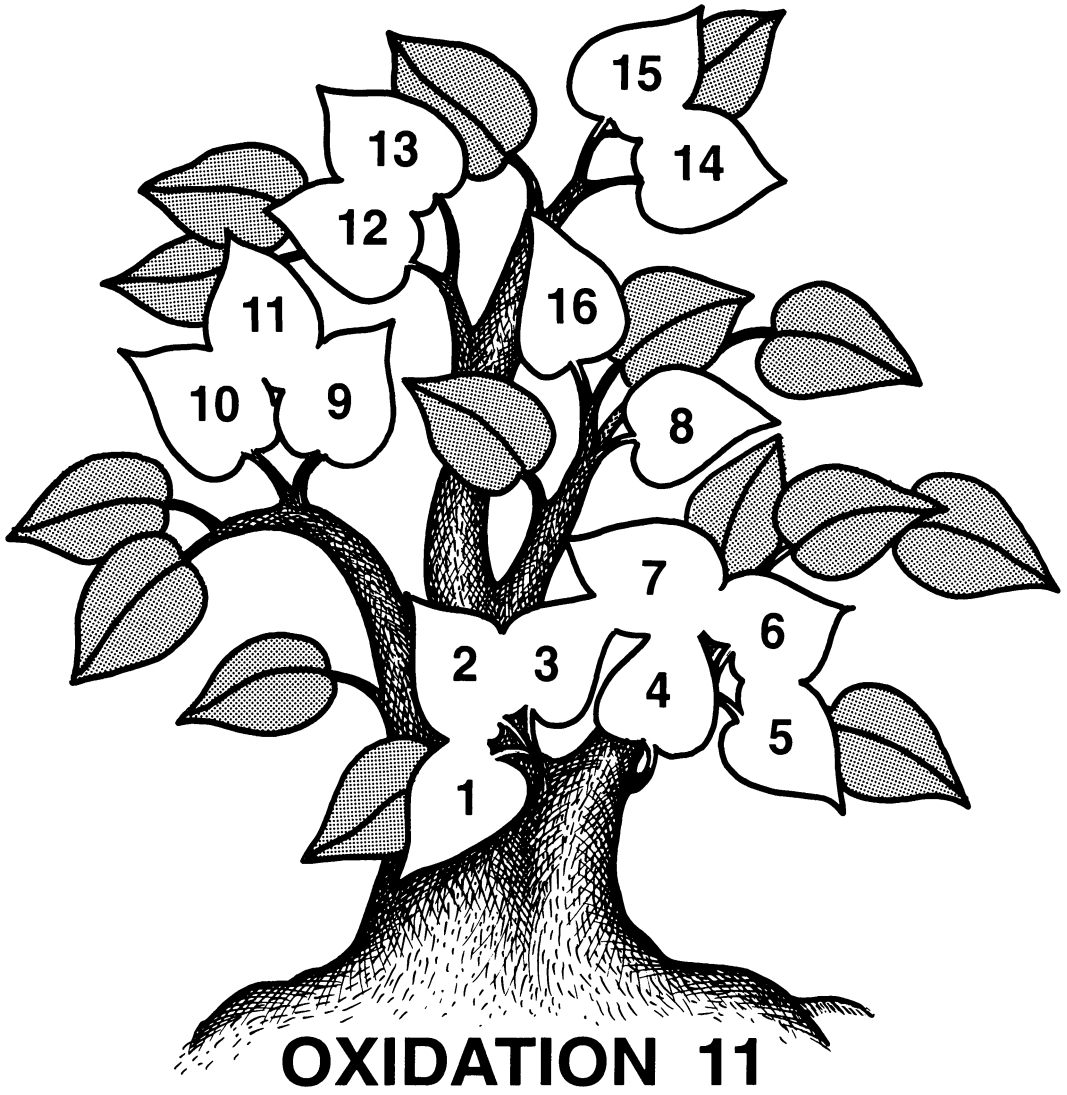
This logic tree shows how all the task cards in this module tie together. In general, students begin at the bottom of the tree and work up through the related branches. As the diagram suggests, upper level activities build on lower level activities.

At the teacher's discretion, certain activities can be omitted, or sequences changed, to meet specific class needs. The only activities that must be completed in sequence are indicated by leaves that open *vertically* into the ones above them. In these cases the lower activity is a prerequisite to the upper.

