SCIENCE 406
CHANGES IN WATER

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CHANGES IN WATER

God is the maker of the world. The Bible teaches that Jesus made all things—the earth, sky, and all matter. Even the tiny bits of matter were made by Him. Colossians 1:16 states, "For by him were all things created, that are in heaven, and that are in earth, visible and invisible, whether they be thrones, or dominions, or principalities, or powers: all things were created by him, and for him."

God has made the earth in a very special way. Earth is the only planet that has been discovered that has enough water for life. God made earth for people to enjoy. Psalm 115:16 states, "The heaven, even the heavens, are the Lord's: but the earth hath he given to the children of men."

In this LIFEPAC® you will learn more about God's wonderful world that He made. You will learn about the properties of water. What different forms does water have? What makes dew, snow, ice, and glaciers? How is water made? What materials will dissolve in water? What are some ways we can use water? All of these questions will be explored in this LIFEPAC.

OBJECTIVES

Read these objectives. The objectives tell you what you should be able to do when you have successfully completed this LIFEPAC.

When you have finished this LIFEPAC, you should be able to:

1. Tell the freezing point and boiling point of water on the Fahrenheit and the Celsius thermometers.
2. Name the three different forms of water.
3. Describe the wisdom of God in making water.
4. Describe the wide variety of uses of water.
5. Tell about water when it is dew, rain, snow, ice, or glaciers.
6. Name some materials that are soluble in water and some that are insoluble in water.
7. Name the three forms of matter and give an example of each.
8. Describe matter, molecules and atoms.
9. Tell what an element is.

VOCABULARY

Study these words. Learning the meanings of these words is a good study habit and will improve your understanding of this LIFEPAC.

atoms (at' ums). Tiny building blocks of matter which join to make molecules.

Celsius (sel' sē us). A temperature scale, also called centigrade, named after its inventor.

centigrade (sen' tu grād). A scale divided into 100 degrees, between water's freezing point and boiling point.

chemistry (kem' u strē). A science that deals with simple materials of earth such as elements.

condense (kun dens'). To change from a gas or vapor into a liquid.

dissolve (di zolv'). To make something break apart by putting it into a liquid.

element (el' u munt). One of the materials of which the earth is made.

evaporate (i vap' u rāt). To change from liquid to gas.

expand (ek spand'). To take up more space.

Fahrenheit (far' un hīt). A thermometer with 32° as water's freezing point and 212° as its boiling point.

glacier (glā' shur). A huge amount of ice moving on land.

hydrogen (hī' dru jun). A colorless gas that burns easily.

iceberg (īs' bėrg). A floating mountain of ice found in the oceans.

insoluble (in sol' yu bul). A material that will not dissolve in another material.

molecule (mol' u kyül). The smallest particle into which a material can be divided without change.

oxygen (ok' su jun). A gas in the air that cannot be seen. Oxygen is needed for life.

particle (pär' tu kul). A very little bit.

property (prop' ur tē). A quality belonging especially to something.

saturated solution (sach' u rā tud su lü' shun). A solution that contains as much dissolved matter as can be dissolved.

soluble (sol' yu bul). A material that can be dissolved in another material.

solution (su lü' shun). A mixture formed when one material is dissolved in another material.

solvent (sol' vunt). A material that can dissolve other materials.

steam (stēm). Vapor arising from a heated material.

suspension (su spen' shun). A condition that happens when one material will not dissolve in another.
vapor (vã' pur). Gas formed from a material that is usually in liquid or solid form.
wood alcohol (wu̇d al' ku hôl). A cleaning liquid.

Note: All vocabulary words in this LIFEPAC appear in **boldface** print the first time they are used. If you are unsure of the meaning when you are reading, study the definitions given.

Pronunciation Key: h**a**t, **ā**ge, c**ã**re, f**ä**r; l**e**t, **ē**qual, t**ėr**m; **i**t, **ī**ce; h**o**t, **ō**pen, **ô**rder; **oi**l; **ou**t; c**u**p, p**u̇**t, r**ü**le; **ch**ild; lo**ng**; **th**in; /*Th*/ for **th**en; /*zh*/ for mea**s**ure; /u/ represents /a/ in **a**bout, /e/ in tak**e**n, /o/ in lem**o**n, and /u/ in circ**u**s.

I. WATER

Water is one of the most important materials in the world. Without water nothing could live. Next to the air you breathe, water is most important. You can live longer without food than you can without water. You need to drink a lot of water.

Water is used for power plants. It supplies electrical energy for cities. Raw materials can be shipped from the farm by water. The finished goods can be sent back by ships.

A lot of water is used for washing clothes and taking baths. Most people use about 70 gallons of water a day. We know our bodies need water every day to stay healthy. We get thirsty and we drink water. God has designed water to satisfy our physical thirst. We also have a spiritual thirst. God sent His only Son to satisfy that thirst. Believing that Jesus came to die for your sins and trusting Him as your Saviour will satisfy your spiritual thirst. Jesus said (John 4:14), "...whosoever drinketh of the water that I shall give him shall never thirst..."

In this section of your LIFEPAC, you will study about water. You will learn that water can be a solid, a liquid, or a gas. You will discover that water is a material that is very useful when used with other materials.

