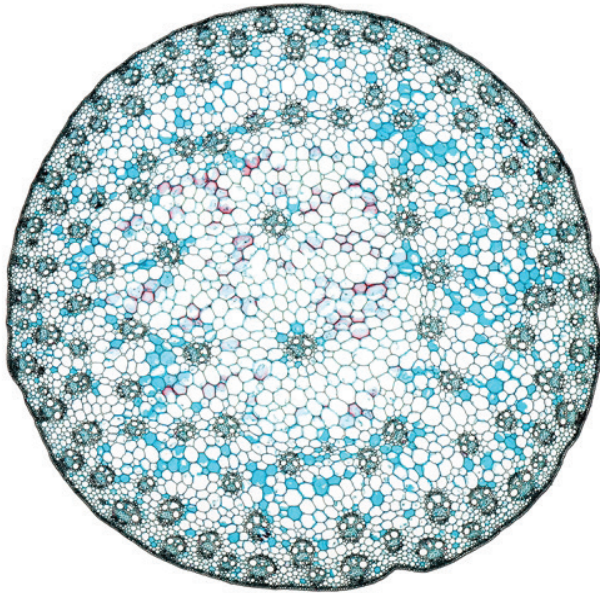
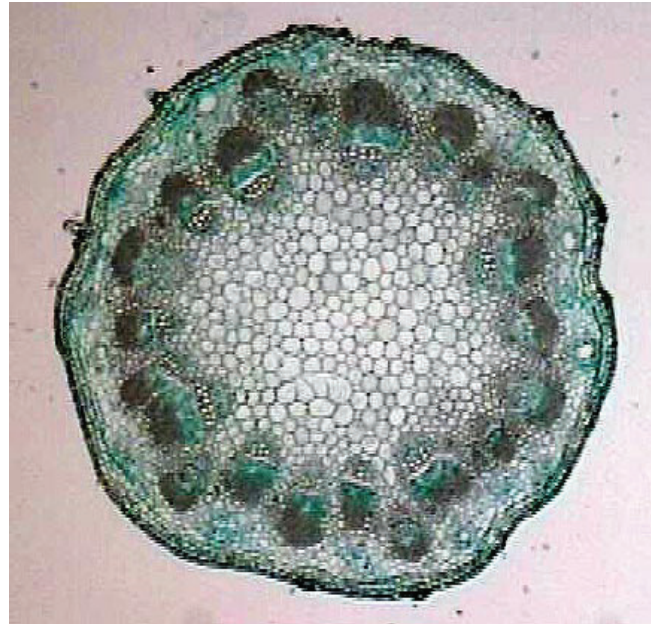


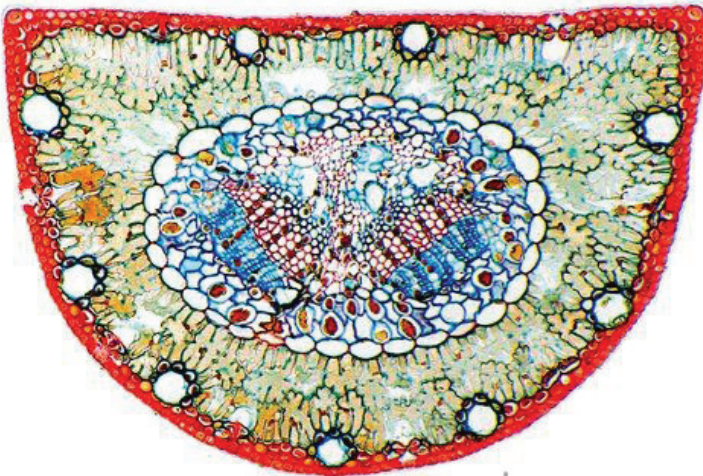
MONOCOT STEM
cross section



DICOT STEM
cross section



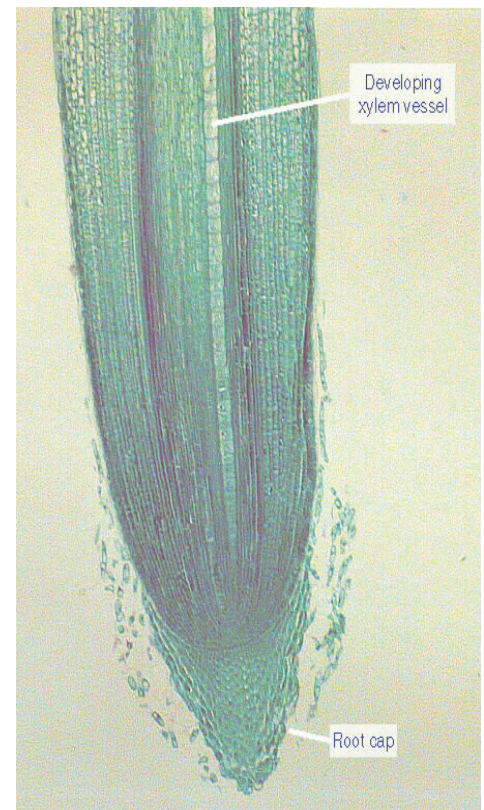
PINE NEEDLE
cross section



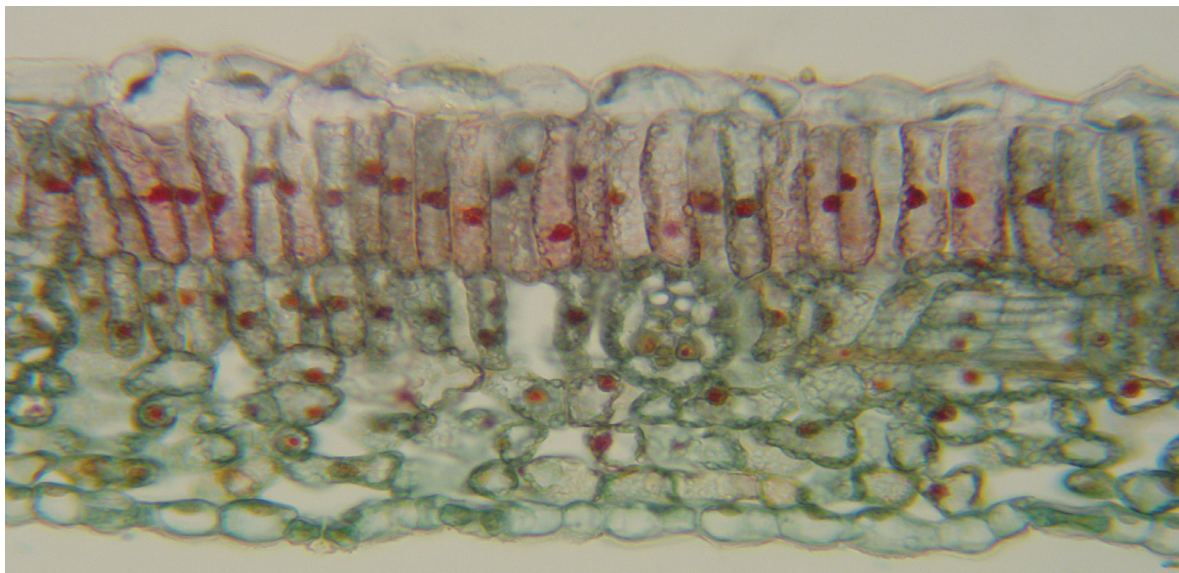
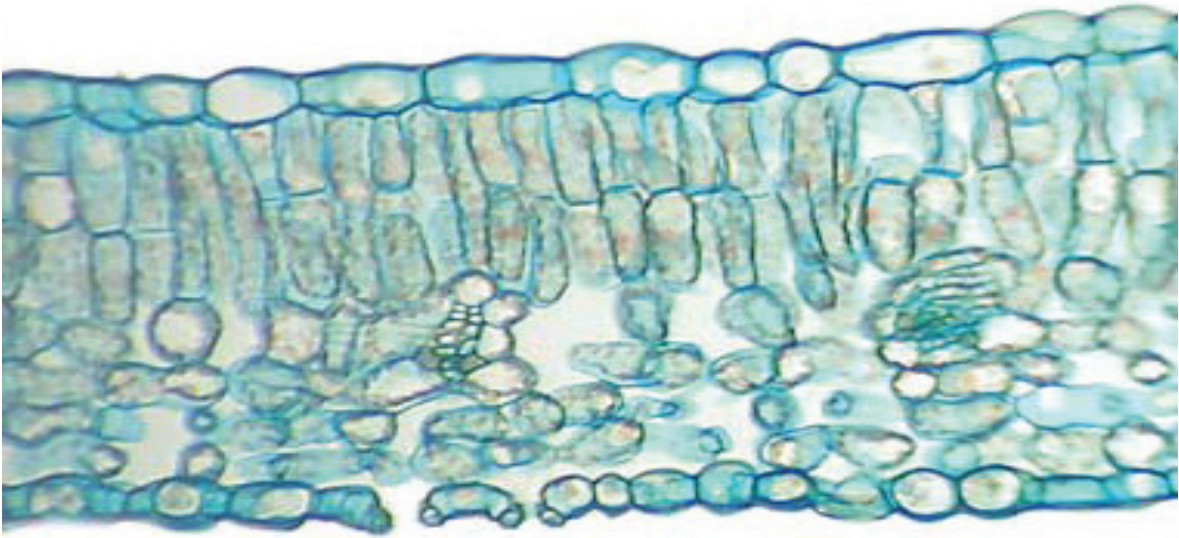
This piece of pine needle has been stained with at least three different stains. The natural cells are either light green or clear.

The epidermis cells have been stained red. There are only a few stomata showing--they are little indentations in the red. The white circles around the outside are resin channels. The interior oval is called the pericycle and contains two vascular bundles. The edges of the bundles are a little vague in this picture, but the xylem is blue. The xylem and phloem blue and the phloem is red with black stripes. The mesophyll is green.

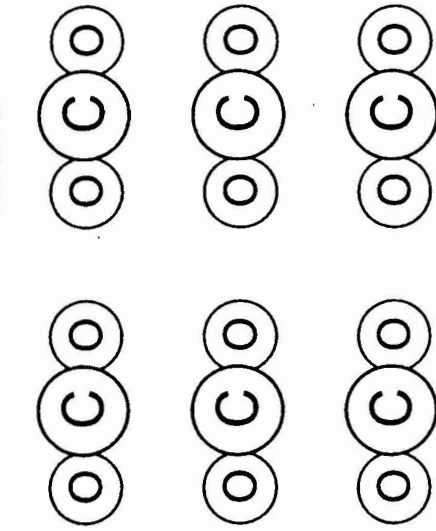
CORN ROOT TIP
cross section



LEAF CROSS SECTIONS

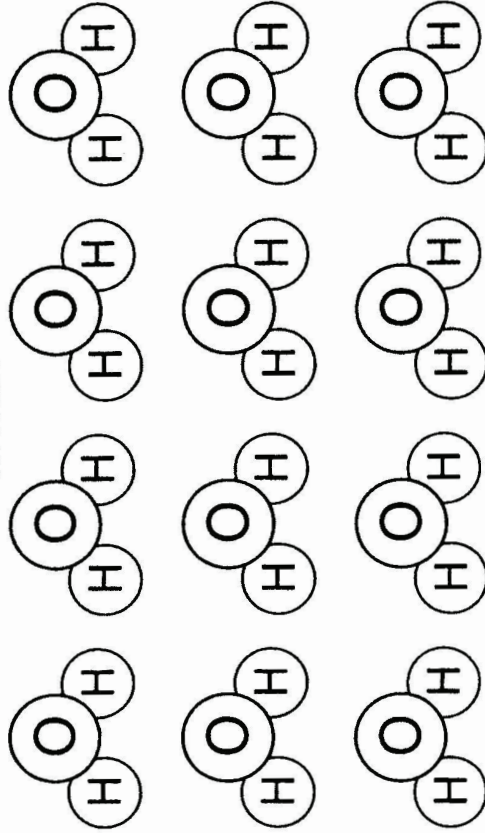


CARBON DIOXIDE



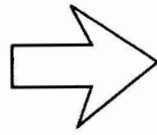
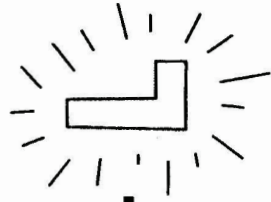
+

WATER

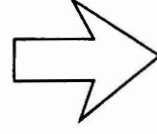


+

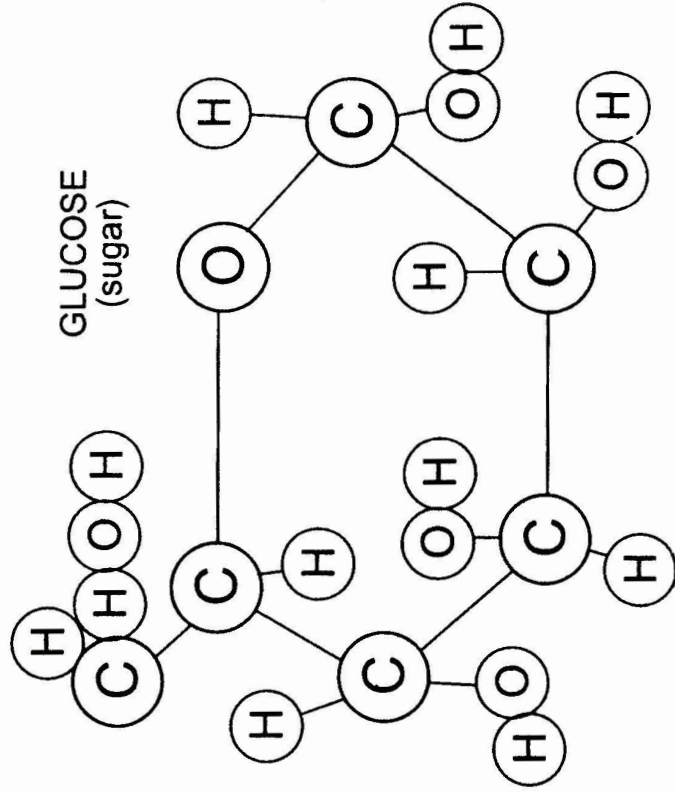
LIGHT
ENERGY



PHOTOSYNTHESIS

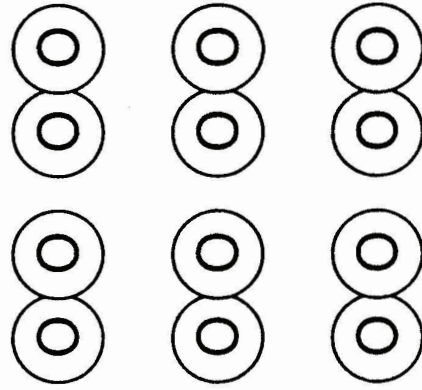


GLUCOSE
(sugar)



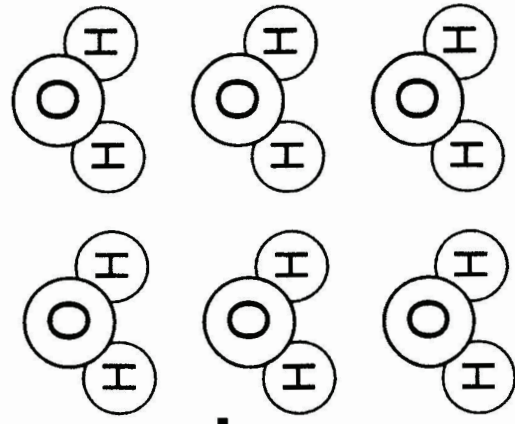
+

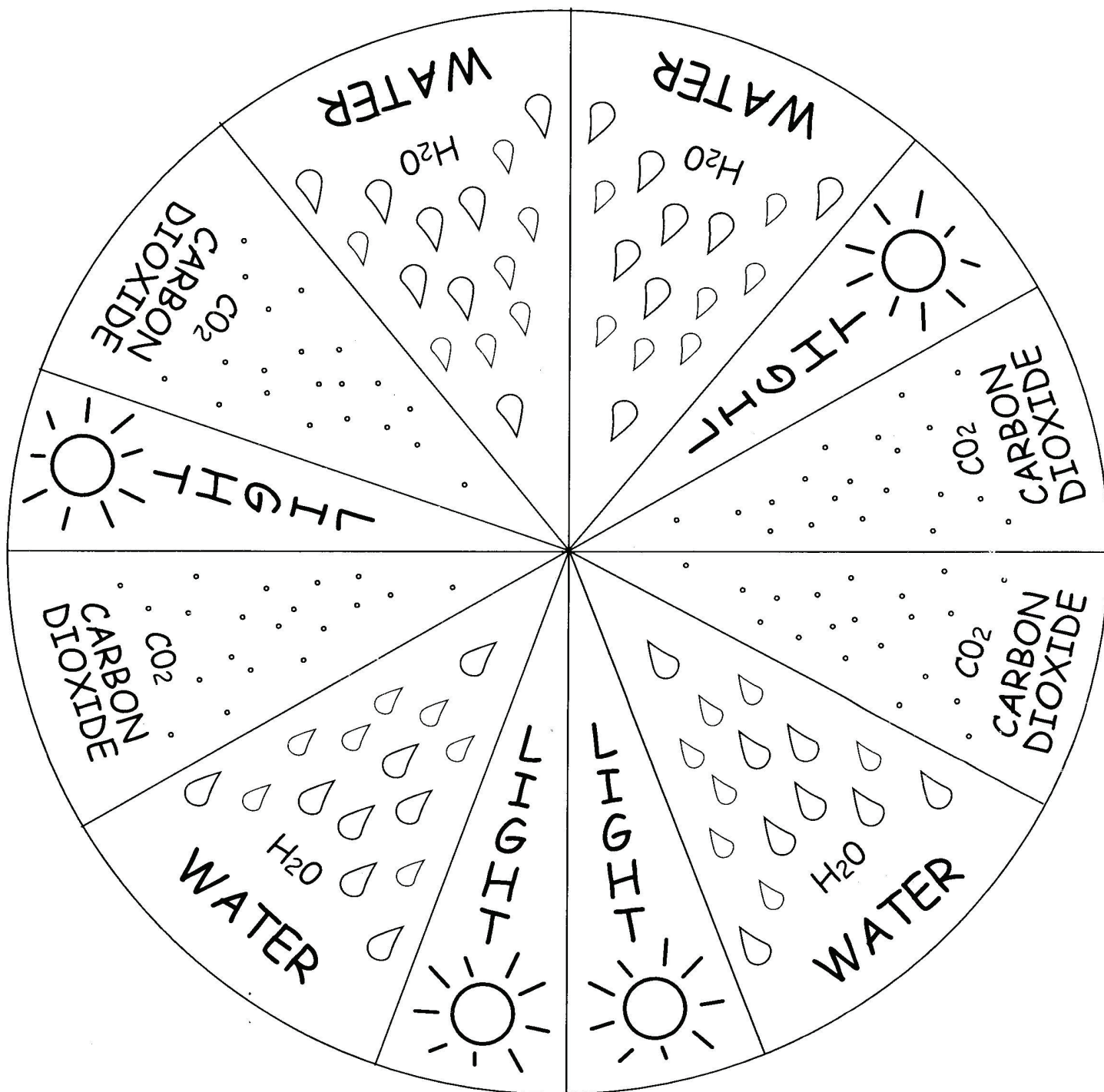
OXYGEN (O₂)