When possible, students should complete the task cards in the same sequence as numbered. If time is short, however, or certain students need to catch up, you can use the logic tree to identify concept-related *horizontal* activities. Some of these might be omitted, since they serve only to reinforce learned concepts, rather than introduce new ones.

On the other hand, if students complete all the activities at a certain horizontal concept level, then experience difficulty at the next higher level, you might move back down the logic tree to have students repeat specific key activities for greater reinforcement.

For whatever reason, when you wish to make sequence changes, you'll find this logic tree a valuable reference. Parentheses in the upper right corner of each task card allow you total flexibility; they are left blank so you can pencil in sequence numbers of your own choosing.



Review / Test Questions

Photocopy the questions below. On a sheet of blank paper, cut and paste those questions you want to use in your test. Include questions of your own design, as well. Place all these questions on a single page for students to answer on another paper, or leave space for student responses after each question, as you wish. Duplicate a class set and your custom-made test is ready to use. Use leftover questions as a review in preparation for the final exam.

tasks 1, 3, 4

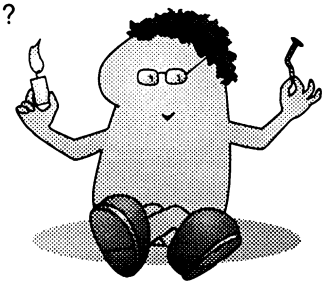
Small fires may be put out be covering them with a blanket. Why is this effective?

tasks 1-3

You are sealed in a small cave by a landslide that has covered your exit route. Rescue workers have brought in heavy equipment to dig you out, but it will probably be many hours before you see the light of day. A candle and matches are in your backpack. You think about lighting the candle to chase away the darkness. Should you?

tasks 1-3, 9-13

What do a burning candle, a living person and a rusting nail have in common?



task 3

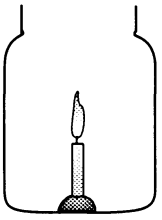
You wish to transfer some oxygen gas from a large bottle to a small test tube. Diagram how to do this.

task 4

You are facing an immense prairie fire, with a huge wall of fire rising straight up toward the sky. Which way do you feel the wind blowing? Why?

tasks 4-5

A candle burns at the bottom of a small jar like this.



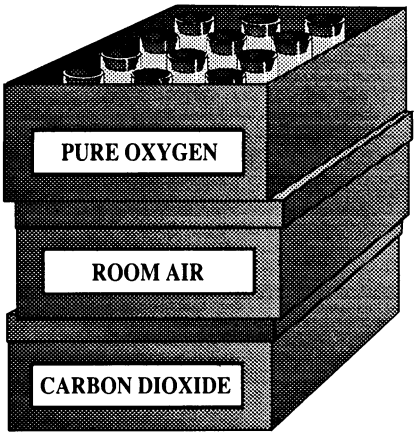
a. Draw convection currents associated with the burning candle.
b. You add vinegar and baking soda to the jar without touching the flame or getting it wet. Will the candle go out? Explain.

task 5

Carbon dioxide is a good fire extinguisher. Explain why.

tasks 5-12

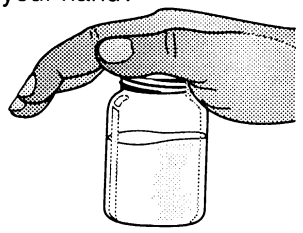
Three trays are filled with test tubes containing these gases.



a. Explain how to use a burning splint to verify that each box is correctly labeled.
b. How would you use limewater to identify each gas?
c. Steel wool?

task 6

You pour carbon dioxide gas into a jar of limewater, cap the top with your hand, and shake it. Why does the jar stick to your hand?



tasks 6-7

Plants consume carbon dioxide. Design a demonstration to show that this is so. Include both an experiment and a control.

task 8

a. Write a balanced equation for the combustion of candle wax ($C_{28}H_{58}$).
b. Write a balanced equation for the oxidation of glucose ($C_6H_{12}O_6$).

tasks 8, 10

Copper (Cu) has a shiny metallic luster, while copper oxide (Cu_2O) looks dull brown.
a. How does the appearance of a new penny change with age? Why?
b. Write a balanced equation.

task 8,16

Write a balanced equation for the combustion of methane gas (CH_4).