Not everyone will begin this study with the same understanding of water. List some ways that water is important to you._____

_____

_____

_____

Write some things you would like to learn about water in this LIFEPAC._____

_____

SECTION OBJECTIVES

Review these objectives. When you have completed this section, you should be able to:

1. Tell the freezing point and the boiling point of water on the Fahrenheit and the Celsius thermometers.
2. Name the three different forms of water.
3. Describe the wisdom of God in making water.
4. Describe the wide variety of use of water.
5. Tell about water when it is dew, rain, snow, ice, or glaciers.
6. Name some materials that are soluble in water and some that are insoluble in water.

Restudy these words.

Celsius	Fahrenheit	solution
centigrade	glacier	solvent
condense	iceberg	steam
dissolve	insoluble	suspension
evaporate	saturated solution	vapor
expand	soluble	wood alcohol

WATER AS A SOLID

Water changes with temperature changes. Water can be a solid, a liquid, or a gas. When water becomes very cold, it is a solid—ice. At room temperature, water is liquid. When heated, water becomes steam. **Steam** is a gas.

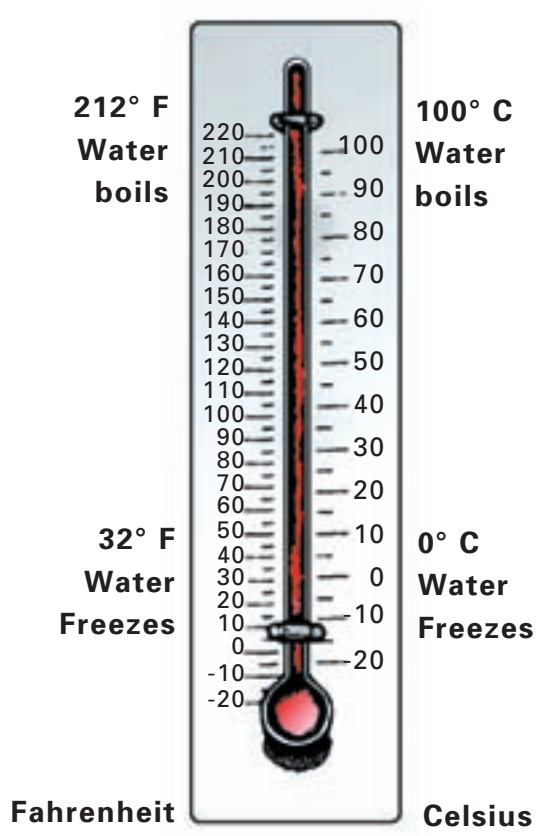
When ice freezes it **expands** and takes up more space. Ice becomes lighter than water. Because ice is

lighter than water, it will float. Animals and plants are able to keep alive in streams and ponds in winter months. The animals escape to the bottom of the pond or stream.

A **glacier** is a huge amount of ice that moves down a slope or land area. The word *glace* means *ice*. A glacier is a huge mountain of ice on land. A large park known as Glacier National Park is located in the state of Montana.

Huge amounts of ice sometimes break away from land and move out into the oceans. These floating mountains of ice are called **icebergs**. The word *berg* means *mountain*. An iceberg is an ice mountain.

Two types of thermometers are used for measuring the temperature of water. One thermometer is the **Fahrenheit** thermometer. Its name is capitalized because it was named for Gabriel Daniel Fahrenheit. The other thermometer is called the centigrade thermometer. The temperature scale called **centigrade** is also called Celsius. The Celsius scale was named for its inventor Anders **Celsius**, a Swedish scientist. If you use the words Celsius scale, the name must be capitalized.



Centigrade Thermometer
Fahrenheit Thermometer

The freezing point of water is 32° on the Fahrenheit thermometer. It is 0° on the centigrade or Celsius thermometer. The boiling point of water is 212° on the Fahrenheit thermometer. On the centigrade thermometer the boiling point is 100°.

Try this experiment.

These supplies are needed:

a plastic bowl large enough to hold 3 or 4 cups of water

2 or 3 ice cubes (these must be cubes or chunks of ice for floating)

Follow these directions and answer the questions. Place a check mark in the box as you complete each step.

- ☐ a. Fill the plastic bowl with 2 or 3 cups of cold tap water.
- ☐ b. Place the ice cubes in the bowl.

1.1 Does the ice float?_____

1.2 How does the floating ice keep fish and other animals from getting crushed to death in winter by freezing lakes and ponds?_____

_____

_____

_____

Try this experiment.

> **These supplies are needed**:
> 1 small paper cup
> enough crushed ice to fill the cup

Follow these directions and answer the questions. Place a check mark in the box as you complete each step.

- ☐ a. Fill the paper cup completely full of crushed ice. Set the cup aside.
- ☐ b. Place the cup in the warmest spot, perhaps near a sunny window.
- ☐ c. Wait for the ice in the cup to melt. Do not spill the ice or water. Save all of the melted water.
- ☐ d. Check the cup of ice that you left to melt.
- ☐ e. Record the amount of water as soon as the ice has completely melted.

1.3 Is the cup full of water?_____

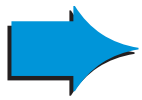
1.4 Why not?_____

_____

1.5 Why does ice float?_____

_____

_____



Draw an iceberg and a glacier.

1.6 On a clean sheet of paper you are to make two separate drawings. Space your drawings so that you can get two on a page. Use about half the sheet for each drawing. First draw an iceberg. Make a white mountain of ice floating on a blue ocean. Make the sky above also blue. Label your drawing Iceberg—a Floating Mountain of Ice. Next make a drawing of a glacier on this same sheet of paper. Make a white mountain of ice with green grass around it. You can make the sky blue. Label your drawing Glacier—a Huge Mountain of Ice on Land.