+

WATER

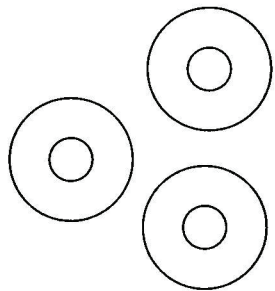
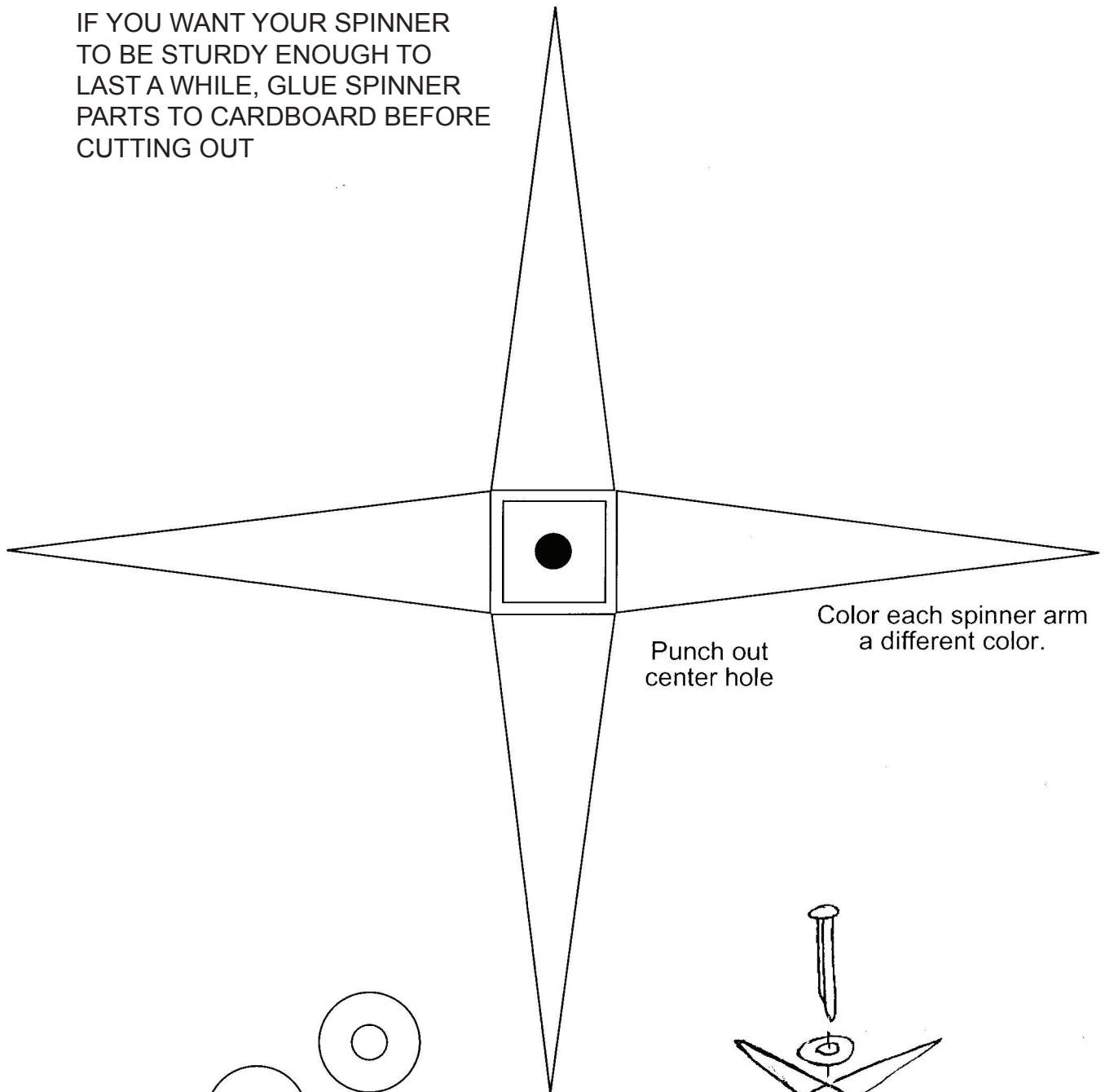




Do not cut out circle. Simply cut across this line.

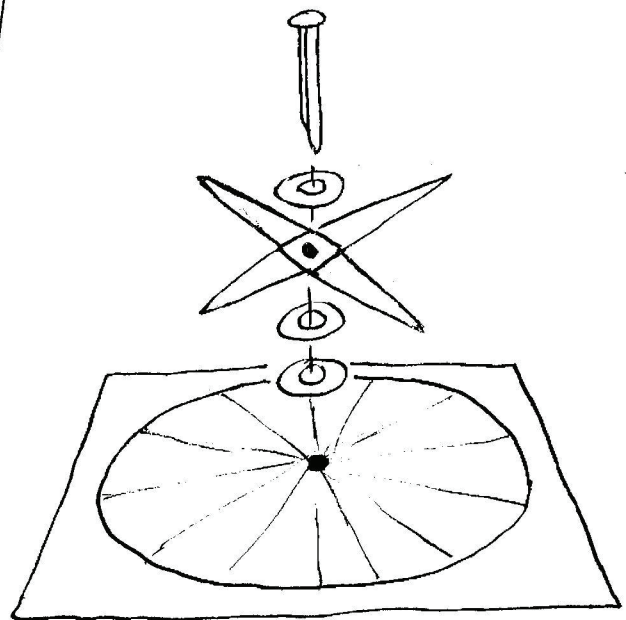
GLUE THIS SPINNER SQUARE TO CARDBOARD IF YOU WANT IT TO BE STURDY ENOUGH TO LAST A WHILE. (CEREAL BOX CARDBOARD IS FINE.)

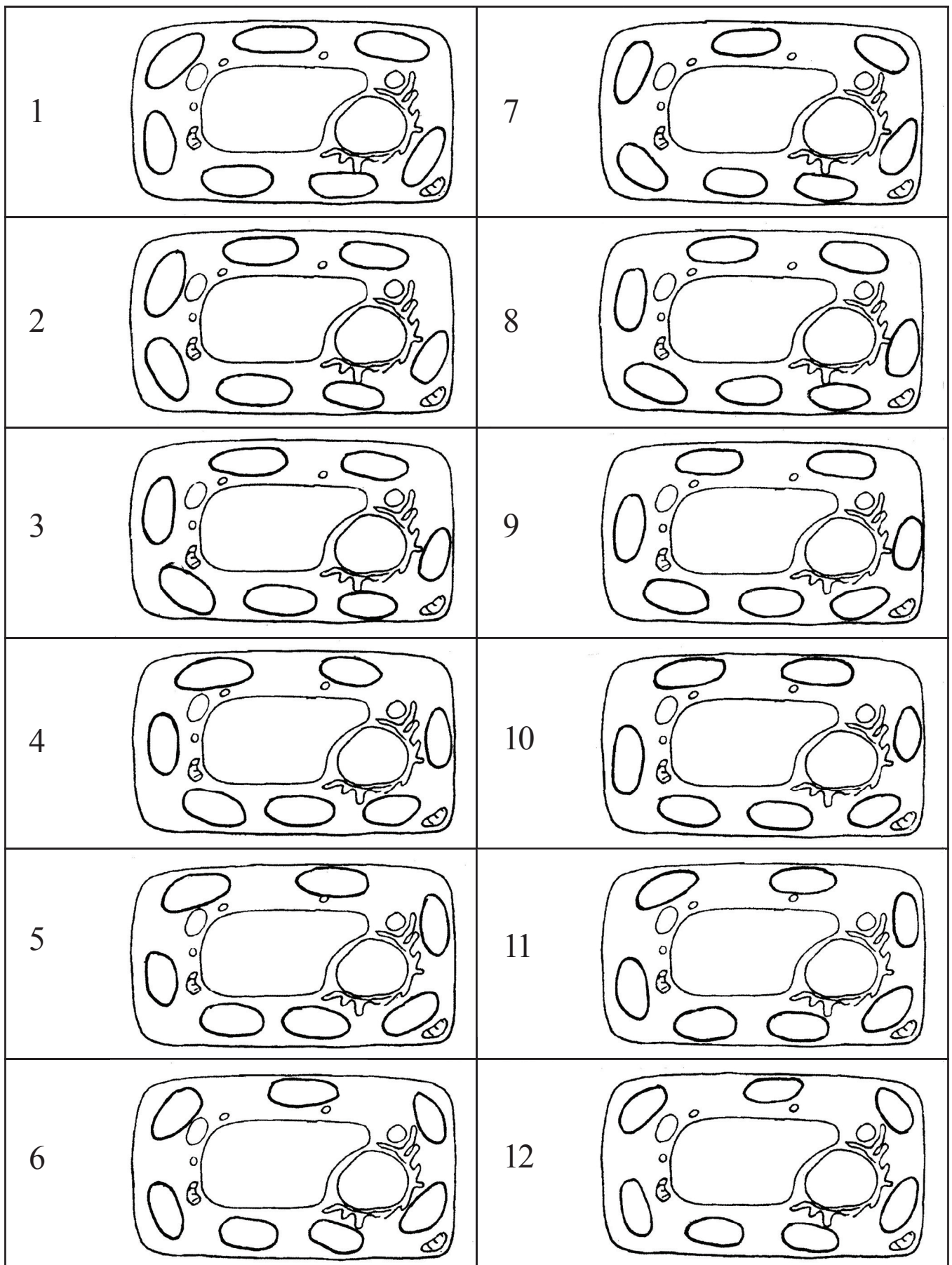
IF YOU WANT YOUR SPINNER
TO BE STURDY ENOUGH TO
LAST A WHILE, GLUE SPINNER
PARTS TO CARDBOARD BEFORE
CUTTING OUT



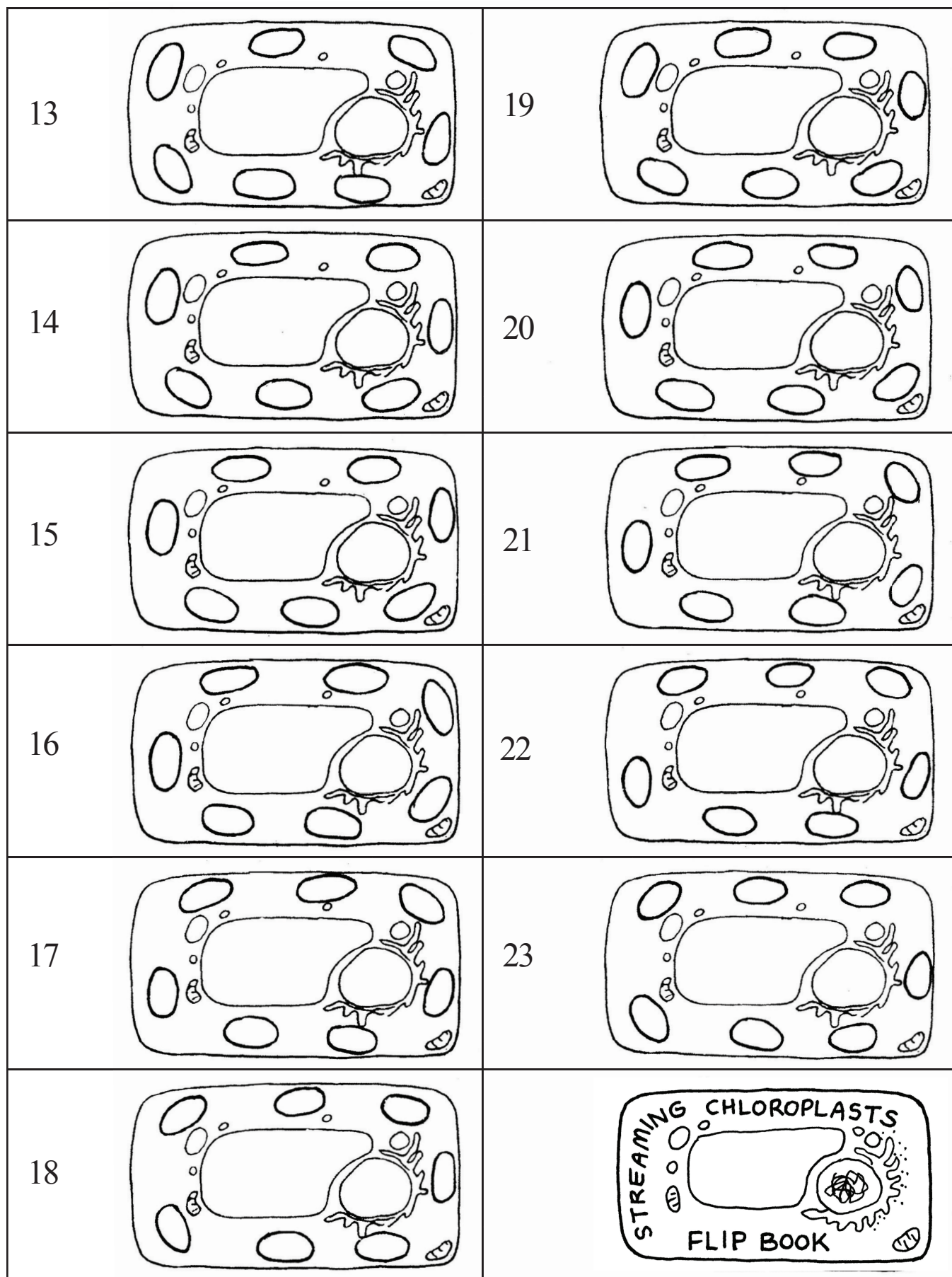
PAPER WASHERS

(You can use a paper punch
to cut out centers.)





COPY ONTO WHITE CARD STOCK

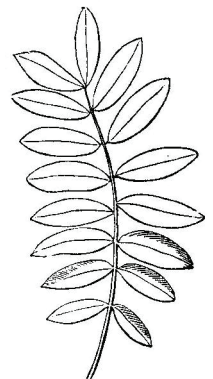
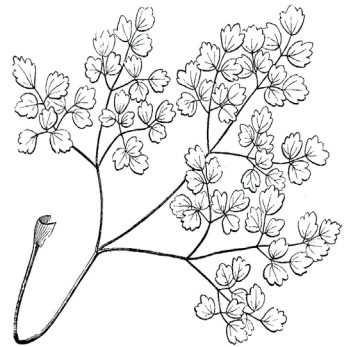


COPY ONTO WHITE CARD STOCK

FINAL REVIEW (Level 1)

Name _____

- 1) Which of these things is NOT a necessary ingredient for photosynthesis?
a) sunlight b) sugar c) carbon dioxide d) water
- 2) This process is considered to be the “opposite” of photosynthesis because it uses sugar and oxygen instead of producing them.
a) respiration b) perspiration c) oxidation d) transpiration
- 3) Where would you find chlorophyll molecules?
a) in thylakoids b) in chloroplasts c) in plant cells d) all of these are correct
- 4) When a cell splits in half, this is called:
a) separation b) doubling c) mitosis d) meiosis
- 5) Which organelle moves around inside the cell, “streaming” in a large circular pattern?
a) the nucleus b) the chloroplasts c) the ribosomes d) the thylakoids e) the vacuoles
- 6) Which one of these does not make seeds?
a) ferns b) legumes c) Ginkgo trees d) lilies e) monocots
- 7) Which one of these does not have a vascular system?
a) ferns b) mosses c) monocots d) gymnosperms
- 8) Which one of these is not a monocot?
a) daffodils b) lilies c) tulips d) roses
- 9) By what process do mosses and liverworts get water to their cells?
a) transpiration b) photosynthesis c) meiosis d) osmosis
- 10) What type of cells transport water from the roots up to the leaves?
a) xylem b) phloem c) epidermis d) cortex
- 11) Which one of these never contains chloroplasts?
a) guard cells b) palisade layer c) epidermis cells d) cuticle e) spongy mesophyll
- 12) Which one of these is NOT a female reproductive part?
a) ovule b) anther c) pistil d) stigma
- 13) Which one of these would you find only in angiosperms?
a) seed b) sperm c) ovule d) pollen tube e) endosperm
- 14) Which one of these is a true vegetable?
a) tomato b) squash c) cabbage d) corn e) bean
- 15) Which one of these is NOT a plant pigment?
a) ethylene b) xanthophyll c) carotene d) anthocyanin e) chlorophyll



Matching:

- 16) ____ Another name for “seed leaf.”
- 17) ____ The center of a dicot stem.
- 18) ____ Transports sugar up or down.
- 19) ____ The holes in the underside of a leaf.
- 20) ____ The waxy outer layer of a leaf.
- 21) ____ The proper name for a plant “hair.”
- 22) ____ This is what forms when an egg and sperm join.
- 23) ____ This is what “heartwood” is made of.
- 24) ____ This is what forms when a sperm joins with polar nuclei.
- 25) ____ This is where you find pollen grains.

Possible answers:

- A) cuticle
- B) trichome
- C) cotyledon
- D) xylem
- E) phloem
- F) stomata
- G) anther
- H) pith
- I) endosperm
- J) zygote

TRUE or FALSE?

- 26) ____ Glucose is a type of sugar.
- 27) ____ Dicots have parallel veins and fibrous roots.
- 28) ____ Ferns have xylem and phloem.
- 29) ____ Ferns make egg and sperm cells.
- 30) ____ Photosynthesis does not occur in roots.
- 31) ____ Desert plants have fewer stomata than tropical plants do.
- 32) ____ Amazon lilies eat beetles.
- 33) ____ Plants can reproduce by means other than using egg and sperm.
- 34) ____ Seagrasses can get oxygen from water instead of air.
- 35) ____ Angiosperm ovules contain one female cell.