Review / Test Questions (continued)

task 9

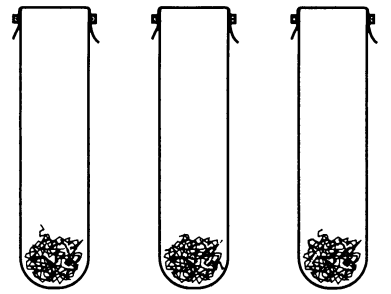
Explain how to use a glowing splint to decide whether a jar of unknown gas contains abundant oxygen.

tasks 10-11 A

Describe what happens when a nail rusts.

tasks 10-11 B

Suppose you put wet steel wool in each test tube, fill them with oxygen, room air, or carbon dioxide as shown, then seal airtight with balloon membranes and rubber bands. Redraw this diagram showing how each test tube might look after several weeks. Give reasons to support each prediction.

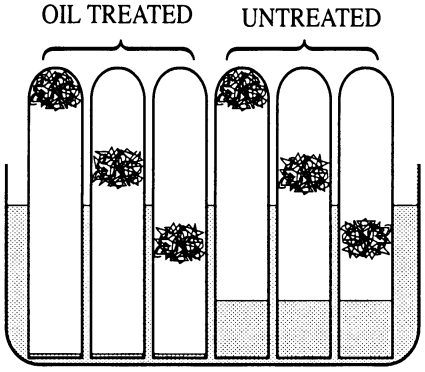


tasks 10-11 C

A company sells cylinders of gas, claiming that they contain 50% oxygen. How might you test this claim by experiment?

tasks 10, 11, 14, 15

Three pieces of steel wool were dipped in oil, and another three pieces were left untreated. They were placed in test tubes (in various positions) and inverted over water. After 24 hours the water levels rose only in the test tubes that contained untreated steel wool.



a. Why did water rise in some of the tubes, but not others?
b. Identify an important variable in this experiment that affected the results.
c. Identify an unimportant variable in this experiment that did not affect the results.
d. All important variables in this experiment are controlled. How do you know?

task 12

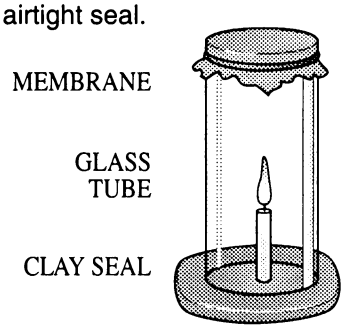
You are assigned the task of burning a nail. Explain how to do it.

tasks 12-13

Is iron oxide magnetic?

tasks 14-15 A

A glass tube has one end sealed with a balloon membrane. The open end is lowered over a burning candle and stuck into a "pancake" of clay, forming an airtight seal.



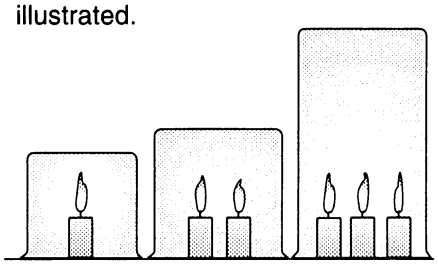
a. Will the membrane bulge out? Why?
b. Will the membrane be drawn in? Why?

tasks 14-15 B

A good scientists is always ready to replace a <u>good</u> hypothesis with a <u>better</u> one. Why not just start out with the <u>best</u> hypothesis and be done with it?

task 15

Burning candles are placed under different sized containers as illustrated.



a. Identify 2 important variables in this experiment.
b. Why is it difficult to predict which candles will go out first?

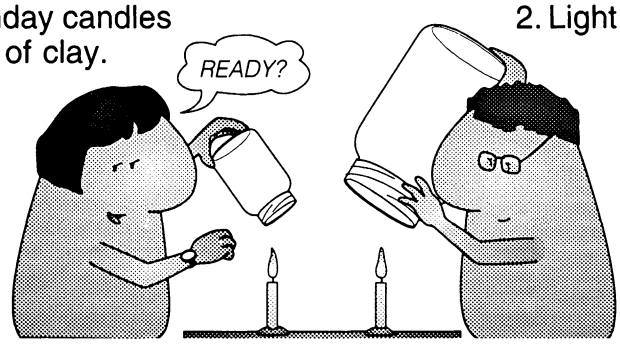
task 16

Design a demonstration to show that a car engine produces carbon dioxide and water vapor when it burns gasoline.