Teacher check _____

Initial Date

WATER AS A LIQUID

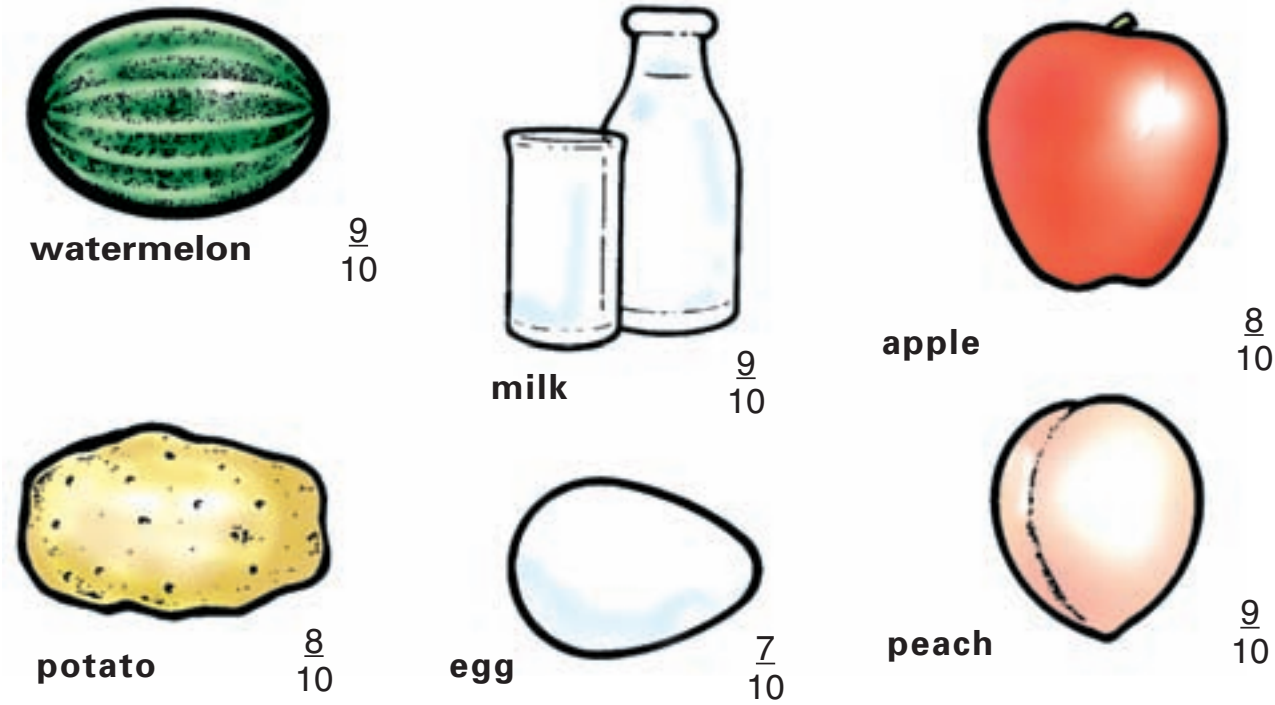
Water is a very old material. Water was present on the second day when God made the world. "And God made the firmament and divided the waters which were under the firmament from the waters which were above the firmament: and it was so." (Genesis 1:7)

Water is all around you. Water is in the air. Water is in soil. Water is in the leaves and trunks of trees. Your body is $\frac{7}{10}$ (seven-tenths) water.

Much water is in the food you eat. A cucumber is over $\frac{9}{10}$ (nine-tenths) water; lean meat is $\frac{6}{10}$ (six-tenths) water; and cheese is $\frac{4}{10}$ (four-tenths) water.

The chief sources of our water are rain and melting snow. Water that falls in the form of rain, snow, and sleet comes originally from oceans and streams. When the sun warms the oceans, lakes, and streams, it causes water to **evaporate**. Water **vapor** rises with the air and forms clouds. When water vapor cools, it turns into liquid water. The clouds return the water to earth through rain, snow, sleet, and sometimes hail.

Water in liquid form is not pure. Liquid water picks up something from most things it touches. Raindrops pick up tiny pieces of other materials from the air as they fall to earth.



The Amount of Water in Some Foods

These tiny pieces go into the soil and are used by plants as food. Water acts as a delivery system. Water moves the food to all parts of the plants. The roots take water from the soil. Plants have small tubes that carry the water from the roots through the stems and out to the leaves.

Water delivers food to all parts of the bodies of people and animals. Water also carries off body wastes. Your blood is almost all water. It carries food to all parts of the body. Water breaks down food to be used by the body.

Water is needed by all living things. It keeps plants, animals, and people alive.

Try this experiment.

These supplies are needed:

1 raw potato
1 scale (to weigh ounces or grams)
1 heavy-duty plastic knife
a paper towel

Follow these directions and answer the questions. Place a check mark in the box as you complete each step.

- ☐ a. Slice the potato into thin slices.
- ☐ b. Weigh all the slices while they are still wet.
- ☐ c. How much do the slices weigh while wet? Be careful to weigh all the slices. Record the wet weight of the potatoes here._____
- ☐ d. Place the slices of potato on a paper towel. Leave them in a sunny window or warm place to dry 3 days.
- ☐ e. Weigh the slices again in 3 days. Record the dry weight here._____
- ☐ f. Subtract the dry weight from the wet weight. How much water did the potatoes lose in 3 days? Record the difference here._____
- ☐ g. You were not able to get all of the water out of the potato. The potato would have to be dried many days in an oven to get all the water out.