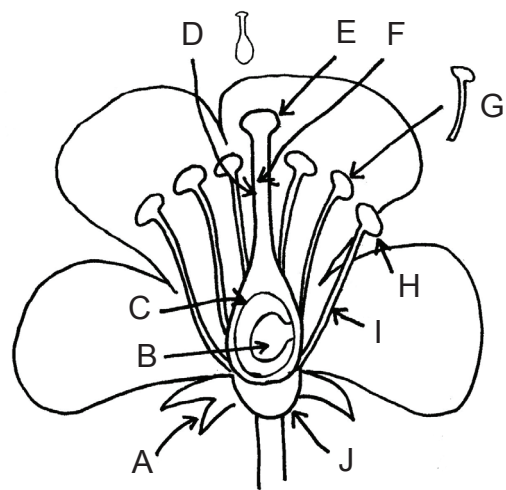
Nasturtium: one of the very few plants with truly circular leaves (the stem attaches to the leaf like an umbrella handle)

Fill in these blanks:

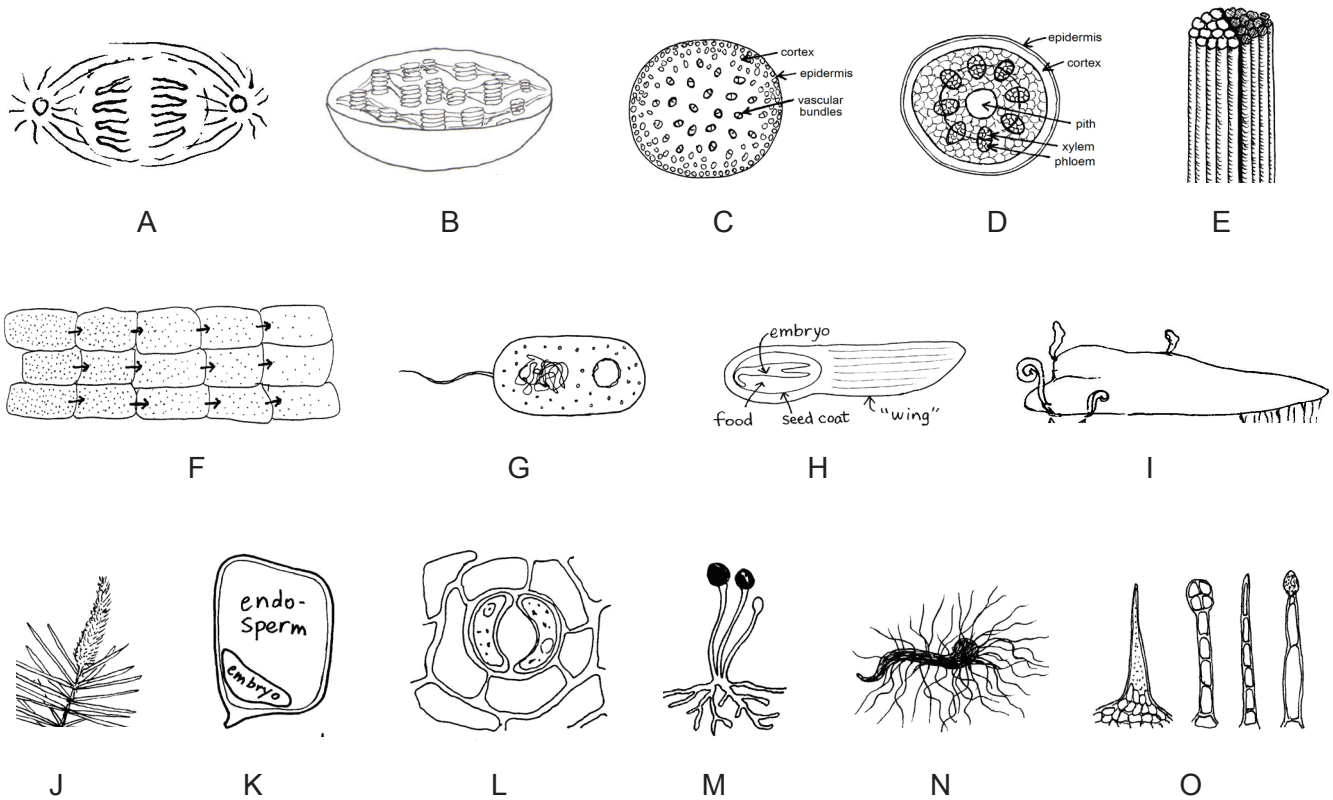
- 36) C3, C4 and CAM are all forms of _____.
- 37) The first virus ever discovered was on a _____ plant.
- 38) The tiniest flower in the world is found on a small aquatic plant called _____.
- 39) A stoma (one stomata) is surrounded by a pair of _____ cells.
- 40) A _____ is a lump that was caused by an invading insect, bacteria, or virus.

Match the words with the labeled parts in the diagram:

- 41) ____ pistil
- 42) ____ sepals
- 43) ____ anther
- 44) ____ stigma
- 45) ____ filament
- 46) ____ stamen
- 47) ____ style
- 48) ____ receptacle
- 49) ____ ovule
- 50) ____ ovary



What are these things? (Hopefully, you remember!)



- 51) ____ monocot cross section
- 52) ____ osmosis in action
- 53) ____ corn seed
- 54) ____ mitosis in cell nucleus
- 55) ____ fern sperm

- 56) ____ dicot cross section
- 57) ____ crown gall bacteria
- 58) ____ pine seed
- 59) ____ guard cells / stoma
- 60) ____ vascular bundle

- 61) ____ fungus
- 62) ____ trichomes
- 63) ____ fern prothallus
- 64) ____ chloroplast
- 65) ____ male cone

We learned quite a few Latin word roots in this curriculum. How many can you remember?

- 66) light _____
67) greenish-yellow _____
68) container/vessel _____
69) naked _____
70) to make _____
71) joined together _____
72) side _____
73) tip _____
74) flat, or blade _____
75) tree _____
76) time _____
77) middle _____
78) one _____
79) two _____
80) outside or outer _____
81) skin _____
82) moss _____
83) leaf _____
84) seed _____
85) yellow _____

Here are the Latin words you can use:

angio	apex	bryo
chloro	chrono	dendro
dermis	di	epi
gymno	lamina	lateral
meso	mono	photo
phyll	sperm	synth
xantho	zygotos	



white oak



sugar maple



plum tree



bristlecone pine



weeping willow

Can you match each tree to its scientific name?

- 86) *Acer saccharum* _____
88) *Pinus longaeva* _____
90) *Prunus domestica* _____

- 87) *Salix babylonica* _____
89) *Quercus alba* _____
(Notice how scientific names are always in italics.)

Can you fill in these word pairs?

- 91/92) The first division of the plant kingdom is _____ versus ____-_____.
93/94) Angiosperms are divided into two groups: _____ and _____.
95/96) The two major parts of an angiosperm seed are the e_____ and the e_____.
97/98) Seagrass leaves have neither c_____ nor s_____.
99/100) The two main types of vascular tissue are _____ and _____.

FINAL REVIEW (Level 2)

Match each organelle to its function.

- | | | |
|-----------------|-----------------|--------------------------|
| A) cytoplasm | D) Golgi bodies | G) ribosomes |
| B) cytoskeleton | E) chloroplasts | H) endoplasmic reticulum |
| C) nucleus | F) leucoplasts | I) vacuole |
| | | J) mitochondria |

- 101) ____ The “center” of the cell. Its contains DNA.
- 102) ____ A network of fibers that helps the cell to maintain its shape and serves as a “road system.”
- 103) ____ The cell’s “post office.” It labels products and sends them where they need to go.
- 104) ____ The “powerhouses” of the cell. They generate energy in the form of ATPs.
- 105) ____ These are like storage tanks.
- 106) ____ These are like little factory workers, assembling proteins.
- 107) ____ This is where light energy is captured and turned into chemical energy.
- 108) ____ This is like an empty bubble.
- 109) ____ This is the fluid that fills the cells.
- 110) ____ This has many jobs. It manufactures proteins and lipids, helps the cell to maintain its shape, and helps to transport things around the cell. Some parts of it are covered with ribosomes.

111) What pops off ATP to release energy?

- a) an electron b) a proton c) a phosphate d) an adenosine e) an oxygen molecule

112) What does Rubisco do?

- a) takes carbon dioxide out of the air b) takes oxygen out of the air c) makes PGALs

113) What changes ADP back into ATP?

- a) nothing b) high-energy electrons c) photons d) ATP synthase

114) How many carbon atoms are in a glucose molecule? a) 1 b) 3 c) 4 d) 6 e) 8

115) Which one of these is NOT necessary for the light-dependent part of photosynthesis?

- a) oxygen b) carbon dioxide c) water d) electrons e) protons

116) Which one of these is NOT necessary for the light-independent part of photosynthesis?

- a) carbon dioxide b) ATP c) NADPH d) photons

117) Which one of these is NOT produced by the light-dependent phase of photosynthesis?

- a) oxygen b) carbon dioxide c) ATP d) NADPH

118) Which one of these is NOT a simple fruit?

- a) watermelon b) squash c) apple d) cherry e) strawberry

119) Which of the following does NOT transport seeds from one place to another?

- a) animals b) birds c) humans d) wind e) water f) rocks

120) What type of parasite is the Rafflesia plant?

- a) hyperparasite b) hemiparasite c) obligate parasite

TRUE or FALSE?

- 121) ____ The human digestive tract is very good at breaking apart plant cells.
122) ____ The inside of the thylakoid is called the lumen.
123) ____ Light is necessary for the Calvin Cycle.
124) ____ A plant's ability to respond to an aspect of its environment is called a tropism.
125) ____ Light stimulates plant cells to produce auxin.
126) ____ Spores do not contain embryos, therefore they can survive a lot longer.
127) ____ Spores are larger than seeds.
128) ____ All plants form nitrogen-fixing nodules on their roots.
129) ____ Pathogens can be used to control other pathogens.
130) ____ Mites belong to the spider family, therefore they are carnivorous and don't eat plants.
131) ____ Anthocyanin is poisonous.
132) ____ Acorns, peanuts and dandelion seeds are actually fruits.
133) ____ Planting marigolds will help to control root nematodes.
134) ____ Planting roses will help to discourage aphids.
135) ____ The Gypsy moth was brought to America intentionally.

Fill in the blanks.

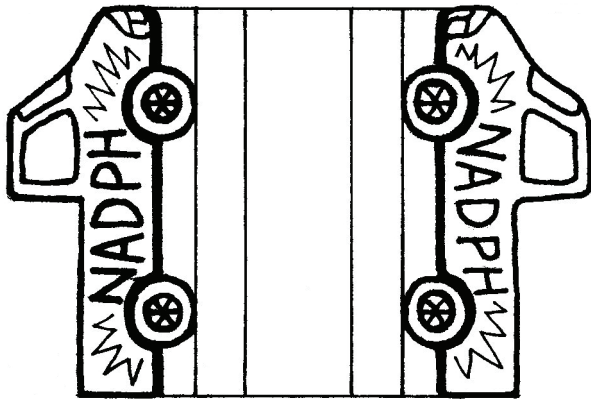
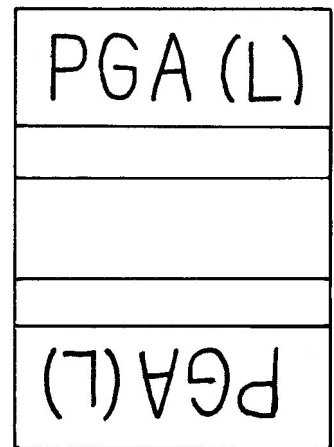
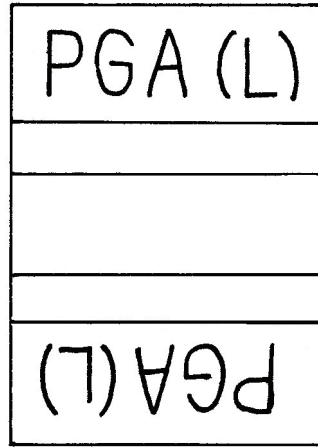
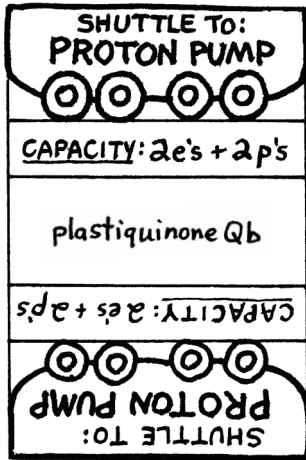
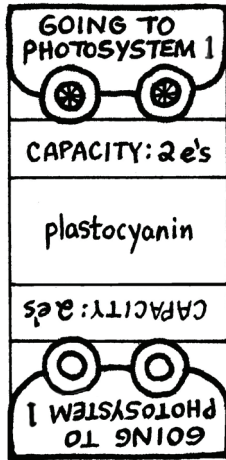
- 136/137) Spores are produced for qu_____, seeds are for qu_____.
138) If it's not herbaceous, it's w_____.
139) If it's not gametophyte, it's s_____.
140) If it can't live on its own, it's a p_____.

Where would you be most likely to find these pests?

- | | |
|--|---------------------|
| 141) ____ Gypsy moths | A) raspberry leaves |
| 142) ____ Aphids | B) tomato stems |
| 143) ____ Weevils | C) oak trees |
| 144) ____ "Cabbage whites" (butterflies) | D) broccoli plants |
| 145) ____ Japanese beetles | E) cotton plants |



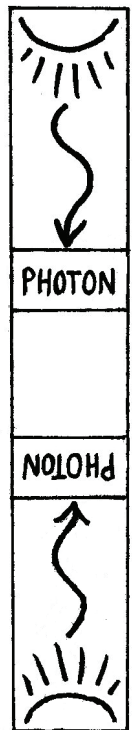
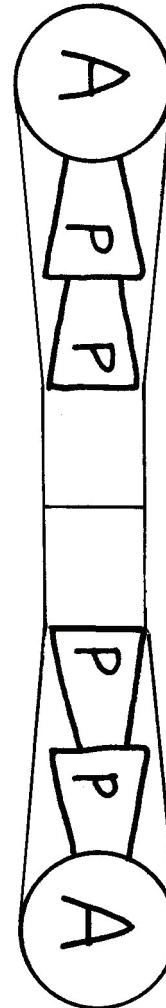
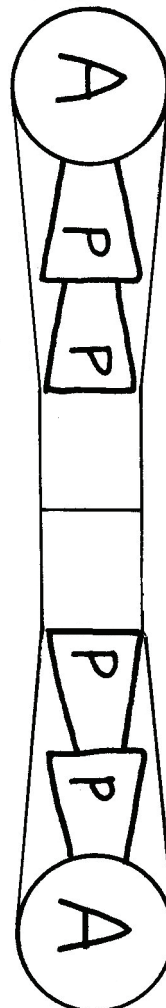
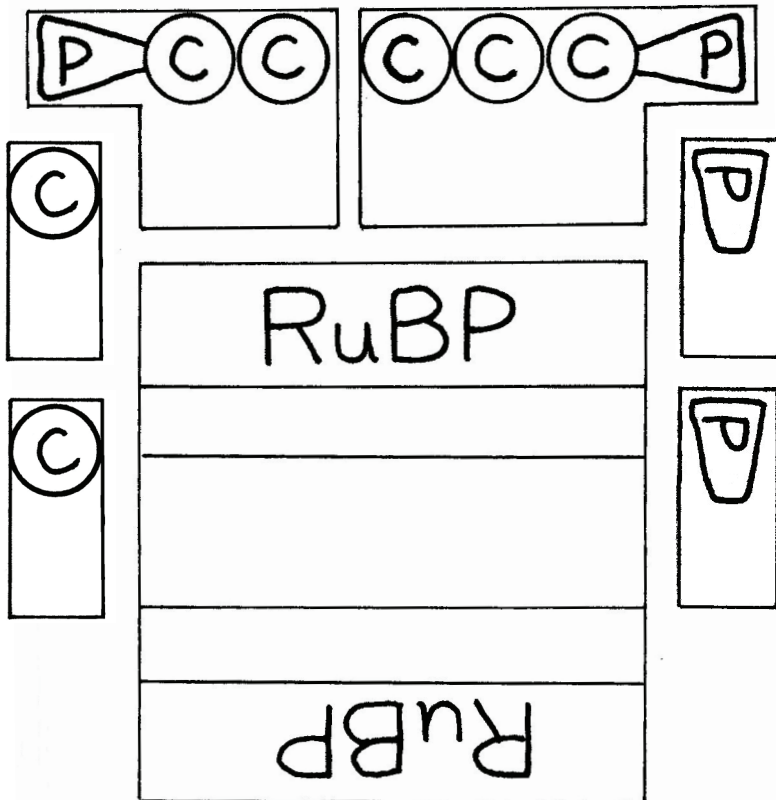
- | | |
|---|-----------------------------|
| 146) This plant has the fastest trap mechanism in the world. ____ | A) <i>Atropa belladonna</i> |
| 147) This plant is poisonous. ____ | B) bladderwort |
| 148) This plant does not have leaves. ____ | C) pitcher plant |
| 149) This plant is a parasite on trees. ____ | D) <i>Rafflesia</i> |
| 150) This plant is carnivorous but has no spring mechanisms. ____ | E) mistletoe |



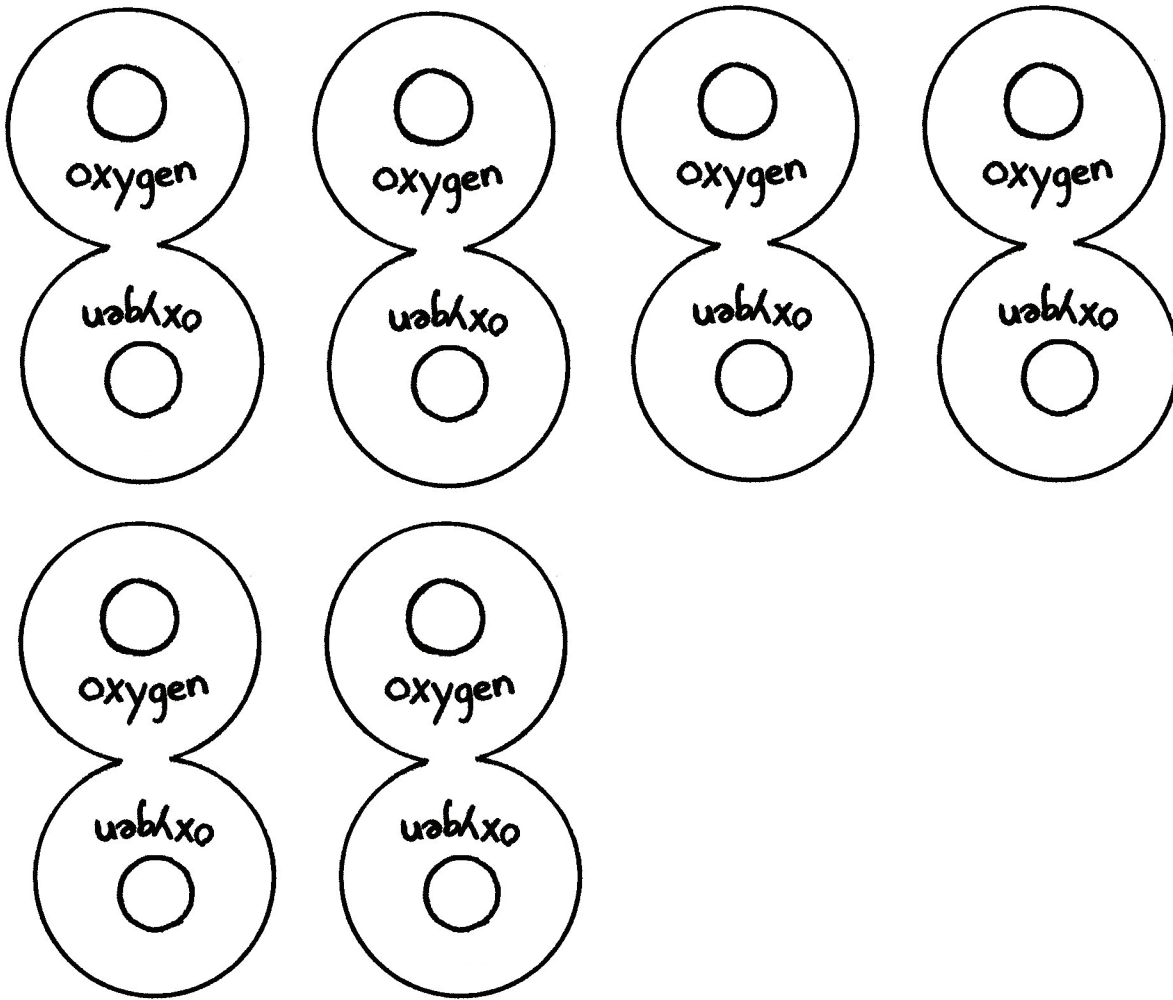
EACH PLAYER NEEDS A COPY OF THIS PAGE.