Task Objective (TO) discover that candles require a constant supply of oxygen to burn. To understand this process as an energy-producing oxidation reaction.

CANDLE COMBUSTION ○ Oxidation ( )

1. Stand 2 birthday candles in small lumps of clay. Put one next to a small jar, the other next to a large jar.



2. Light the candles, then set a jar over each one at the same time. Write your observations.

3. Blow fresh air into each jar, and repeat the experiment. Time how long each candle burns inside each jar.

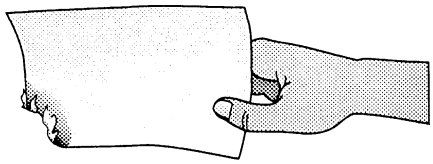
4. *Combustion* (burning) is a process that uses up both fuel and oxygen.
   a. Compare a new candle with a used one. What fuel is being consumed?
   b. Why do burning times vary with jar size?

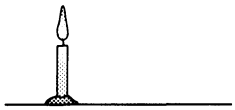
5. When a fuel burns, it *oxidizes* (combines with oxygen).
   a. What gets oxidized in this experiment?
   b. Does this oxidation reaction absorb energy or release energy? Explain.

 1

Introduction

Light a candle. Observe how a piece of paper (like hair and clothing) can catch fire at a distance. Discuss the safe and responsible use of open flames, disposal of hot matches, etc.





Answers / Notes

2. Both covered candles burn for a little while, then go out. The candle covered by the large jar burns longer than the candle covered by the small jar.

3. *Expect variations up to several seconds depending on the size of the candle flame and how thoroughly used air is purged from each container. Here is one result:*
   6 oz. baby food jar: candle burned 7 seconds
   pint jar: candle burned 16 seconds

4a. A used candle is shorter than a new one. This implies that candle wax is the fuel that gets consumed.

4b. The candle burns for a longer time in the larger jar because it contains more oxygen than the smaller jar. *(Air is a mixture of gases that include oxygen. For now, these words can be used interchangeably. Their distinction will emerge naturally over time.)*

5a. Candle wax gets oxidized as it burns.

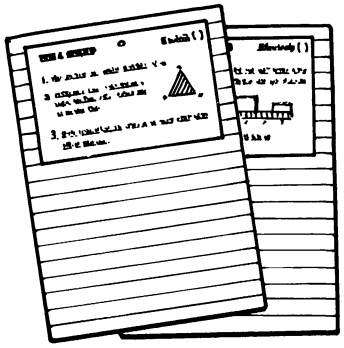
5b. This oxidation reaction releases energy in the form of heat and light.

Materials

- ☐ Birthday candles. Avoid the dripless variety with hollow centers.
- ☐ Modeling clay.
- ☐ A small jar. We recommend using a tall 170 g (6 ounce) baby food jar. Smaller sizes may not provide enough "head room" for the burning candle.
- ☐ A large jar, pint or quart size.
- ☐ Matches.
- ☐ A household candle (optional). Keeping 1 continuously lighted pilot candle in an accessible place will dramatically reduced match consumption.
- ☐ A tuna fish can or other shallow container for the safe disposal of used matches.
- ☐ A wall clock or a watch with a second hand.

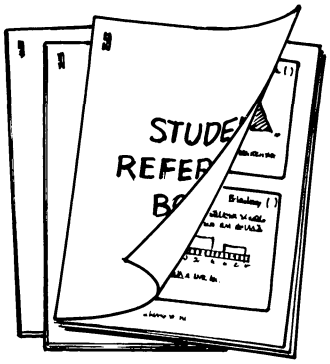
Task Cards Options

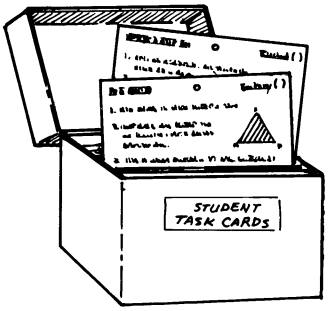
Here are 3 management options to consider before you photocopy:



1. Consumable Worksheets: Copy 1 complete set of task card pages. Cut out each card and fix it to a separate sheet of boldly lined paper. Duplicate a class set of each worksheet master you have made, 1 per student. Direct students to follow the task card instructions at the top of each page, then respond to questions in the lined space underneath.