1.7 How much of a potato is water?_____

Do these activities.

1.8 Write Isaiah 55:10._____

_____

_____

_____

1.9 Tell two things (from Isaiah 55:10) that the rain and snow will help.

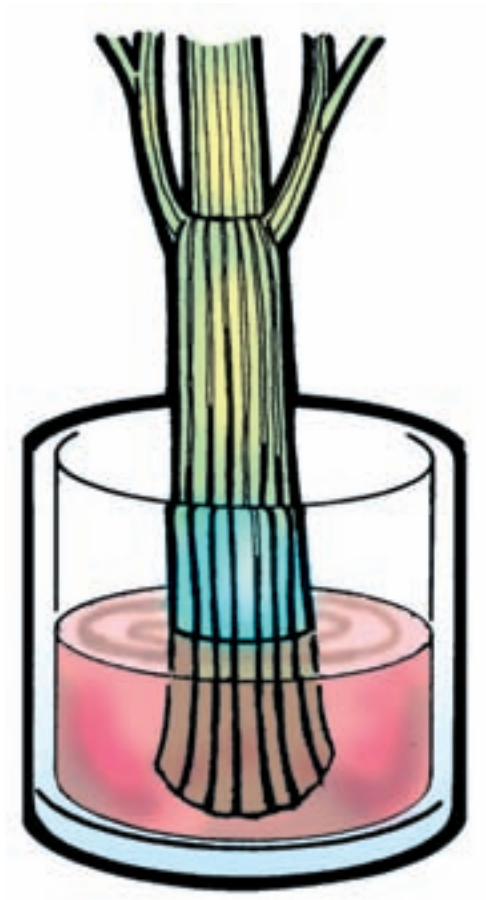
a._____

b._____

Try this experiment.

These supplies are needed:

1 stalk of celery
1 heavy-duty plastic knife
1 clear plastic glass (disposable type)
red food coloring



Follow these directions and answer the questions. Place a check mark in the box as you complete each step.

- ☐ a. Cut off the bottom of a celery stalk.
- ☐ b. Place the celery stalk in a glass of water so that the fresh cut is down.
- ☐ c. Add several drops of food coloring. Stir gently.
- ☐ d. Leave celery in colored water at least 3 hours or overnight.

1.10 Did the water go up the celery stalk?_____

1.11 What did the water go through to get to the top of the celery?_____

Complete these activities.

1.12 Your body is about _____ parts out of ten parts water.

1.13 Clouds are made of water _____.

1.14 The real sources of our water are a. _____ and b._____.

1.15 When the sun warms the oceans, lakes, and streams, it causes water to _____ .

1.16 Clouds return water to us in the form of a._____, b._____ , c. _____ , and sometimes d._____ .

1.17 Water is used by plants and animals to deliver _____ to all parts of their bodies.

1.18 If you were extremely thirsty and could not get any water, what would you do for water?_____

_____

1.19 Rainwater is not pure. Raindrops pick up tiny _____ from the air as they fall to earth.

1.20 Water helps your body stay alive. Name three ways the body is helped by water.

a._____

b._____

c._____

1.21 Water was made by God. How do you know from the Bible that water is very old?

_____

WATER AS A GAS

Water can be a solid and a liquid. Water can also be a gas. Water vapor is an example of a gas.

When you boil water in a teakettle, steam pours forth. Steam is a gaseous form of water. The boiling

point of water is 212° on the Fahrenheit scale and 100° on the centigrade or Celsius scale. The boiling point of any material is the temperature at which a material changes from a liquid to a gas.

Water vapor escapes when the sun warms the oceans, lakes, and ponds. The wind carries the vapor into the sky. Clouds are made of the water vapor. When the clouds gather lots of moisture, rain falls. Rain is water vapor returning to earth in the form of droplets.

When steam from a teakettle hits a cool windowpane, it forms droplets of water. Dew on the ground is formed in a similar manner. The dew point is the temperature at which water vapor in the air begins to change into droplets. The temperature at which water vapor changes in the air to form dew will vary with the amount of moisture in the air. Dew is water vapor from the air that **condenses** on objects.

Snow is frozen water vapor. Each little snow crystal is different and suggests design by God. Notice the beauty and design of the snow crystal. Snow is used in the Bible to show how God can wash away sins (Isaiah 1:18). "Come now, and let us reason together, saith the Lord: though your sins be as scarlet, they shall be as white as snow; though they be red like crimson, they shall be as wool."

A Snow Crystal

Photograph from *Snow Crystals* by W.A. Bentley and W.J. Humphreys Dover Publications

Try this experiment. Make dew form by cooling the air.

These supplies are needed:

1 small tin can, fruit juice type (be sure there are no sharp edges)
enough ice to fill the can

Follow these directions and answer the questions. Place a check mark in the box as you complete each step.

☐ a. Fill the tin can with ice.
☐ b. Set the can aside for a few minutes until droplets collect on the outside of the tin.

1.22 Where did the water droplets come from?

_____

1.23 Why did the droplets form on the can?

_____

_____

Match these items.

1.24	_____	snow	a. dew
1.25	_____	steam	b. 212 degrees
1.26	_____	rain	c. frozen water vapor
1.27	_____	Fahrenheit boiling point	d. water vapor returning to earth
1.28	_____	water droplets on objects	e. gaseous form of water
			f. 0 degrees
1.29	_____	Celsius boiling point	g. 100 degrees

Do this activity.