IF POSSIBLE, MAKE EACH COPY ON A DIFFERENT COLOR OF PAPER. IF COLORED PAPER IS NOT AN OPTION, EACH PLAYER SHOULD USE A MARKER OR COLORED PENCIL TO PERSONALIZE THEIR PIECES SO THAT THEY CAN IDENTIFY THEIR PIECES DURING THE GAME.

We've added an extra carbon and an extra phosphate. These are tiny pieces and can get lost easily, so you have an extra.



YOU NEED ONLY ONE COPY OF THIS PAGE PER GAME (up to 4 players)



\oplus P	\oplus P	\oplus P	\oplus P	\oplus P	\oplus P	\oplus P	\oplus P	\oplus P	\oplus P	\oplus P	\oplus P
\ominus E	\ominus E	\ominus E	\ominus E	\ominus E	\ominus E	\ominus E	\ominus E	\ominus E	\ominus E	\ominus E	\ominus E
\oplus P	\oplus P	\oplus P	\oplus P	\oplus P	\oplus P	\oplus P	\oplus P	\oplus P	\oplus P	\ominus E	\ominus E

Roll 
to get
through

PHOTOSYSTEM 2

START

START

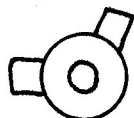
START

START

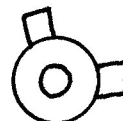
PHOTOSYSTEM 2

is very unstable - it must be
reassembled many times per second!

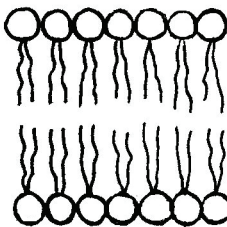
Water molecules



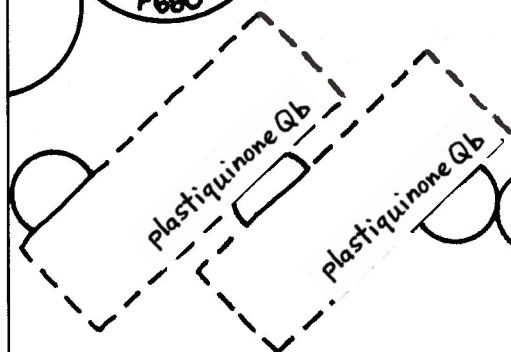
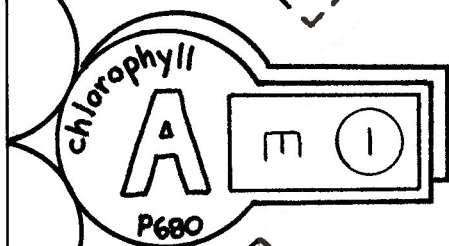
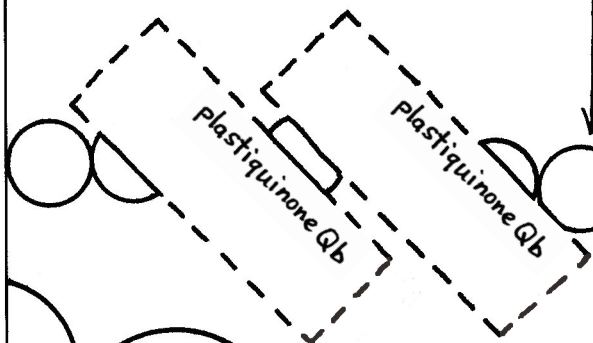
float here



These circles represent the "heads" of phospholipid molecules. The "tails" are not shown because they would make the drawing look too complicated.



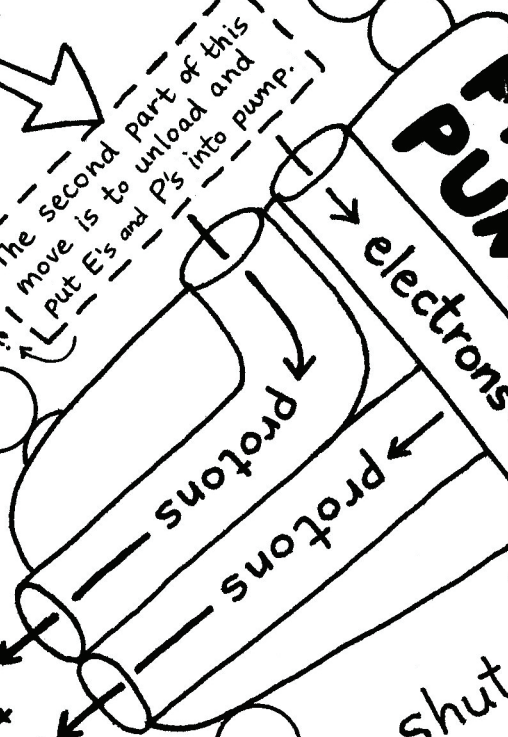
Parking spaces for shuttles



ONE MOVE

Move your shuttle back when you are done.

The second part of this move is to unload and put E's and P's into pump.

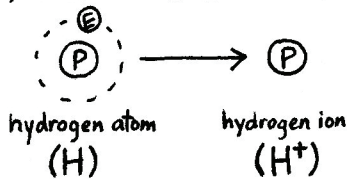


$2 + 2 = 4$ protons pumped in

shut par

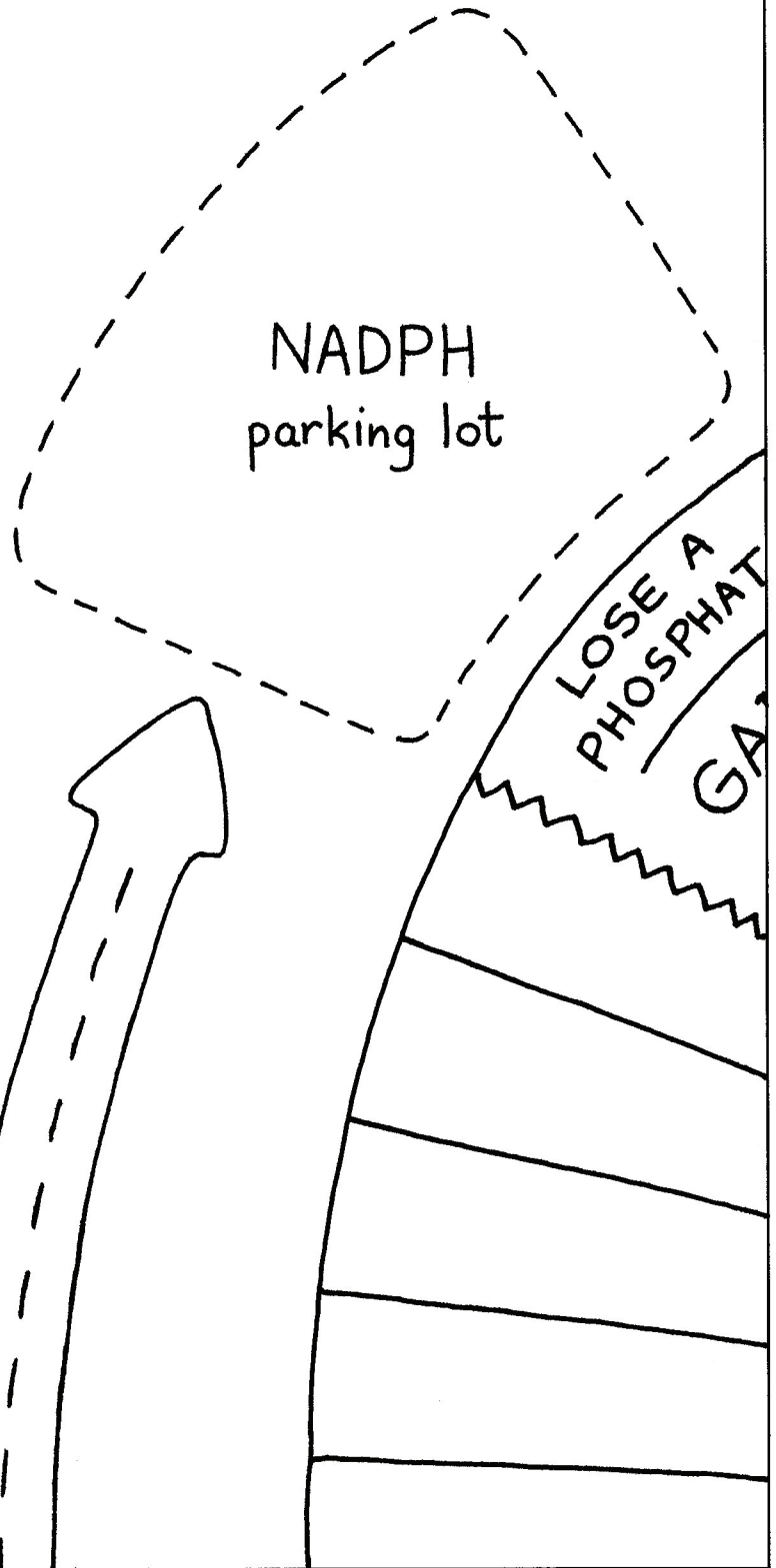
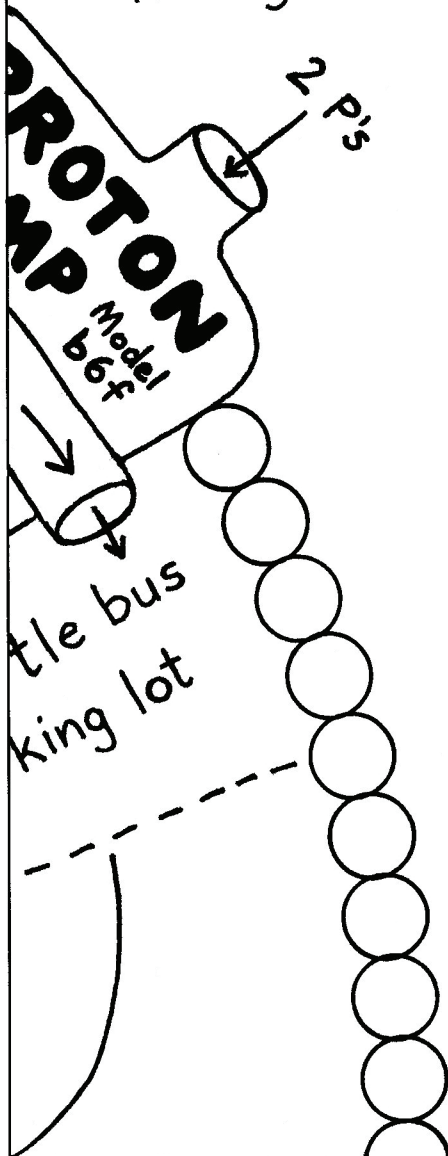
protons will float down (no moves needed)

Another name for protons is "hydrogen ions." Since a hydrogen atom is nothing but one proton and one electron, when you take away the electron (making the atom into an ion), only the proton is left.

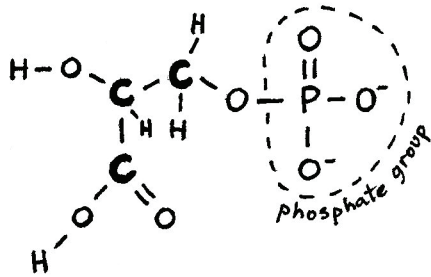


Discarded phosphates can just float here, or they can be put next to the ATP synthase, ready for recycling.

extra protons should be floating here

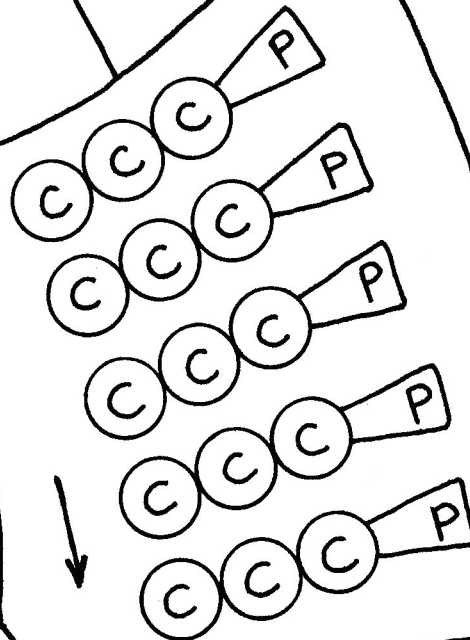


This is what PGAL
looks like:



CONGRATULATIONS
You may now leave
the Calvin Cycle!

PGAL is now PGAL!
2 P's



(3x5)

Store empty

Magical Mathematical



ATP synthase is also found in the mitochondria of both plant and animal cells.

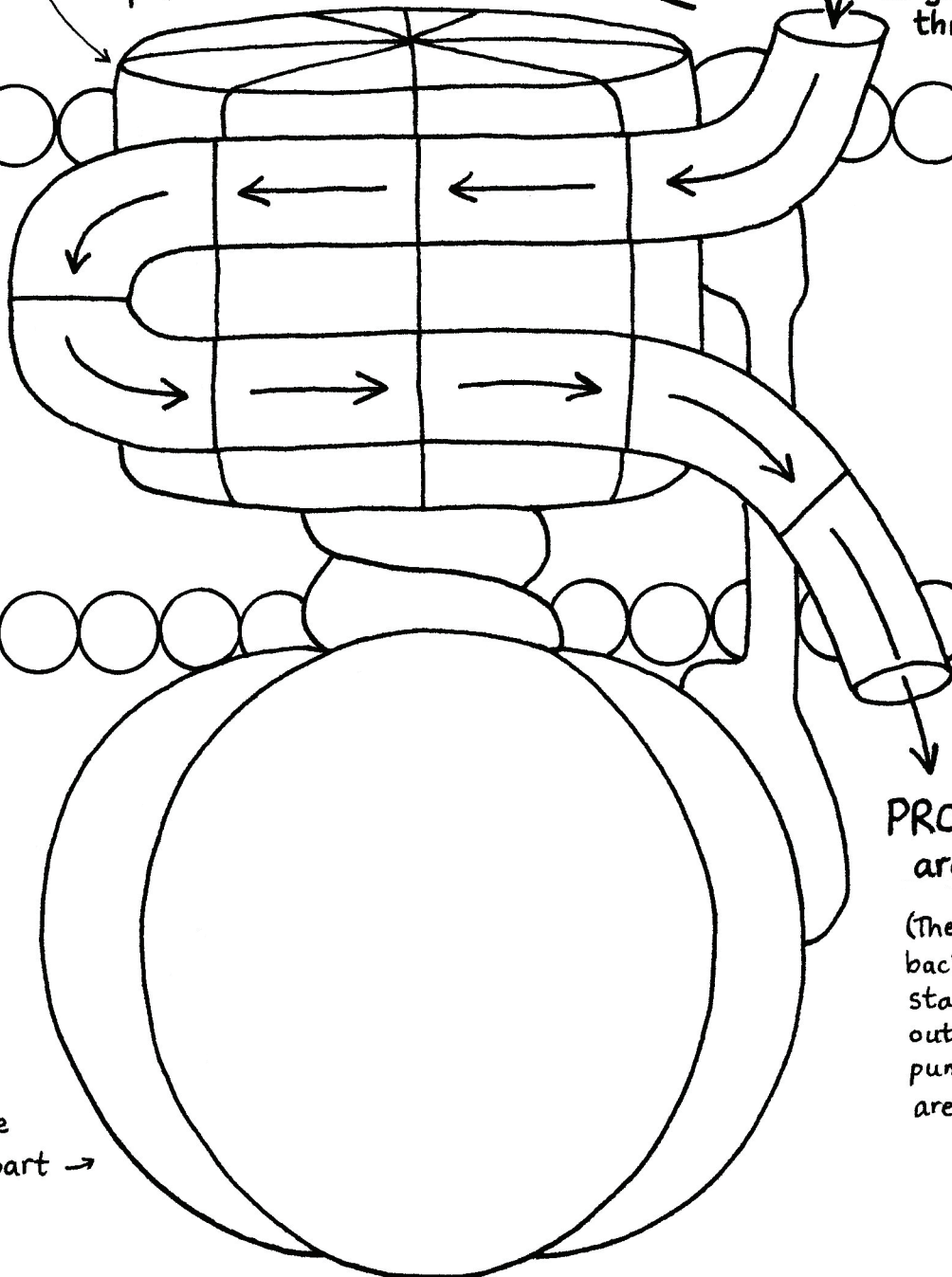


PROTONS

Roll  to get through

ATP SYNTHASE

In real ATP synthase, the protons push this top part, causing it to rotate.