2. Nonconsumable Reference Booklets: Copy and collate the 2-up task card pages in sequence. Make perhaps half as many sets as the students who will use them. Staple each set in the upper left corner, both front and back to prevent the outside pages from working loose. Tell students that these task card booklets are for reference only. They should use them as they would any textbook, responding to questions on their own papers, returning them unmarked and in good shape at the end of the module.



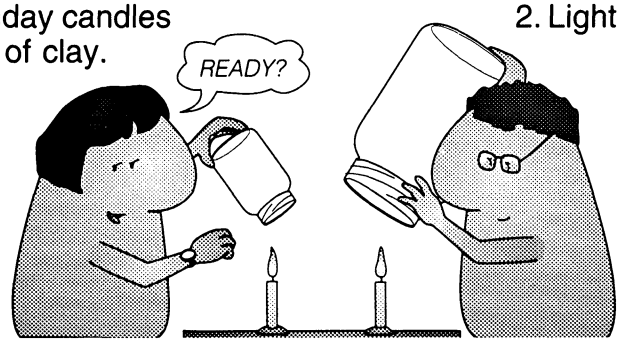


3. Nonconsumable Task Cards: Copy several sets of task card pages. Laminate them, if you wish, for extra durability, then cut out each card to display in your room. You might pin cards to bulletin boards; or punch out the holes and hang them from wall hooks (you can fashion hooks from paper clips and tape these to the wall); or fix cards to cereal boxes with paper fasteners, 4 to a box; or keep cards on designated reference tables. The important thing is to provide enough task card reference points about your classroom to avoid a jam of too many students at any one location. Two or 3 task card sets should accommodate everyone, since different students will use different cards at different times.

CANDLE COMBUSTION

Oxidation ( )

1. Stand 2 birthday candles in small lumps of clay. Put one next to a small jar, the other next to a large jar.



2. Light the candles, then set a jar over each one at the same time. Write your observations.

3. Blow fresh air into each jar, and repeat the experiment. Time how long each candle burns inside each jar.

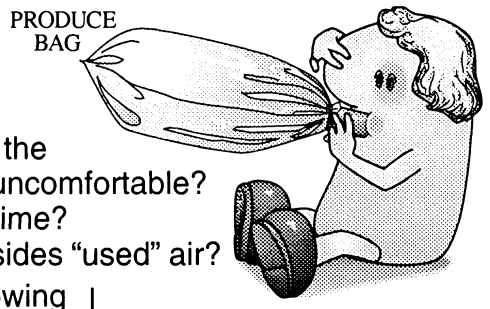
4. *Combustion* (burning) is a process that uses up both fuel and oxygen.
   a. Compare a new candle with a used one. What fuel is being consumed?
   b. Why do burning times vary with jar size?

5. When a fuel burns, it *oxidizes* (combines with oxygen).
   a. What gets oxidized in this experiment?
   b. Does this oxidation reaction absorb energy or release energy? Explain.

HUMAN RESPIRATION

Oxidation ( )

1. Cut an empty toilet paper roll into 2 equal tubes. Rubberband the mouth of a sandwich bag around one, a plastic produce bag around the other.



2. Take a deep breath and hold your nose. Breathe in and out through your mouth, as normally as possible, into the larger bag.
   a. Look at a clock. How long can you use the same air over and over before you feel uncomfortable?
   b. How did your breathing change over time?
   c. Did you collect anything in the bag besides "used" air?

3. Now exhale fully into the small bag, allowing excess air to leak past the mouthpiece. Once again, hold your nose and breathe through your mouth as normally as possible.
   a. How long did you rebreathe the same air? Compare this result with step 2a.
   b. Compare human *respiration* (breathing) to candle combustion.

4. A candle oxidizes wax.
   a. What do you think *you* oxidize?
   b. Does the oxidation reaction in your body absorb or release energy? Explain.