A *prefix* is a vowel or a syllable placed before the root word to form a new word. For example, *re-* in the word *reuse* is a prefix. *Use* is the root word. In the following exercise you will use the prefixes *un-, ex-, re-*, and *in-*.

1.30 The prefix *un-* means not. Circle the root word in each of the following words:

unbreakable ungrateful

1.31 The prefix *ex-* means *former* or *coming before in time.* Circle the root word in each of the following words:

exschool exfriend

1.32 The prefix *in-* means *not*. Circle the root word in each of the following words:

inactive indirect

1.33 The prefix *re-* means *backward* or *again*. Circle the root word in each of the following words:
reinvestigate rediscover

1.34 Write a prefix with the root word *fasten* to mean *fasten again*._____

1.35 Write a prefix with the root word *correct* to mean *not correct*._____

1.36 Write a prefix with the root word *godly* to mean *not godly*.
_____

1.37 Write a prefix with the root word *teacher* to meant *former teacher*._____

Do this activity.
Many causes and effects are taught by science. One thing happens first that brings about, or causes, something else to happen (an effect). In the following statements you are to find the cause and effect. Use only what is given in the statement. Draw one line under the part of the sentence that is the cause. Draw two lines under the part of the sentence that is the effect. The first one is done for you.

Water steams when it is heated.

1.38 Cooled moisture in the air will condense.

1.39 When water freezes, it expands.

1.40 Ice floats because it expands.

1.41 Ice melts when it is heated.

Write your own cause and effect sentence using water vapor and liquid water for cause and effect.

1.42 _____
_____
_____

WATER AS A SOLVENT

A solvent dissolves other materials. Water is a good solvent because water dissolves many materials. Water will dissolve sugar, salt, and many foods. The blood, which is mostly water, carries the dissolved food to different parts of our bodies.

If a substance will dissolve, it is **soluble**. If it will not dissolve, it is

insoluble. Some substances do not completely dissolve. Perhaps you have tried to dissolve cocoa in milk and found it difficult to do. Heating the milk helps the cocoa to dissolve in hot water but not in cold water.

Some materials are soluble in one liquid but not in another liquid. **Wood alcohol** is also a good solvent. Sometimes more than one solvent must be tried to dissolve a material.

When salt is mixed with water, the salt disappears. The salt has gone into the **solution**. In other words, the salt has spread through the water. A solution is the mixture formed when a material is dissolved in another material.

Salt dissolves quickly in water. If you keep adding more salt, some of it will not dissolve. When a solution will not dissolve anymore of a material, it is saturated. A **saturated solution** contains as much material as can be dissolved although heating the solution may cause a little more to dissolve. Even when heated the solution will reach a point where it will not dissolve more.

Oil will not dissolve in water. Oil is lighter than water and will float on the water. It stays on top of the water. Oil floating on water is called a **suspension**. A suspension is a material that will not dissolve in another substance.

Wood doesn't dissolve in water. Over a long period of time, it will decay and wash away.

Try this experiment.

These supplies are needed:

4 plastic glasses (1 for each test material)
1 teaspoon of salt
1 teaspoon of sugar
1 teaspoon of sand
1 teaspoon of salad or cooking oil
a plastic spoon or wooden stick for stirring

Follow these directions and answer these questions. Place a check mark in the box as you complete each step.

☐ a. Fill each of the four glasses half–full of water.

☐ b. Number each of the glasses 1 - 4.

☐ c. In glass number 1 add 1 teaspoon of salt and stir.

1.43 Did the salt disappear?_____

1.44 Is salt soluble in water?_____

☐ d. In glass number 2 add 1 teaspoon of sugar and stir.

1.45 Did the sugar disappear?_____

1.46 Is sugar soluble in water?_____

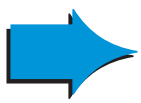
☐ e. In glass number 3 add 1 teaspoon of sand and stir.

1.47 Did the sand disappear?_____

1.48 Is sand soluble in water?_____

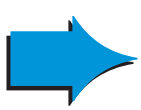
☐ f. In glass number 4 add 1 teaspoon of oil and stir.

1.49 Is oil soluble in water?_____



Match these items.

1.50_____	mixture formed when one material is dissolved in another material	a. an insoluble material
1.51_____	a material that will not dissolve in another. material	b. wood alcohol
1.52_____	oil on water	c. solution
1.53_____	sugar	d. a soluble solid
1.54_____	a good solvent	e. suspension
1.55_____	a material that will dissolve in another	f. saturated solution
1.56_____	a solution that will not dissolve any more of a material	g. soluble
		h. crystal



Answer this question.

1.57 How is water necessary to dissolve food for your body?

_____

_____

_____

SCIENCE

4 0 6

LIFEPAC TEST

Name _____

Date _____

Score _____

Possible Score 100

SCIENCE 406: LIFEPAC TEST

Match these items (each answer, 3 points).