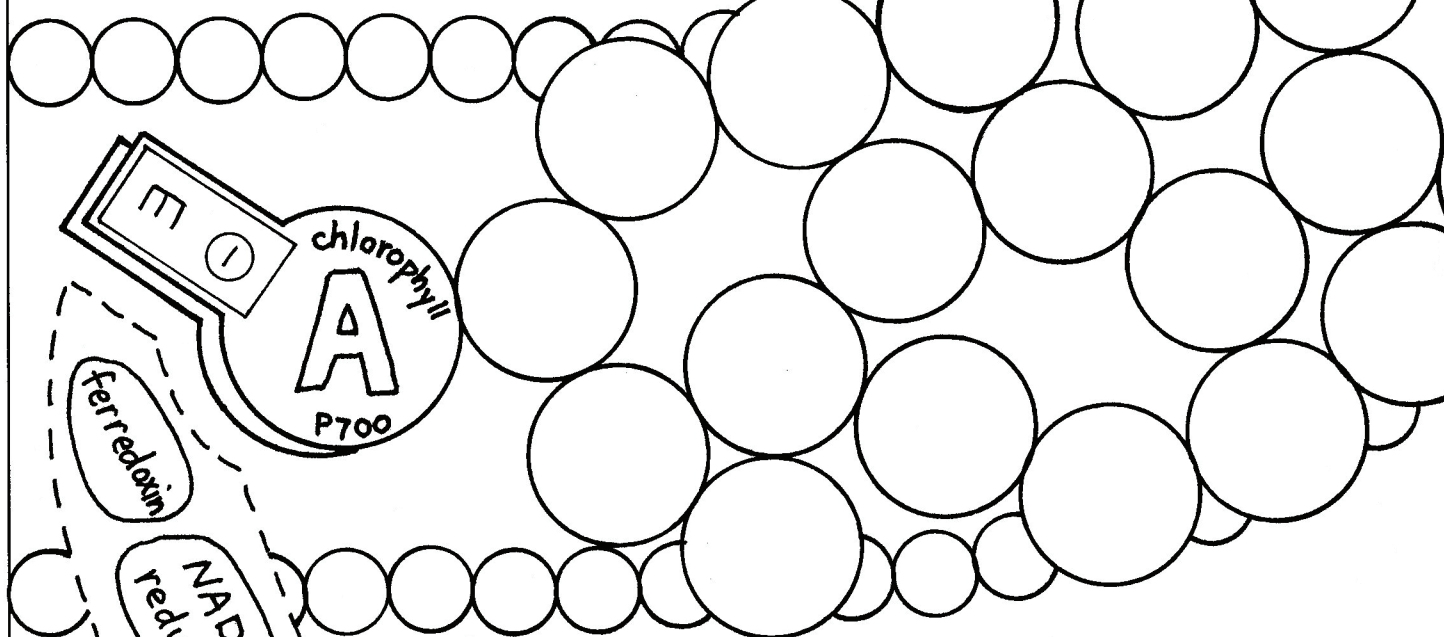
PROTONS are done

(They can float back to the starting area outside the pump, if they are needed.)

In real ATP synthase this bottom part → rotates, too.

ONE MOVE

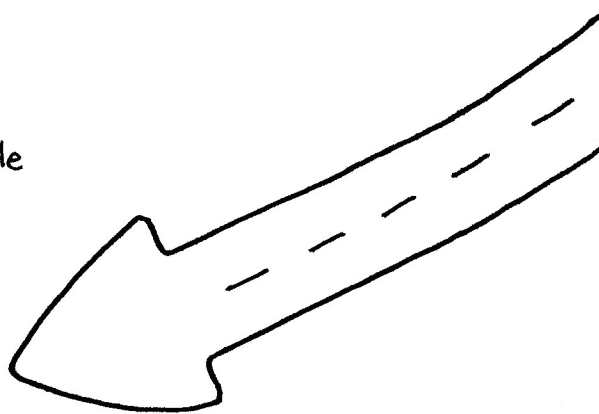
shuttle bus
parking lot
for the
"plastocyanin" shuttle

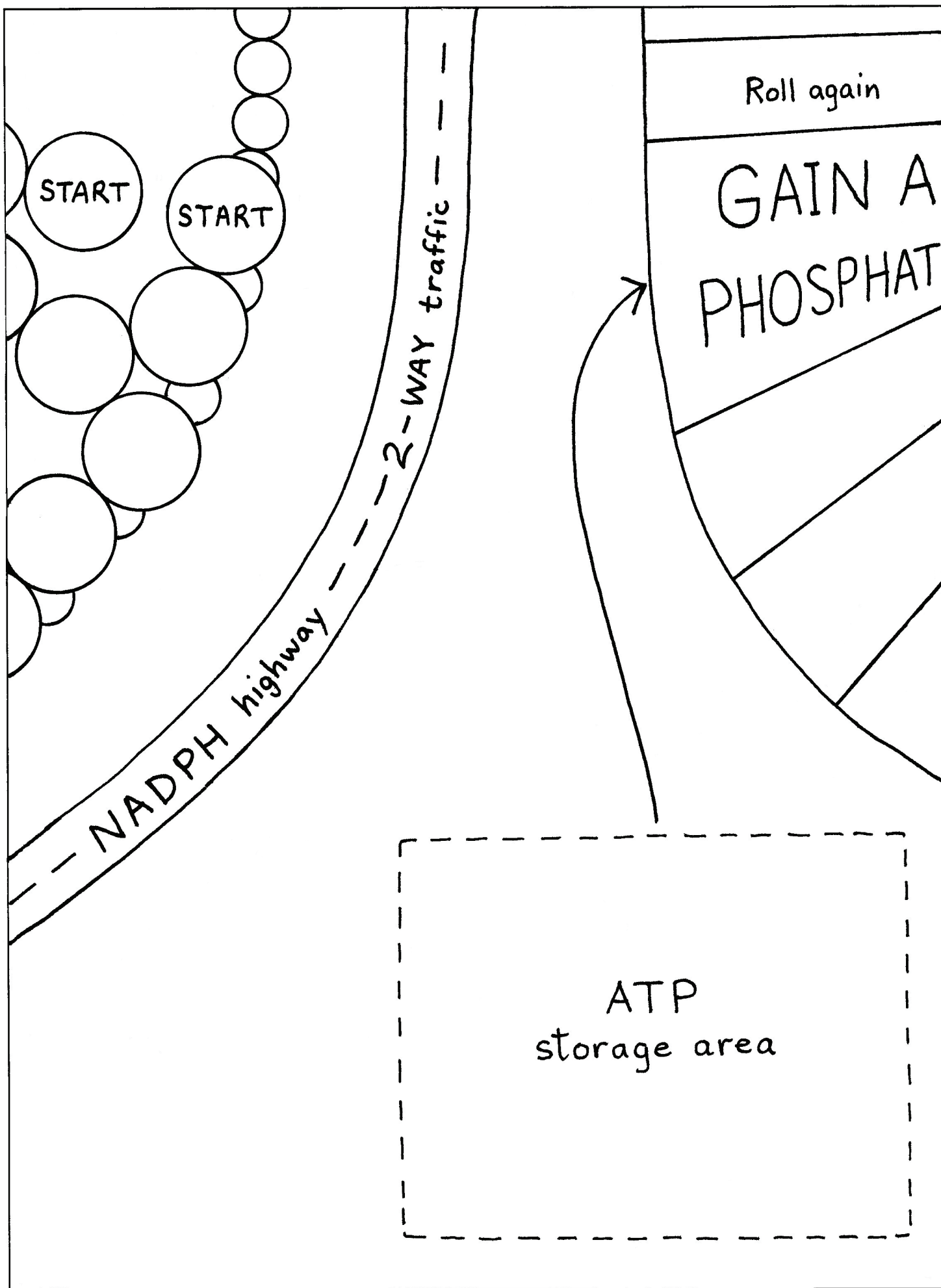


← Spend one move
sitting on the carriers

↓ then load the E into the shuttle

NADPH shuttle
parking lot





PGAs here

Transformation Tunnel

RuBP


RuBP

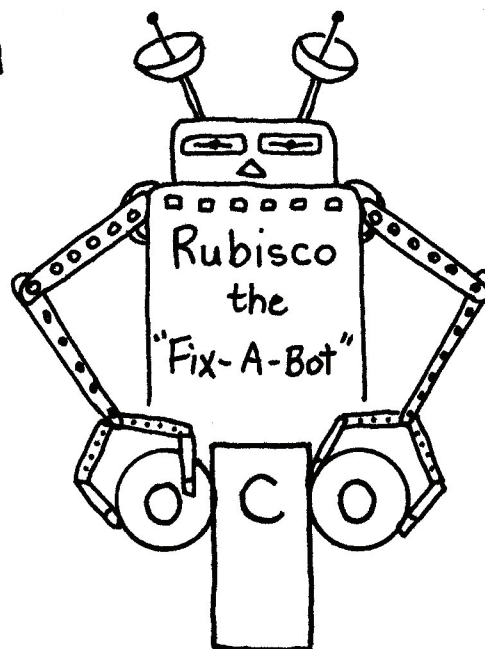
RuBP

(5 x 3)

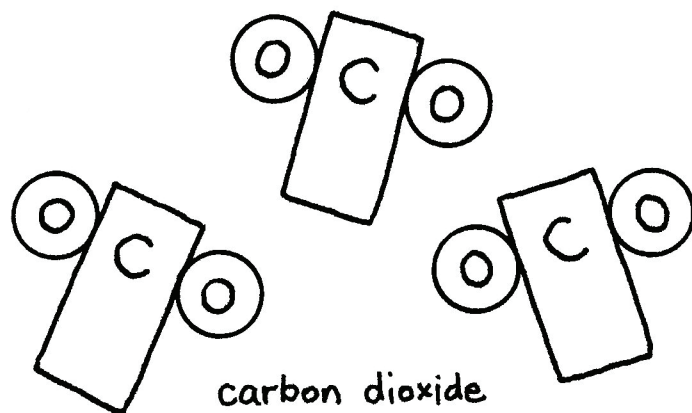
RuBP

Roll again

Roll  to proceed



Rubisco can only fix a few carbons per second.

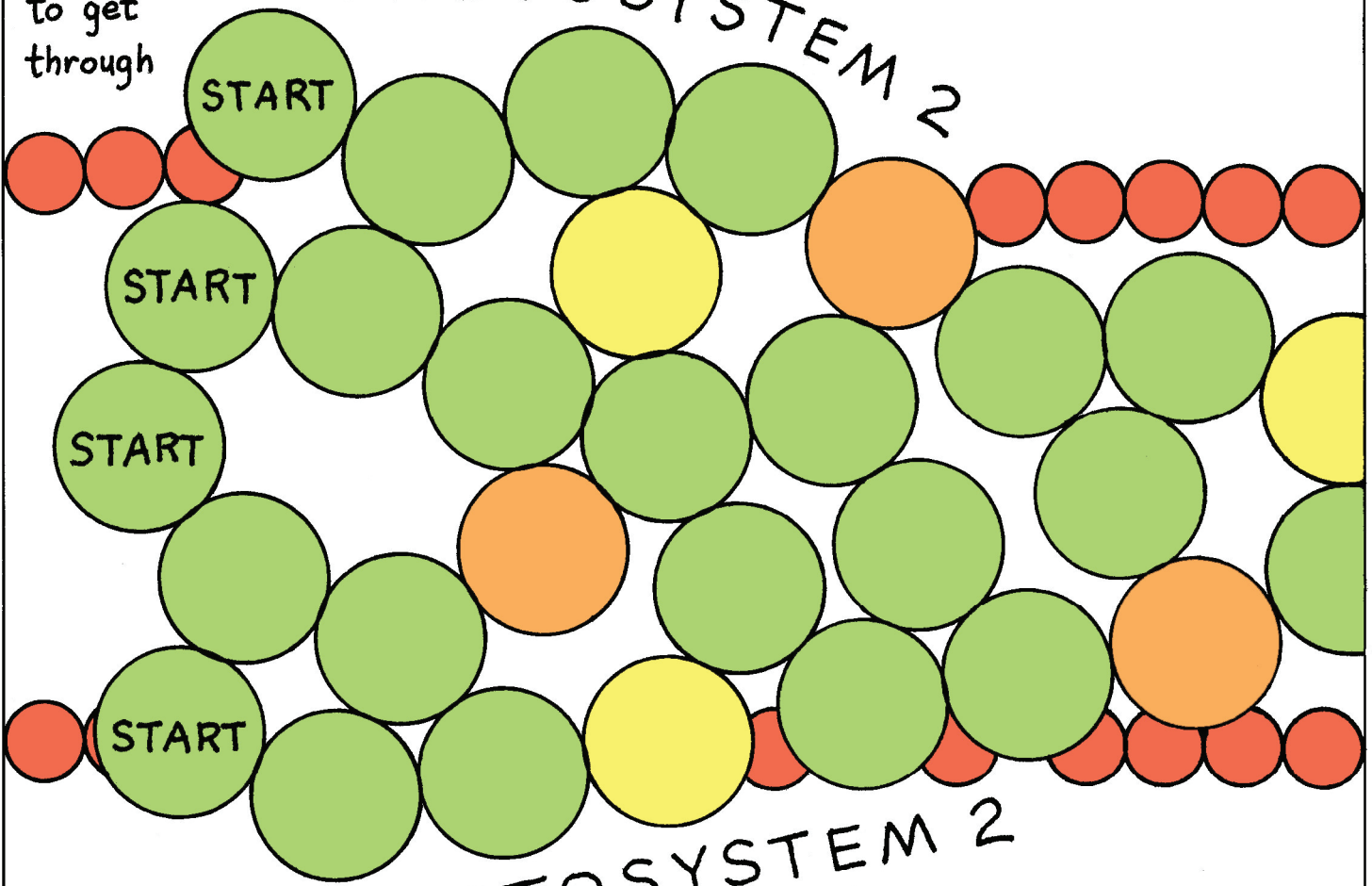


carbon dioxide from the atmosphere

Rubisco is the most abundant protein on Earth.

Roll 
to get
through

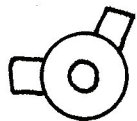
PHOTOSYSTEM 2



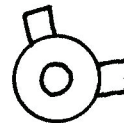
PHOTOSYSTEM 2

is very unstable – it must be
reassembled many times per second!

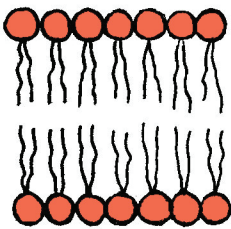
Water molecules



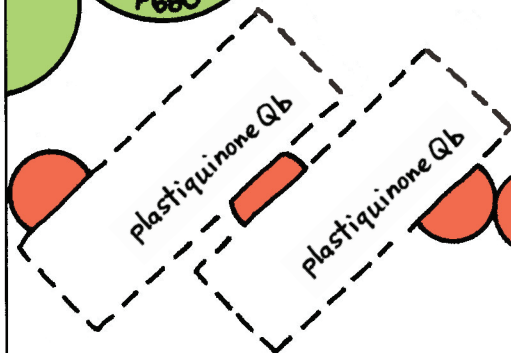
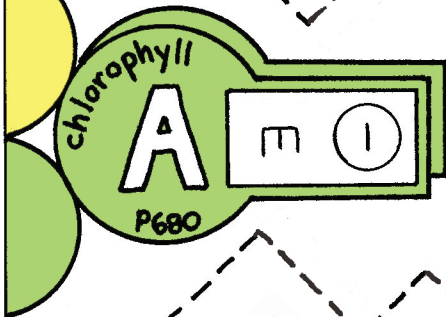
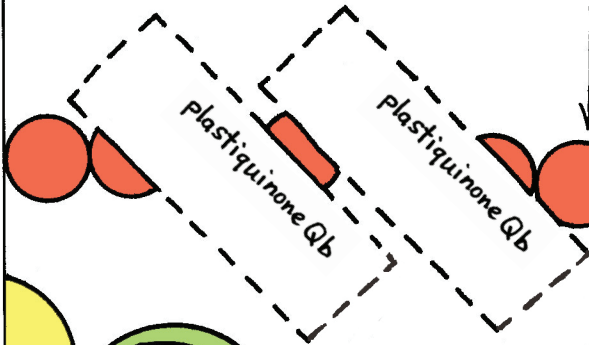
float here



These circles represent the "heads" of phospholipid molecules. The "tails" are not shown because they would make the drawing look too complicated.



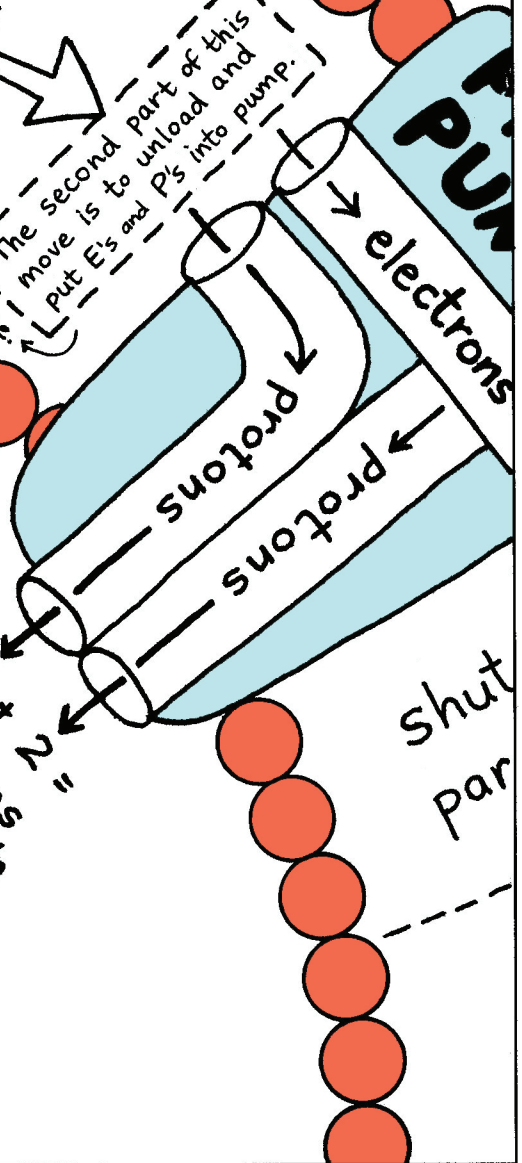
Parking spaces for shuttles



ONE MOVE

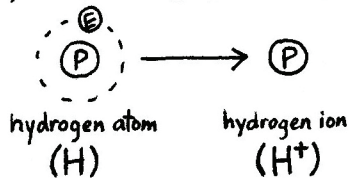
move your shuttle back when you are done.

The second part of this move is to unload and put E's and P's into pump.



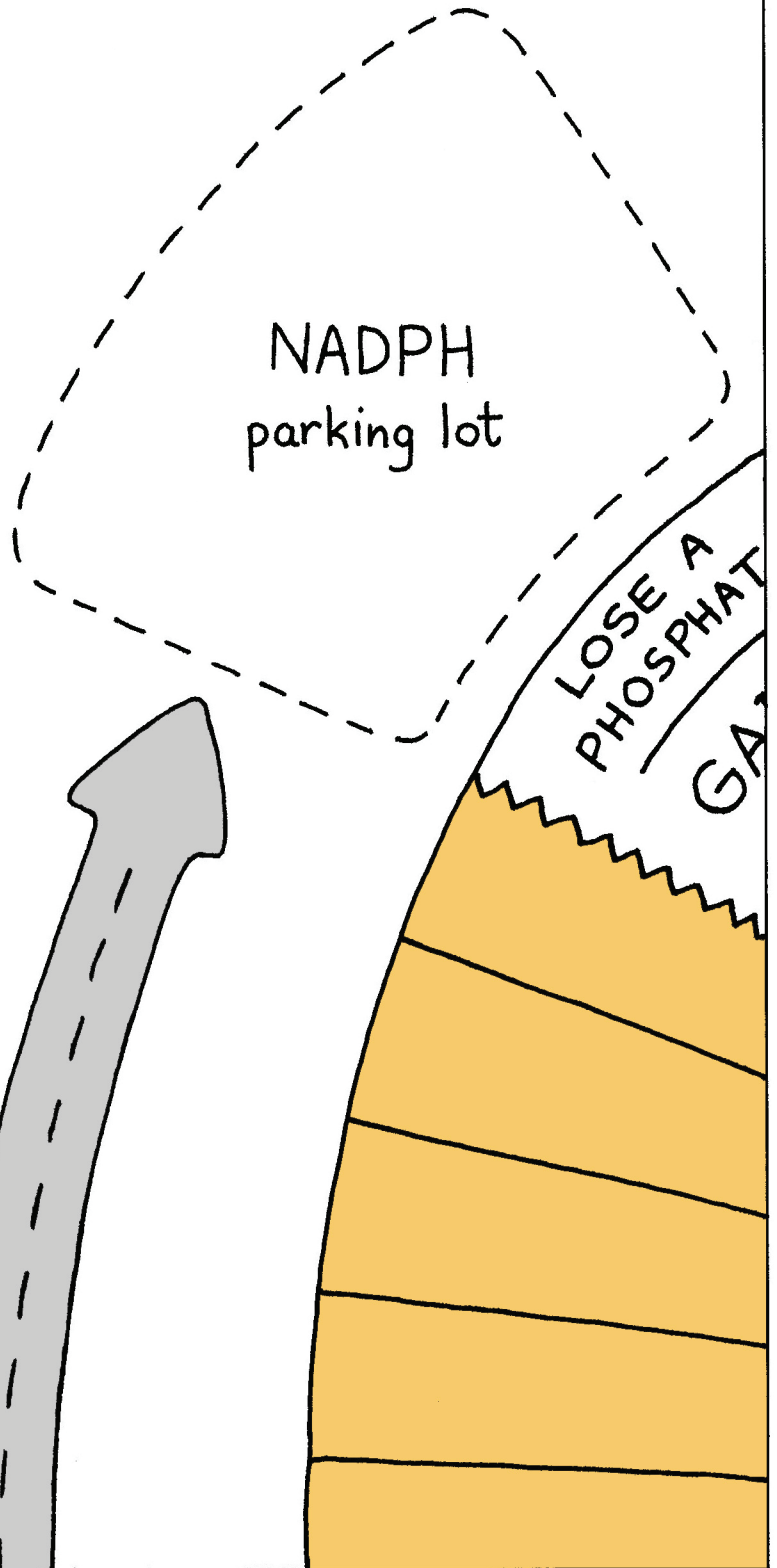
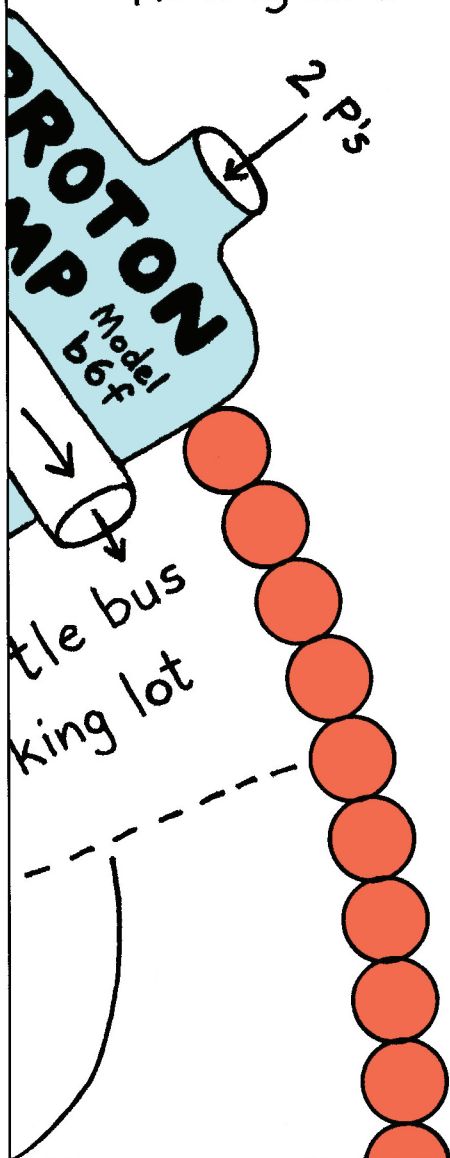
protons will float down (no moves needed)

Another name for protons is "hydrogen ions." Since a hydrogen atom is nothing but one proton and one electron, when you take away the electron (making the atom into an ion), only the proton is left.

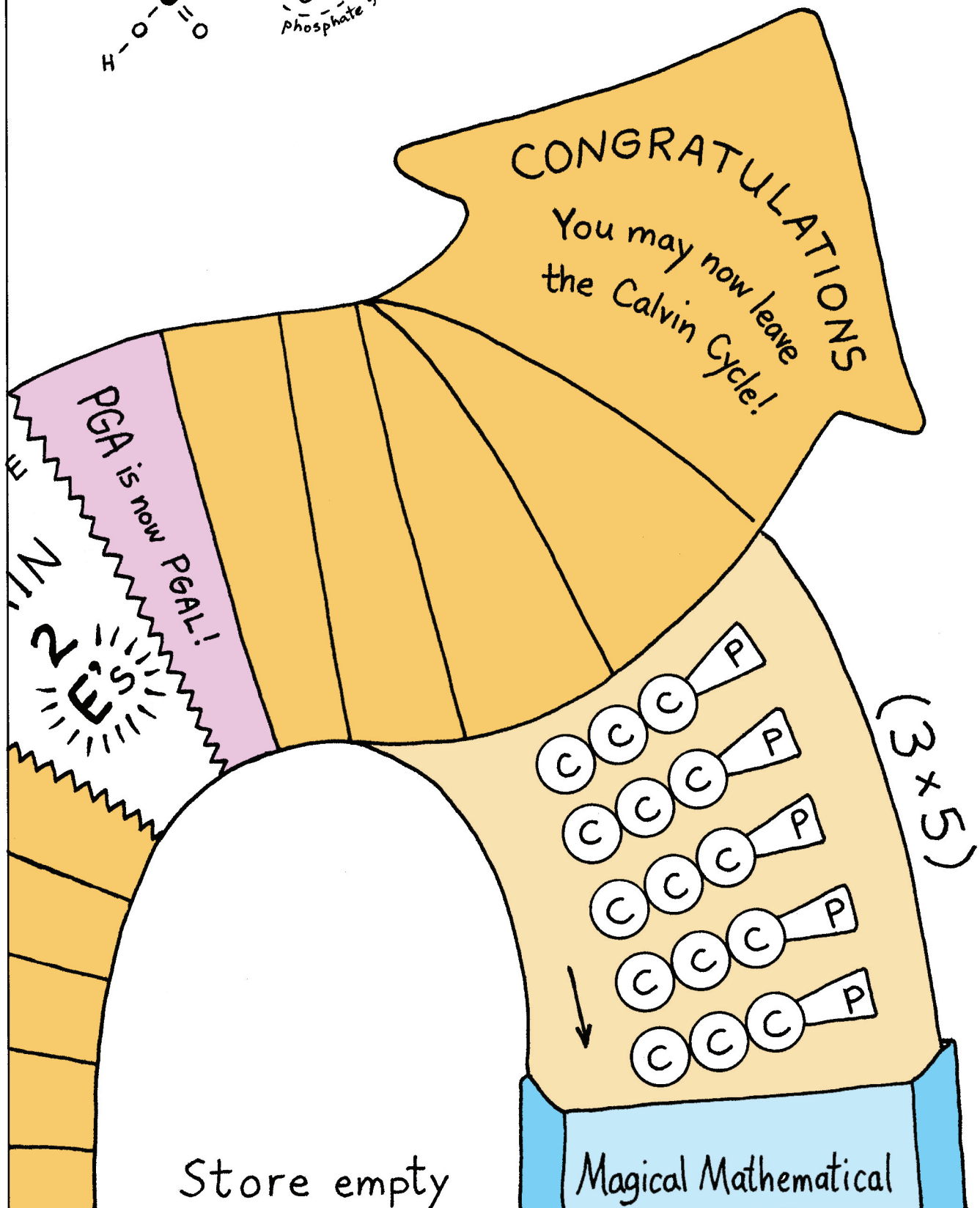
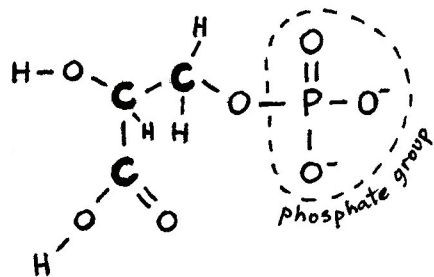


Discarded phosphates can just float here, or they can be put next to the ATP synthase, ready for recycling.

extra protons should be floating here



This is what PGAL
looks like:





ATP synthase is also found in the mitochondria of both plant and animal cells.

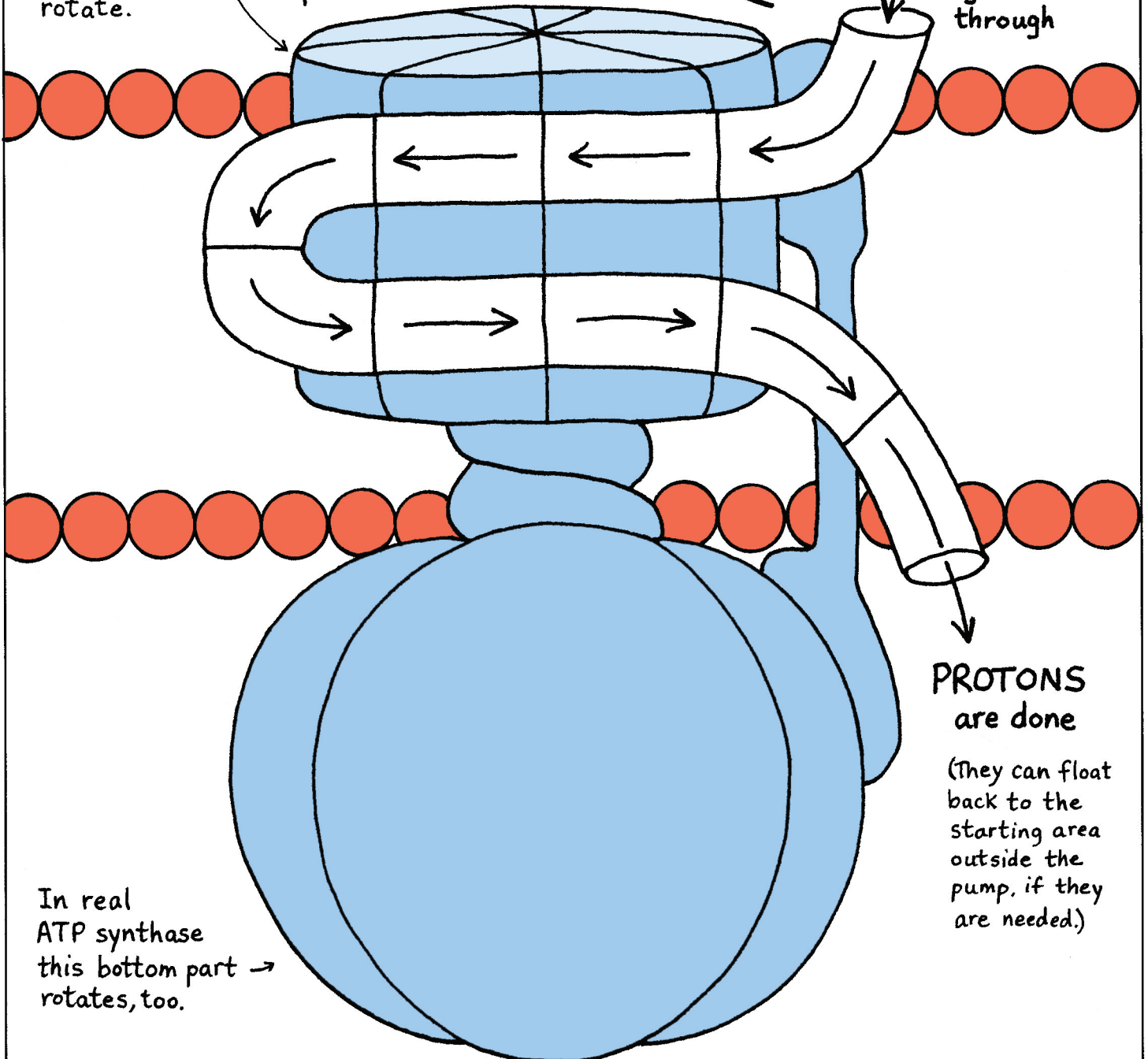


In real ATP synthase, the protons push this top part, causing it to rotate.

ATP SYNTHASE

PROTONS

Roll to get through



PROTONS are done

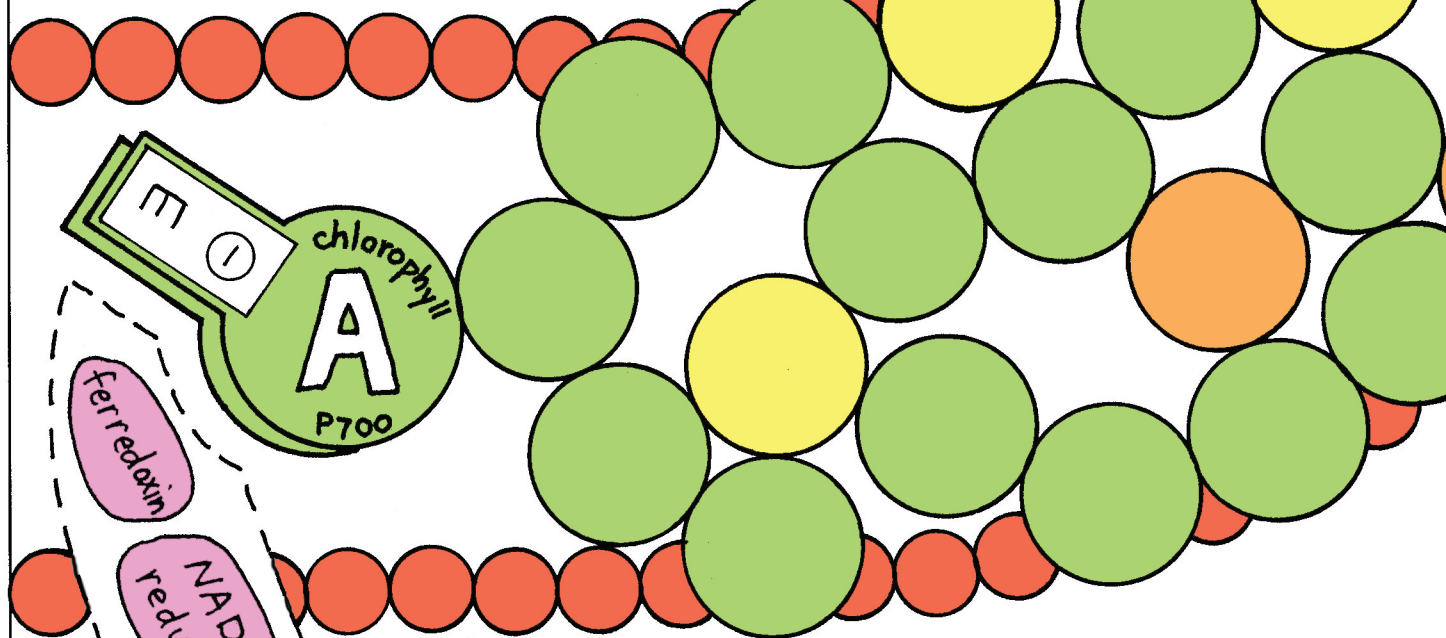
(They can float back to the starting area outside the pump, if they are needed.)

In real ATP synthase this bottom part → rotates, too.

ONE MOVE

shuttle bus
parking lot

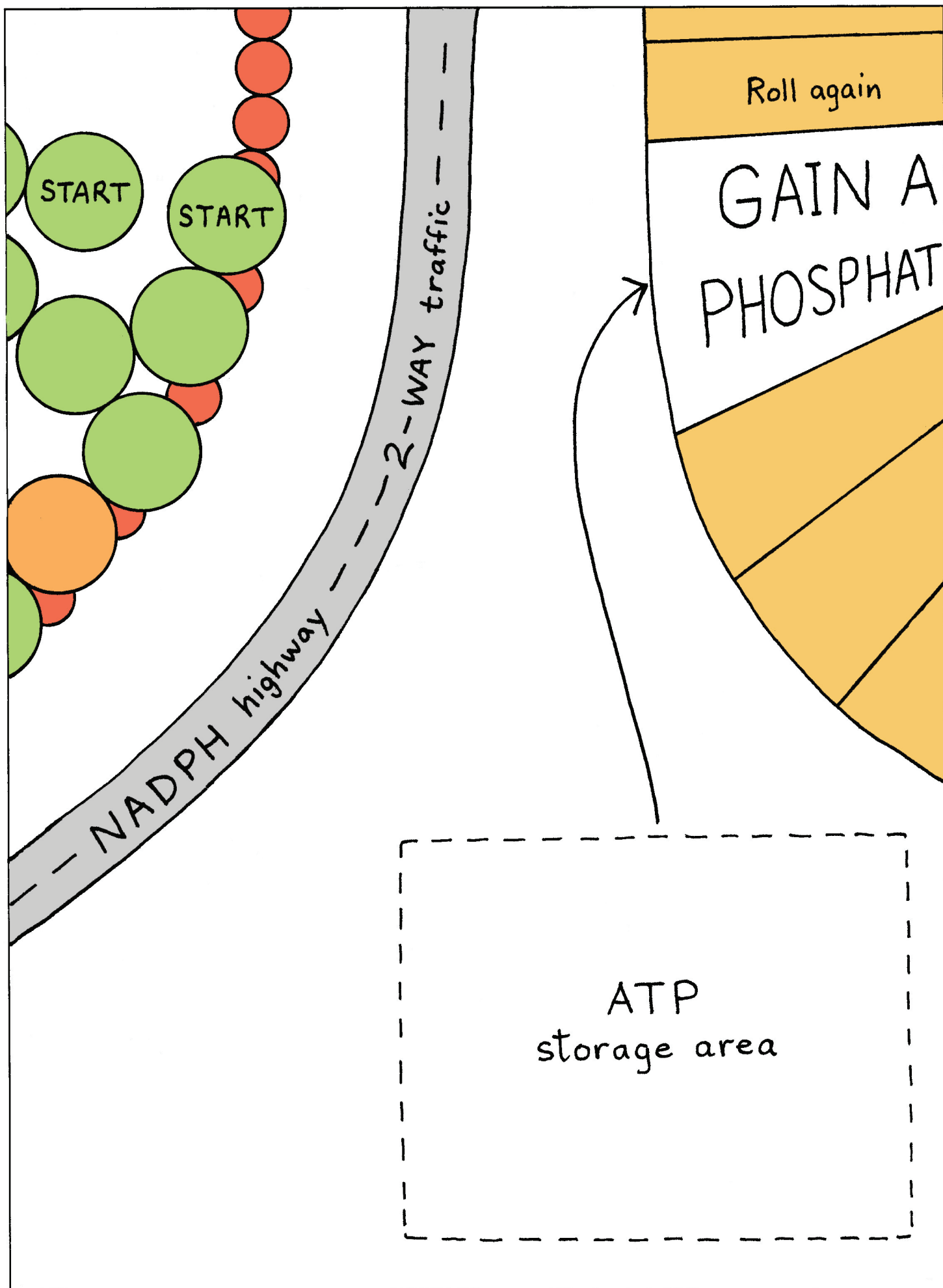
for the
"plastocyanin" shuttle



← Spend one move
sitting on the carriers

→ then load the E into the shuttle

NADPH shuttle
parking lot



PGAs here

Transformation Tunnel

RuBP


RuBP

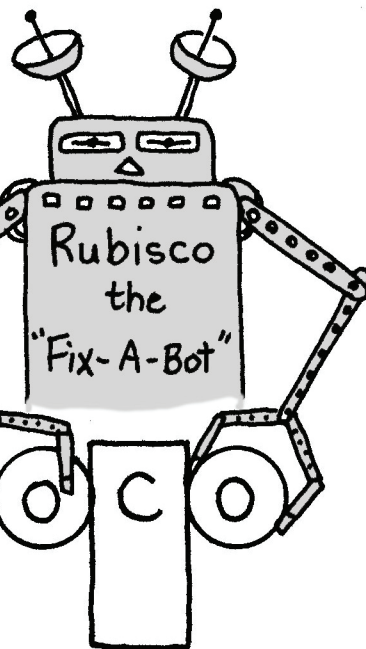
RuBP

(5 x 3)