1.	_____	water vapor from the air that condenses on objects	a. insoluble b. Celsius c. small tubes
2.	_____	helps to dissolve some materials	d. heating e. cooling saturated solution
3.	_____	the freezing point of water	f. icebergs g. your nose
4.	_____	the condition that makes crystals grow	h. dew i. 0° C
5.	_____	a body material that is nearly all water	j. glaciers k. blood
6.	_____	mountains of ice floating in the oceans	l. definite m. container
7.	_____	carry water to all parts of plants	
8.	_____	a substance that cannot be dissolved	
9.	_____	a detector of molecules	
10.	_____	the centigrade thermometer	
11.	_____	the shape taken by a gas	
12.	_____	the shape taken by a solid	

Write *true* **or** *false* (each answer, 2 points).

13. _____ Melted ice expands and give you much more water than the amount of ice you had.

14. _____ Gabriel Daniel Fahrenheit made the Celsius thermometer.

15. _____ A potato is about eight-tenths water.

16. _____ You can live longer without food than you can without water.

17. _____ Milk is a good source of water if you do not have water to drink.
18. _____ Raindrops are always pure.
19. _____ 212°F and 100°C are the same temperatures on different thermometers.
20. _____ Sand and water do not form a solution.
21. _____ Everything in the world is made of matter except you.
22. _____ Snow is frozen water vapor.
23. _____ Air is matter.
24. _____ The air in your lungs is square-shaped.
25. _____ The prefixes in- and un- mean not.

Complete these statements (each answer, 4 points).

26. Two atoms of hydrogen and one atom of oxygen make a molecule of _____ .
27. All matter takes space and has _____ .
28. The human body is about _____ parts out of ten parts water.
29. One of the chief sources of water is _____ .
30. When something expands it takes up more _____ .
31. Every living thing needs air and _____ .
32. Water was made by God on the _____ day.
33. The centigrade thermometer was made by _____ .

Complete this activity (this activity, 6 points).

34. Name the three forms of matter and give an example of each.

a. _____ b. example: _____
c. _____ d. example: _____
e. _____ f. example: _____

NOTES

Try this experiment.

When a saturated solution such as saltwater is cooled, salt crystals form. Diamonds, sugar, and most metals are also crystals that have formed from saturated solutions. Try this experiment at home. Have one of your parents check in the space provided.

These supplies are needed:

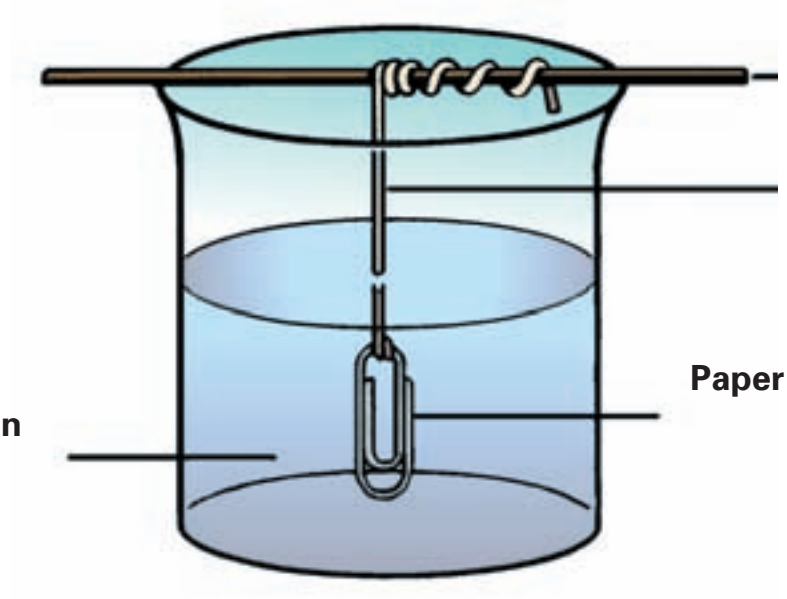
A very small pan that holds about 1 or 2 cups of water
about 1/3 (one-third) cup of water
about 1 cup sugar or salt
a piece of string
a paper clip or small nail
a pencil or stick
a beaker

Follow these directions. Have a parent supervise heating of the solution. Place a check mark in the box as you complete each step.

- ☐ a. Place about one-third of a cup of water in the small pan.
- ☐ b. DO NOT ADD SUGAR YET. Bring the water to a boil. Pour the water into the beaker.
- ☐ c. Stir in the sugar or salt until no more can be dissolved. REMEMBER: DO NOT BOIL THE SUGAR OR SALT. STIR IT IN AFTER THE WATER IS HOT.
- ☐ d. When the solution is complete and all the material dissolved that will go into the water, you have a saturated solution.
- ☐ e. Suspend a paper clip on a string and let it dangle down in the sugar or salt solution. As the saturated solution cools, sugar or salt crystals will form on the paper clip. See the illustration on page 18.
- ☐ f. Bring some of your crystals to class if you are successful.

Parent check _____

Initial Date



Method of Making Crystals

Do these activities.
The same method used for making salt or sugar crystals is used for making alum crystals.

1.58 Use the dictionary. What is alum used for?

_____

_____

When your body needs water, you become thirsty. Water satisfies thirst. Christ also satisfies the thirst for life. When you receive Him as your Savior, He will satisfy that thirst of longing for life. The Bible says (Revelation 22:17b) "...And let him that is athirst come. And whosoever will, let him take the water of life freely."

1.59 Write Revelation 22:17b in the space provided below. Memorize this verse._____

_____

_____

Make a library report.

1.60 Write a page on one of the following subjects about water. If you do not want to choose one of the ideas given, you may select some other subject about water. You must have your teacher sign approval of your choice. Use your very best handwriting.

a. The use of water for winter sports and fun
b. The use of water for summer sports and fun
c. Water used for irrigation
d. Water as a source of power
e. Water as a means of transportation
f. The use of water as punishment from God (example, the Flood)
g. God's use of water for performing His marvelous works
h. Ways of keeping water clean
i. The choice I have made is: _____

Teacher check _____
Initial Date

Review the material in this section to prepare for the Self Test. The Self Test will check your understanding of this section. Any items you miss on this test will show you what areas you need to restudy.

SELF TEST 1

Match these items (each answer, 3 points).

1.01	_____	a body material that is nearly all water	a.	ice
1.02	_____	boiling temperature of water	b.	insoluble
1.03	_____	freezing temperature of water	c.	saturated solution
1.04	_____	to take up more space	d.	212° Fahrenheit
1.05	_____	not a pure material	e.	evaporate
1.06	_____	a gaseous form of water	f.	glacier
1.07	_____	water as a solid	g.	oil and water
1.08	_____	an example of a suspension	h.	suspension
1.09	_____	a mountain of ice in the ocean	i.	solution
1.010	_____	a material that has evenly spread throughout another	j.	blood
1.011	_____	a solution that will not dissolve any more of a material	k.	iceberg
1.012	_____	a material that will not dissolve	l.	in-
1.013	_____	a material that floats on top of another material	m.	0° Celsius
1.014	_____	to change from a liquid to a gas	n.	rainwater
1.015	_____	a prefix	o.	tubes
1.016	_____	a mountain of ice or huge amount of ice on land	p.	expand
			q.	steam

Write *true* **or** *false* (each answer, 2 points).

1.017 _____ Water freezes at 0° on the Fahrenheit thermometer.
1.018 _____ Raindrops are always pure.
1.019 _____ Freezing water expands.
1.020 _____ Anders Celsius made the centigrade thermometer.
1.021 _____ 212°F and 100°C are the same temperatures on different thermometers.
1.022 _____ Snow is frozen water vapor.
1.023 _____ The prefixes *in-* and *un-* mean not.
1.024 _____ Oil floats because it is lighter than water.
1.025 _____ Ice is heavier than water.
1.026 _____ Gabriel Daniel Fahrenheit made the centigrade thermometer.
1.027 _____ Melted ice expands and gives you more water than you started with.

Complete these statements (each answer, 4 points).

1.028 One of the chief sources of water is rain or _____ .
1.029 When water vapor is cooled, it becomes _____ .
1.030 Water boils at _____ Celsius.
1.031 Water from the soil is delivered to plant parts by _____ .
1.032 Water may be solid, liquid, or _____ .

Answer these questions (each answer, 5 points).

1.033 How can you make a crystal of salt or sugar?_____
_____
_____

1.034 Suppose you have a substance that you cannot get dissolved in cold water. What are two ways you might be able to get this material dissolved?_____
_____
_____

Possible Score 100 My Score _____
Teacher check _____
Initial Date

II. MATTER

In this section of your LIFEPAC, you will learn about **atoms** and **molecules**, the tiniest bits of matter that God has made. You will learn about **elements**. Elements form the materials from which the world is made.

SECTION OBJECTIVES

Review these objectives. When you have completed this section, you should be able to:

7. Name the three forms of matter and give an example of each.
8. Describe matter, molecules and atoms.
9. Tell what an element is.

Restudy these words.

atoms	hydrogen	particle
chemistry	molecule	property
element	oxygen	

PROPERTIES AND FORMS

Everything in the world is made of matter. Your desk, books, school building, and yes, even you are made of matter. You cannot see the smallest bits of matter. Even with a powerful microscope the smallest bits of matter cannot be seen. All the different things in the world around you are matter. Different materials make different kinds of matter.

Scientists group matter into three forms. The three forms of matter are solids, liquids, and gases.

Liquids and gases have no special shape of their own. They take the shape of their container. Air in a paper bag is a gas. It takes the shape of the paper bag. Water is a liquid. A glass of water takes the shape of the glass.

Solids have a definite shape. An ice cube is a solid. It has a definite shape.

You may tell if an object is matter in the following two ways. All matter takes up space. If you blow up a paper bag, you know it is full of air. The paper bag full of air takes more space than the empty paper bag does. The second test of matter is that all matter has weight.

If you are asked to describe an object, you probably will tell about its size, weight, shape, color, taste, and smell. You have described the object's **properties**. All matter has properties.

Different kinds of matter have different properties. A straight pin might be described as thin and sharp. Your school desk might be described as hard and smooth.

Many words might be used to describe the same object. Then the object has more than one property. The object may have many properties. You might describe a piece of cotton as light, white, soft, and round.

The study of matter is called **chemistry**. Robert Boyle is famous for his work in chemistry. Robert Boyle lived from 1627 to 1691. Boyle loved God. He had the Bible printed in Irish and Gaelic languages. He started a group that helped spread the Word of God.

Write true **or** false.

2.1 _____ Shape, color, size, and taste are called properties of matter.

2.2 _____ Everything you touch is matter.

2.3 _____ Air is not matter.

2.4 _____ Matter can only have one property.

Do this activity.

2.5 Play a guessing game with another student. Think of a kind of matter. Have your friend try to guess what the matter is by asking you questions such as "Can it be seen?" "Can it boil?" "Can it dissolve?" "Can it burn?" "Is it hard or soft?"

Teacher check _____

Initial Date

Try this experiment.