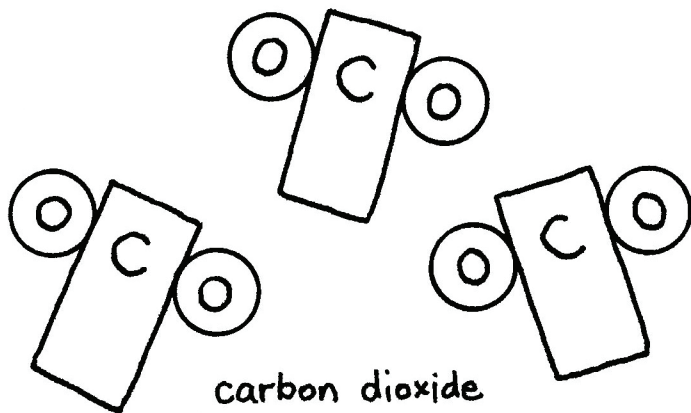
RuBP

Roll again

Roll  to proceed

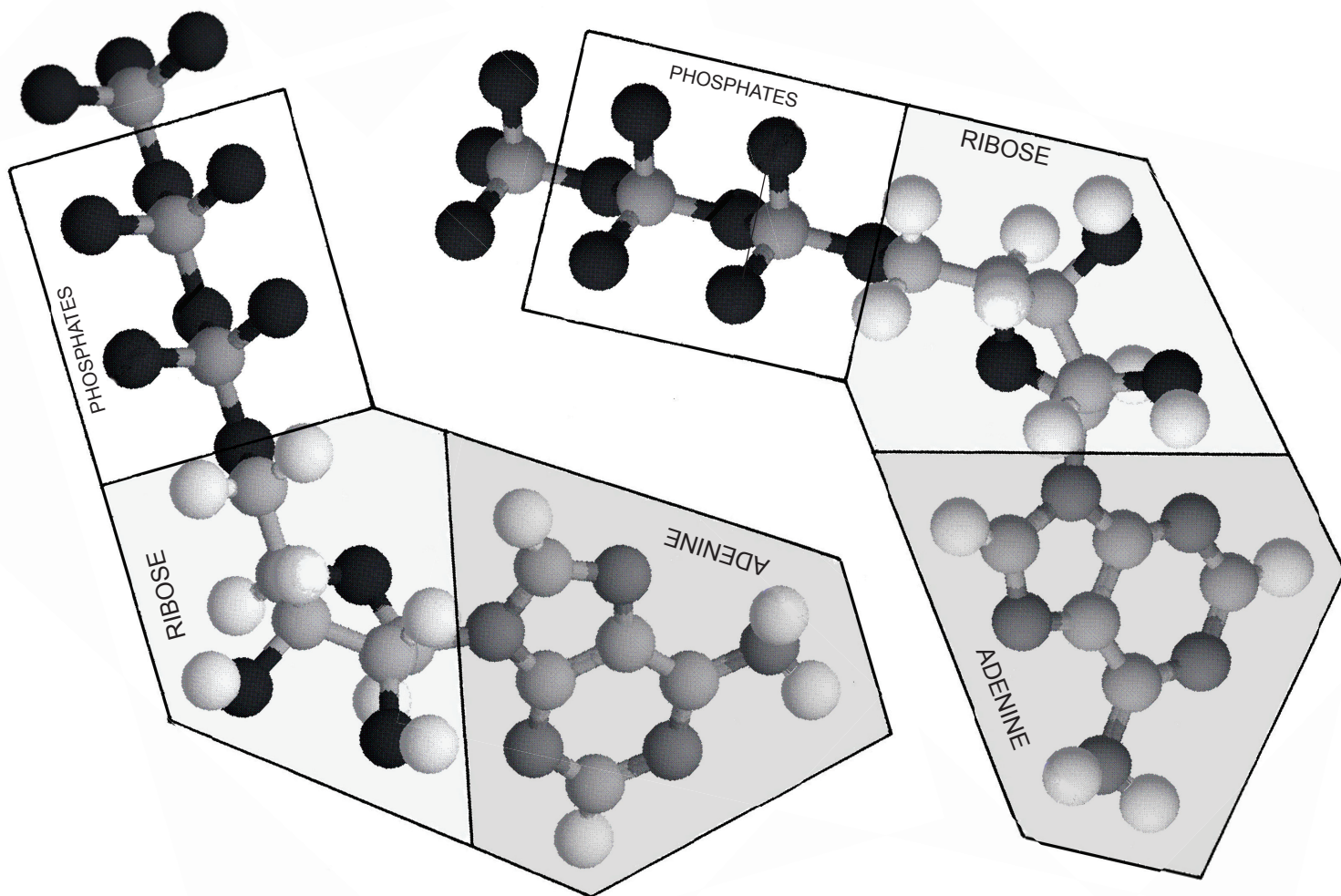
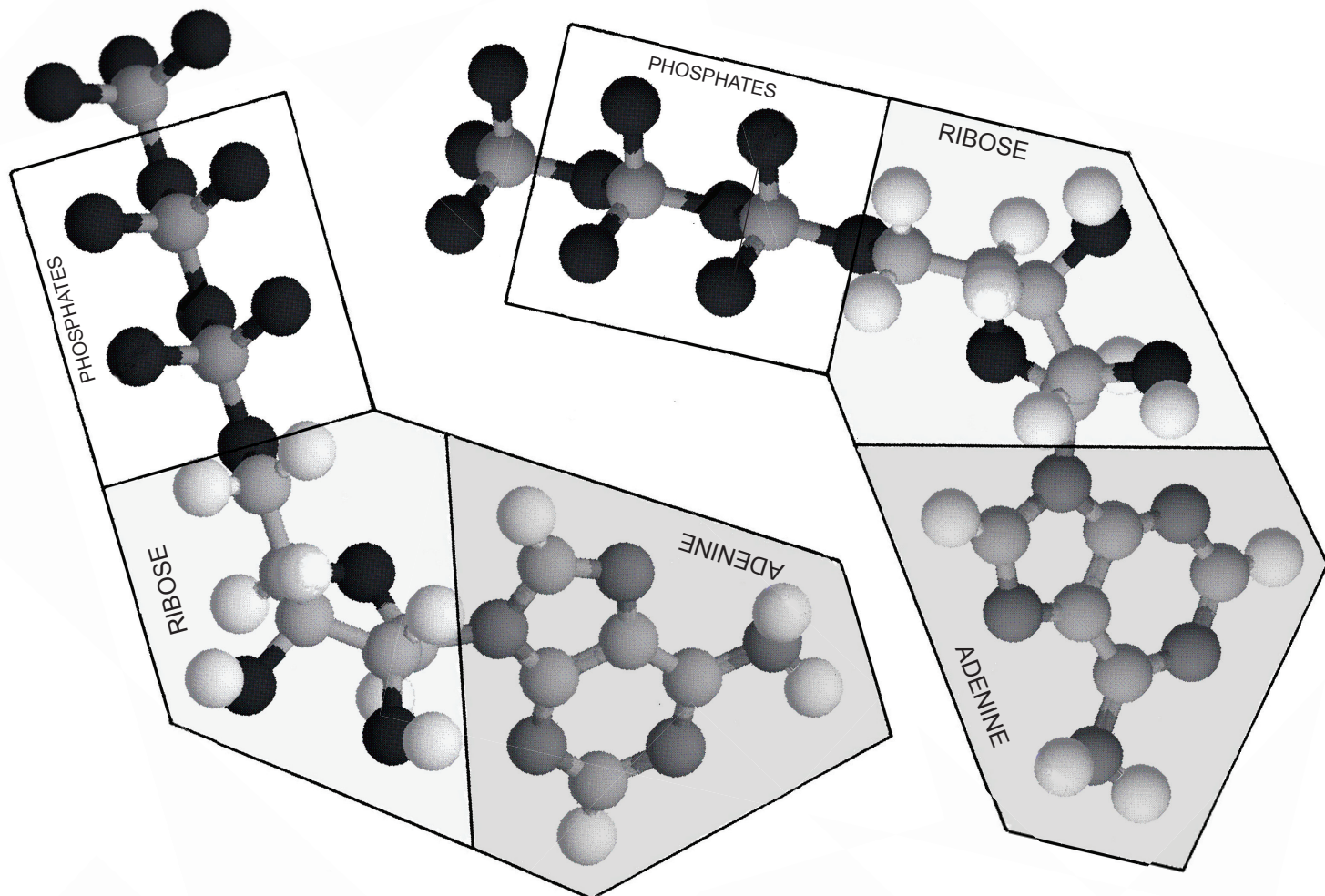


Rubisco can only fix a few carbons per second.



carbon dioxide from the atmosphere

Rubisco is the most abundant protein on Earth.





Quaking Aspen



Red Maple



Sassafras



Cherry



Black Walnut



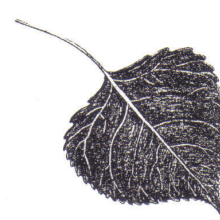
Shagbark Hickory



Southern Magnolia



Sugar Maple



Cottonwood



Dogwood



Sweet Gum



Tree of Heaven



Tulip Tree



Holly



Locust



White Oak



Willow



Red Oak



Ohio Buckeye



Pin Oak



Beech



Ginkgo



Mesquite



Poplar

WIND

Takes away all
serrated edges
unless weighted

WIND

Takes away all
monocots
unless weighted
(ginkgo is only monocot)

WIND

Takes away all
pinnate leaves
unless weighted

WIND

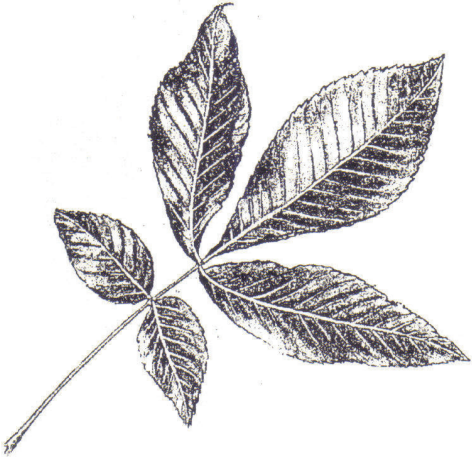
Takes away all
compound leaves
unless weighted

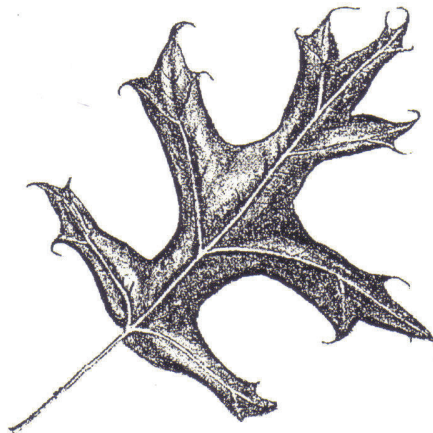
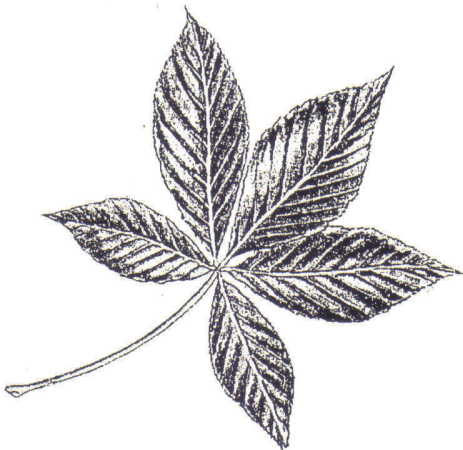
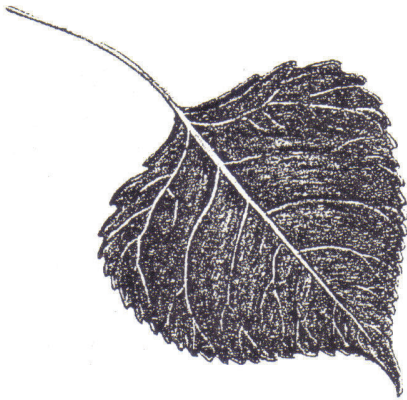
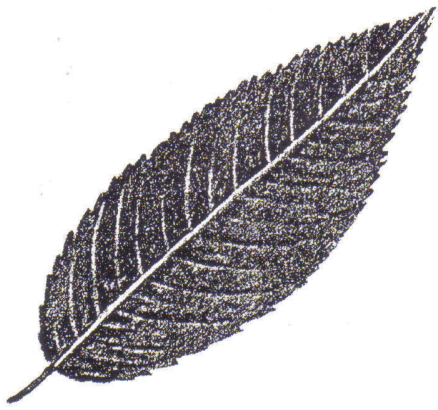
WIND

Takes away all
palmate leaves
unless weighted

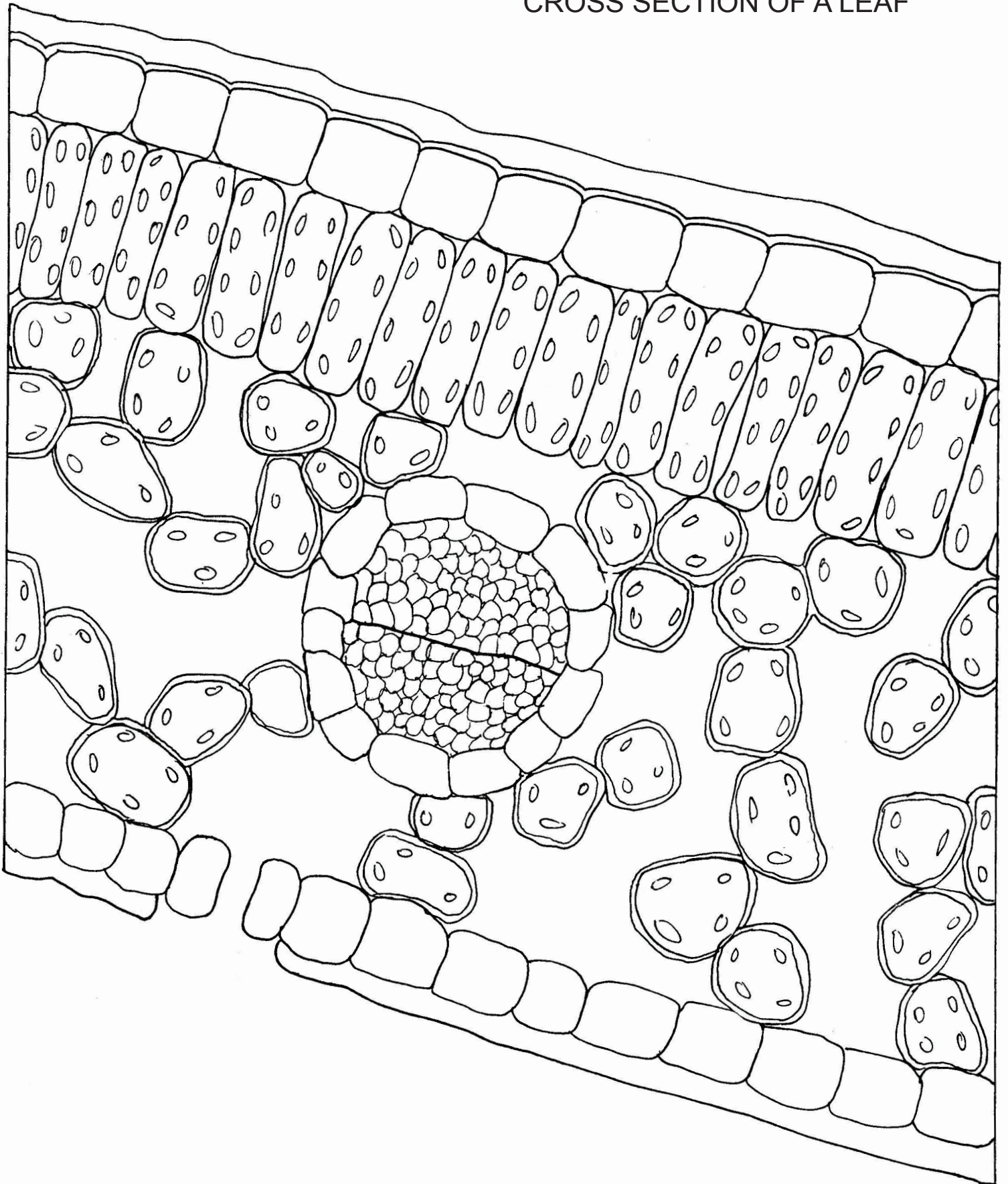
WIND

Takes away all
deltoid edges
unless weighted





CROSS SECTION OF A LEAF



FLOWER DISSECTION LAB

1) What are the names of your flowers? (common names or scientific names, or both)

Flower 1: _____

Flower 2: _____

2) How many petals does the flower have? Are the petals all basically the same shape?

Flower 1: _____ Y/N

Flower 2: _____ Y/N

3) How many stamens does the flower have? How long are they? (estimate in centimeters) What color is the pollen? (If the grains are too small to see, just write "too small.")

Flower 1: _____, _____, _____

Flower 2: _____, _____, _____

4) Find the pistil and stigma. Does the flower have more than one stigma? What shape is/are the stigma(s)? How long is the style?

Flower 1: Y/N, _____, _____

Flower 2: Y/N, _____, _____

5) Find the receptacle, sepals and ovary. Is the ovary above, below, or in the middle of the sepals?

Flower 1: _____

Flower 2: _____

6) Cut the pistil down the middle lengthwise. Observe the inside of the ovary. Does it appear to have more than one chamber? How many ovules do you see? (If there are too many to count, write "many.") Each ovule will become a seed, so if you see things that look like seeds, those are the ovules.

Flower 1: Y/N, _____

Flower 2: Y/N, _____

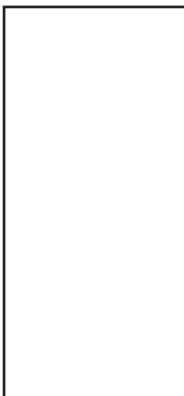
7) Cut a thin section of stem. Observe it under magnification and find the vascular bundles. Is the flower a monocot or dicot? (If your flower has leaves attached, you can use those as clues, also.)

Flower 1: _____

Flower 2: _____

8) Draw a sketch of each feature:

STAMENS

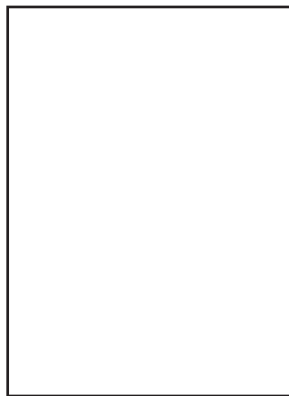


Flower 1

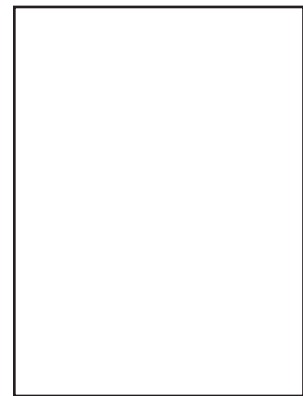


Flower 2

PISTILS








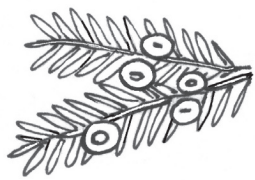




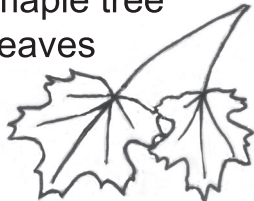





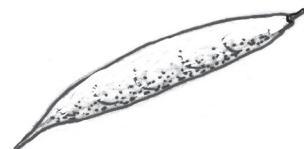







Flower 1



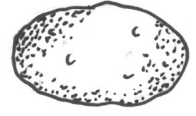

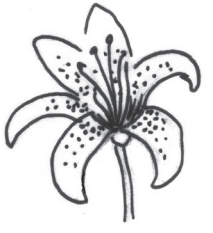


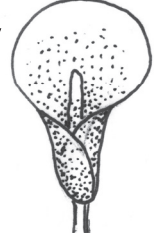
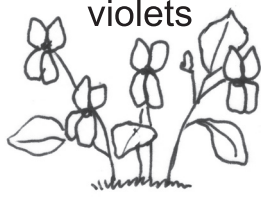



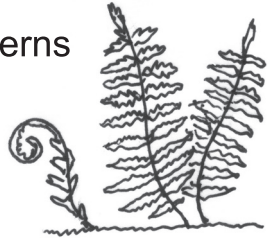

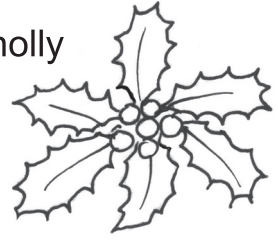
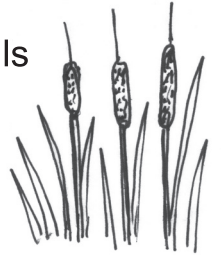










Flower 2

Where Sheep May Safely Graze

12	azalea 	hibiscus 	rhododendron 	hydrangea 
11	gooseberries 	asparagus berries 	pokeweed berries 	yew berries 
10	tulip bulbs 	orchid bulbs 	daffodil bulbs 	hyacinth bulbs 
9	maple tree leaves 	dogwood tree leaves 	cherry tree leaves 	oak tree leaves 
8	raw kidney beans 	raw lima beans 	raw green beans 	raw Mung beans 
7	cherry pits 	grape seeds 	apple seeds 	pear seeds 

Trim off the top of this page then tape or glue this page to the bottom of previous page.

6	<p>potato leaves</p> 	<p>potato stems</p> 	<p>green potatoes</p> 	<p>red potatoes</p> 
5	<p>tiger lily</p> 	<p>lily of the valley</p> 	<p>Jack-in-the-pulpit</p> 	<p>calla lily</p> 
4	<p>violets</p> 	<p>buttercups</p> 	<p>foxglove</p> 	<p>larkspur</p> 
3	<p>ferns</p> 	<p>ivy</p> 	<p>holly</p> 	<p>cattails</p> 
2	<p>white snakeroot</p> 	<p>jimson weed</p> 	<p>ragwort</p> 	<p>nettles</p> 
1	<p>wild carrots</p> 	<p>dandelion leaves</p> 	<p>rhubarb leaves</p> 	<p>tomato leaves</p> 


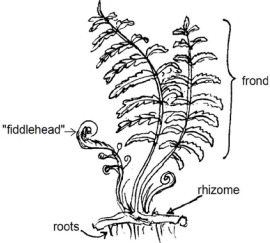
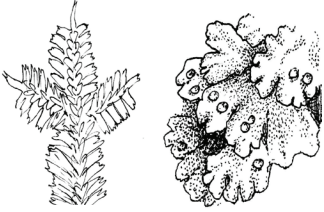
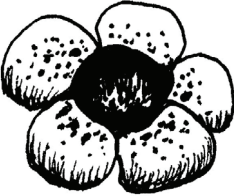


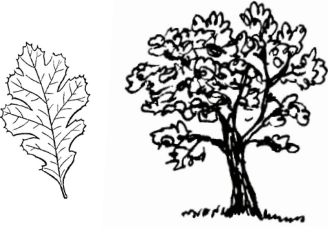



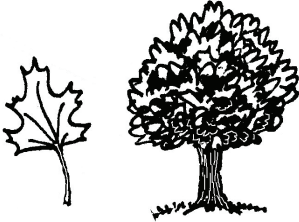



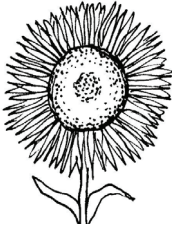
Three of the plants (or plant parts) in each row are toxic. One is edible.




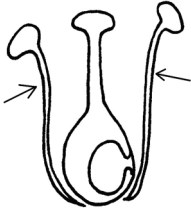
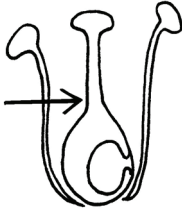
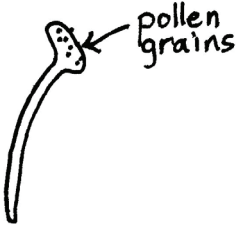
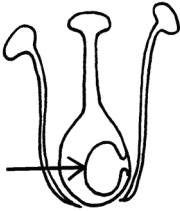

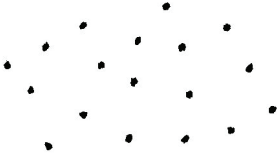
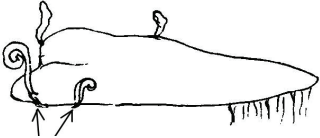
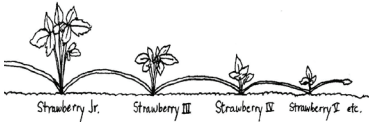
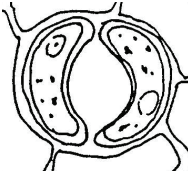
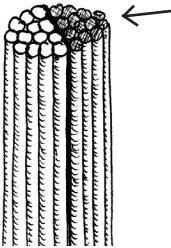
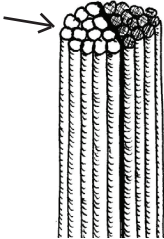
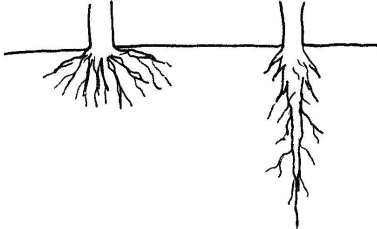
Good luck, sheep!

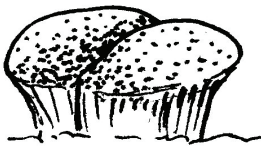
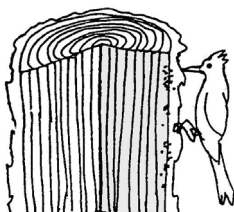
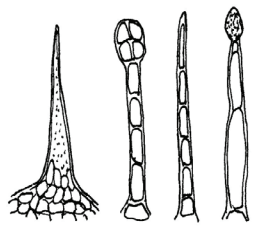
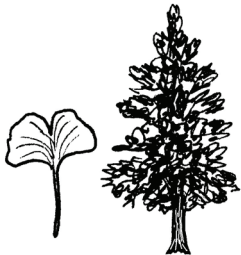
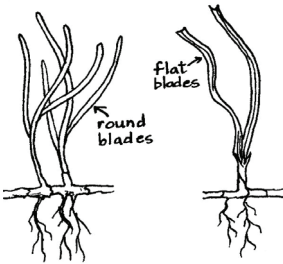
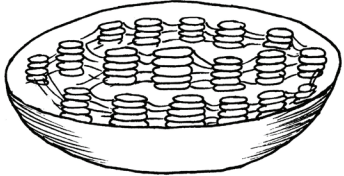
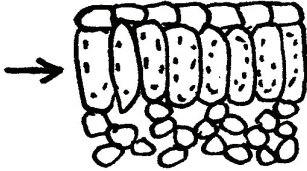
Where Sheep May Safely Graze

HAS CHLOROPLASTS	HAS CHLOROPLASTS	HAS CHLOROPLASTS
HAS A VASCULAR SYSTEM OR IS PART OF A VASCULAR SYSTEM	HAS A VASCULAR SYSTEM OR IS PART OF A VASCULAR SYSTEM	IS AN ANGIOSPERM
IS PERENNIAL (ADULT PLANT SURVIVES FOR SEVERAL YEARS)	MAKES SPORES	MAKES FLOWERS
HAS AN ADAPTATION THAT ALLOWS IT TO SURVIVE IN ITS ENVIRONMENT (NAME THE ADAPTATION)	HAS AN ADAPTATION THAT ALLOWS IT TO SURVIVE IN ITS ENVIRONMENT (NAME THE ADAPTATION)	HAS AN ADAPTATION THAT ALLOWS IT TO SURVIVE IN ITS ENVIRONMENT (NAME THE ADAPTATION)
PLAYS A ROLE IN REPRODUCTION	PLAYS A ROLE IN REPRODUCTION	PLAYS A ROLE IN REPRODUCTION

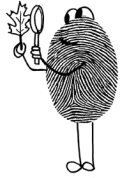
MAKES SUCCULENT FRUITS	COMMONLY EATEN BY ANIMALS OR BIRDS (not insects)	IS MADE OF CELLS
MAKES FRUITS	MAKES SEEDS	MAKES DRY FRUITS
NEED A MAGNIFIER OR MICROSCOPE TO SEE IT PROPERLY	COMMONLY USED AS A FOOD SOURCE (for humans)	MAKES DRY FRUITS
NEED A MAGNIFIER OR MICROSCOPE TO SEE IT PROPERLY	DOES NOT HAVE A VASCULAR SYSTEM (or is not part of a vascular system)	DOES NOT MAKE FRUITS
HAS A “WOODY” STEM (not an herbaceous stem)	IS A DICOT	NEEDS SUNLIGHT (has a direct need for it)

<p>MOSS</p> 	<p>FERN</p> 	<p>LIVERWORT</p> 
<p><i>RAFFLESIA</i> ("corpse flower")</p> 	<p>AMAZON LILY</p> 	<p>BLADDERWORT</p> 
<p><i>QUERCUS ALBA</i> (white oak tree)</p> 	<p><i>SOLANUM TUBEROSUM</i> (potato plant)</p> 	<p><i>SALIX BABYLONICA</i> ("Weeping willow" tree)</p> 
<p><i>PINUS LONGAIEVA</i> (bristlecone pine)</p> 	<p><i>ACER SACCHARUM</i> (sugar maple tree)</p> 	<p><i>PRUNUS DOMESTICUS</i> (plum tree)</p> 
<p><i>ATROPA BELLADONNA</i> ("deadly nightshade")</p> 	<p><i>DAUCUS CAROTA</i> (carrot plant)</p> 	<p><i>HELIANTHUS</i> (sunflower plant)</p> 




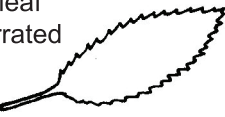


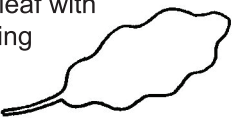
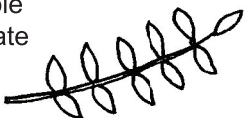
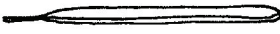
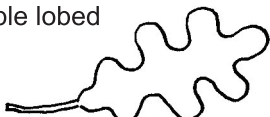



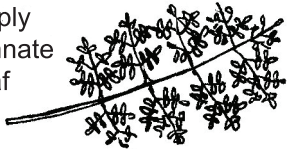
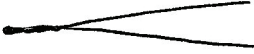

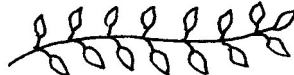
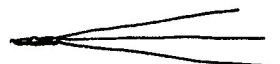









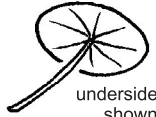


<p>SAGUARO</p> 	<p>DUCKWEED</p> 	<p>MISTLETOE</p> 
<p>STAMEN</p> 	<p>PISTIL</p> 	<p>POLLEN</p> 
<p>OVULE</p> 	<p>CONES</p> 	<p>SPORES</p> 
<p>PROTHALLUS</p> 	<p>RUNNERS</p> 	<p>GUARD CELLS</p> 
<p>XYLEM</p> 	<p>PHLOEM</p> 	<p>ROOTS</p> 

<p>STONE PLANT</p> 	<p>SAPWOOD</p> 	<p>TRICHOMES</p> 
<p>GINGKO TREE</p> 	<p>SEAGRASS</p> 	<p>THYLAKOIDS</p> 
<p>PALISADE LAYER</p> 	<p>HAS LEAVES</p>	<p>NEEDS CARBON DIOXIDE</p>
<p>NEEDS WATER</p>	<p>START A NEW PILE</p>	<p>START A NEW PILE</p>
<p>START A NEW PILE</p>	<p>START A NEW PILE</p>	<p>START A NEW PILE</p>

BOTANY SCAVENGER HUNT

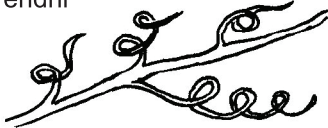





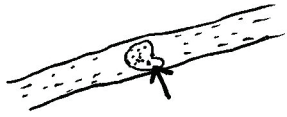

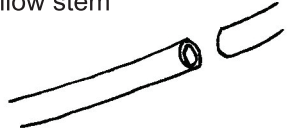


LEAVES (NOTE: Your specimens do not need to match these pictures. Yours might look very different but still qualify.)

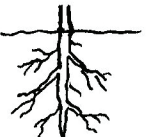
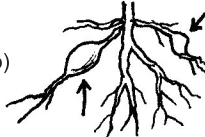
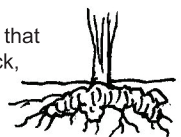



Simple leaf with smooth edges 	1	Simple palmate leaf 	1	Furry or fuzzy leaf 	1
Simple leaf with serrated edges 	1	Compound palmate leaf 	1	Thick, succulent leaf 	2
Simple leaf with undulating edges 	1	Simple pinnate leaf 	1	Flat conifer needle (Test: won't roll between finger and thumb) 	1
Simple lobed leaf 	1	Doubly pinnate leaf 	2	Round conifer needle (Test: will roll between finger and thumb) 	1
Leaf with deltoid shape 	2	Triply pinnate leaf 	3	Conifer tuft containing 2 needles 	1
Leaf with cordate shape 	2	Opposite leaves 	1	Conifer tuft containing 3 needles 	2
Leaf with obcordate shape 	3	Alternate leaves 	1	Conifer tuft containing 5 or more needles 	2
Leaf with linear shape 	1	Leaves in spiral pattern 	1	Leaf miner trail 	3
Leaf with orbicular shape (round, but with stem parallel to lamina) 	2	Leaves with whorl pattern 	2	Leaf gall 	3
Circular leaf (stem is perpendicular to lamina)  underside shown	3	Variegated leaf (more than one color) 	1	Leaf with fungus circles (spots cross over veins) 	3

TOTAL POINTS EARNED ON THIS PAGE

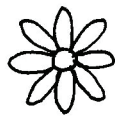










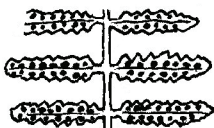
STEMS

Tendrils 	2	Stipules Occur at the base of some leaves. May look leafy or spiny. 	2	Stem gall 	3
Stolon ("runner") They can be at soil surface or slightly under. 	1	Apical (or "terminal") bud 	1	Axillary (or "lateral") bud 	1
Leaf scar 	1	Fuzzy or hairy stem 	2	Hollow stem 	1

ROOTS / RHIZOMES

Tap root (but can't use carrot) 	1	Tuber (but can't use potato) 	2	Rhizome (Modified stem that looks like a thick, clumpy root.) 	3
Fibrous root (but can't use grass) 	1	Nitrogen-fixing nodules 	3	Bulb (but not onion, tulip or daffodil) 	2

REPRODUCTIVE STRUCTURES

Regular flower (has radial symmetry) 	1	Flower spire 	2	Seed case designed to float or fly 	1
Irregular flower (has bilateral symmetry) 	2	Cone 	1	Seed case with hooks or barbs 	2
Composite flower (made of smaller flowers) 	1	A dry fruit (not from the store or your kitchen) 	2	Seed case thicker than this one: 	3
Umbrella-shaped flower 	2	Moss sporangium 	3	Fern sori 	3

optional additional category

--	--

TOTAL POINTS EARNED ON THIS PAGE

TOTAL FROM FIRST PAGE

GRAND TOTAL

WANTED



WANTED