These supplies are needed:
1 clear plastic glass (must be round)
1 clear freezer carton (must be square)
1 paper bag (small lunch bag is best)

Follow these directions and answer the questions.
Place a check mark in the box as you complete each step.

☐ a. Fill the round plastic glass half full of water.
2.6 What shape is it?_____

☐ b. Pour the water into the square freezer carton.
2.7 What shape does the water take?_____

☐ c. Blow up the paper bag with air.
2.8 What shape is air?_____

Complete these activities.

2.9 The three forms of matter are a. _____ , b. _____, and c. _____ .
2.10 Liquids and gases do not have a special shape. They take on the shape of their _____.
2.11 Air in a paper bag is an example of a _____.
2.12 If you pour water in a round container, what is the shape of the water?_____
2.13 If you pour water in a square container, what is the shape of the water?_____

Do this activity.

2.14 Put a check ✔ mark by each sentence that is a test of matter.

a. _____ You can see matter.
b. _____ Matter takes space.
c. _____ You can smell matter.
d. _____ Matter is alive.
e. _____ All matter has weight.

Complete this chart.

2.15

Name of Material	Is it a Solid, Liquid, or Gas?	Shape It Takes
water ice steam		

MOLECULES AND ATOMS

When your mother bakes rolls, they smell delicious in the kitchen. Tiny bits of matter from the rolls have escaped. These tiny bits of matter spread throughout the air. They reach your nose. These tiny bits of matter are called **molecules**. Your nose can tell what kind of molecules are in the air. An onion does not smell like a hot roll.

A molecule is the smallest **particle** of a material that is still like that material. Every tiny molecule of a material has the same property as does the larger material.

Hardness is a property of rock. Every tiny piece of that same rock has the property of hardness.

What are molecules made of? A molecule can be split into smaller things called **atoms**. Atoms are like building blocks. They are joined together to make molecules.

Complete these activities.

2.16 Name five things that you can see around you that are matter.
a._____ c._____ e._____
b._____ d._____

2.17 The smallest bit of water is called a _____ .

2.18 Every tiny molecule of a rock has the property of _____ .

2.19 Atoms are joined together to make _____ .

2.20 You smell things because of tiny bits of matter called a. _____ that travel through the b. _____ .

2.21 Matter is anything that takes a. _____ and has b. _____ .

2.22 The odors which your nose detects are actually _____ .

Try this experiment.

These supplies are needed:
1 bottle of strong smelling perfume
1 bottle of household ammonia
(just a small amount is enough)

Follow these directions. Place a check mark in the box as you complete each step.

☐ a. Remove the stopper from the perfume. Check the clock and see how long it takes for the perfume to be smelled on the other side of the room. Replace the stopper on the perfume. How long?_____

☐ b. Remove the cap from a bottle of household ammonia. Check the clock to see how long it takes for the ammonia smell to reach the other side of the room. Replace the cap. How long?_____

ELEMENTS

Scientists have divided and grouped the different kinds of materials of which the earth is made. All the different materials that make up the world are called **elements**.

Scientists have discovered over 100 different elements. Each of these elements has been given a name. Some of the elements you have heard of are iron, silver, gold, tin, and copper.

An element is made of only one kind of atom, but you cannot see the atoms of an element. When millions of atoms are put together, however, the pieces are large enough to see. Some types of jewelry are made of silver, which is an element. Pennies are made of copper, which is also an element.

Scientists needed shorter ways of writing the names of elements. A Swedish scientist, John Berzelius, thought that the first letter of the name of the element should be its symbol. If two or more elements had the same first letter, then both the first and second letter should be used. Sometimes, it happened that the first two letters of two elements were the same, so another letter was used.

Element	Symbol
copper	Cu
iron	Fe
tin	Sn
hydrogen	H
oxygen	O

Some Elements and Their Symbols

Much of the earth is water, but water is not a separate element. Two elements, **hydrogen** and **oxygen**, combine together to make water.

Find these words.
In the word maze are names of some elements. They may be up, down, across, or backwards. Circle the word when you find it.

iron	gold	hydrogen	zinc
tin	silver	helium	argon
oxygen	iodine	cobalt	

2.23

O	A	C	W	C	H	A	L	Z	O
X	C	B	C	L	E	F	K	Y	C
Y	Q	R	V	S	L	L	M	L	T
G	B	Z	C	N	I	Z	N	G	R
E	V	C	L	R	U	I	R	O	N
N	O	G	R	A	M	N	S	L	T
I	O	D	I	N	E	C	F	D	A
N	E	G	O	R	D	Y	H	T	U
C	Q	L	H	S	I	L	V	E	R
B	V	C	I	W	Y	G	S	R	L
N	C	T	F	C	O	B	A	L	T
T	I	N	V	W	R	U	S	U	V

Answer *yes* **or** *no*.

2.24 _____ Elements are made of different kinds of atoms.
2.25 _____ Scientists have discovered over 100 different elements.
2.26 _____ Iron is the name of an element.
2.27 _____ Many elements can be seen and touched.
2.28 _____ Elements form the materials of the world.

Do this activity.

2.29 When you go home today, ask your mother for a glass of H_2O. See if your mother knows what you mean. A scientist often writes H_2O instead of water. The H stands for hydrogen. The O stands for oxygen. The 2 after the H means two atoms of hydrogen are in each molecule of water.

The molecule has only one atom of oxygen.
Write a short report on some properties and forms of water. Include what happened when you asked for some H_2O.

Teacher check _____

Initial Date

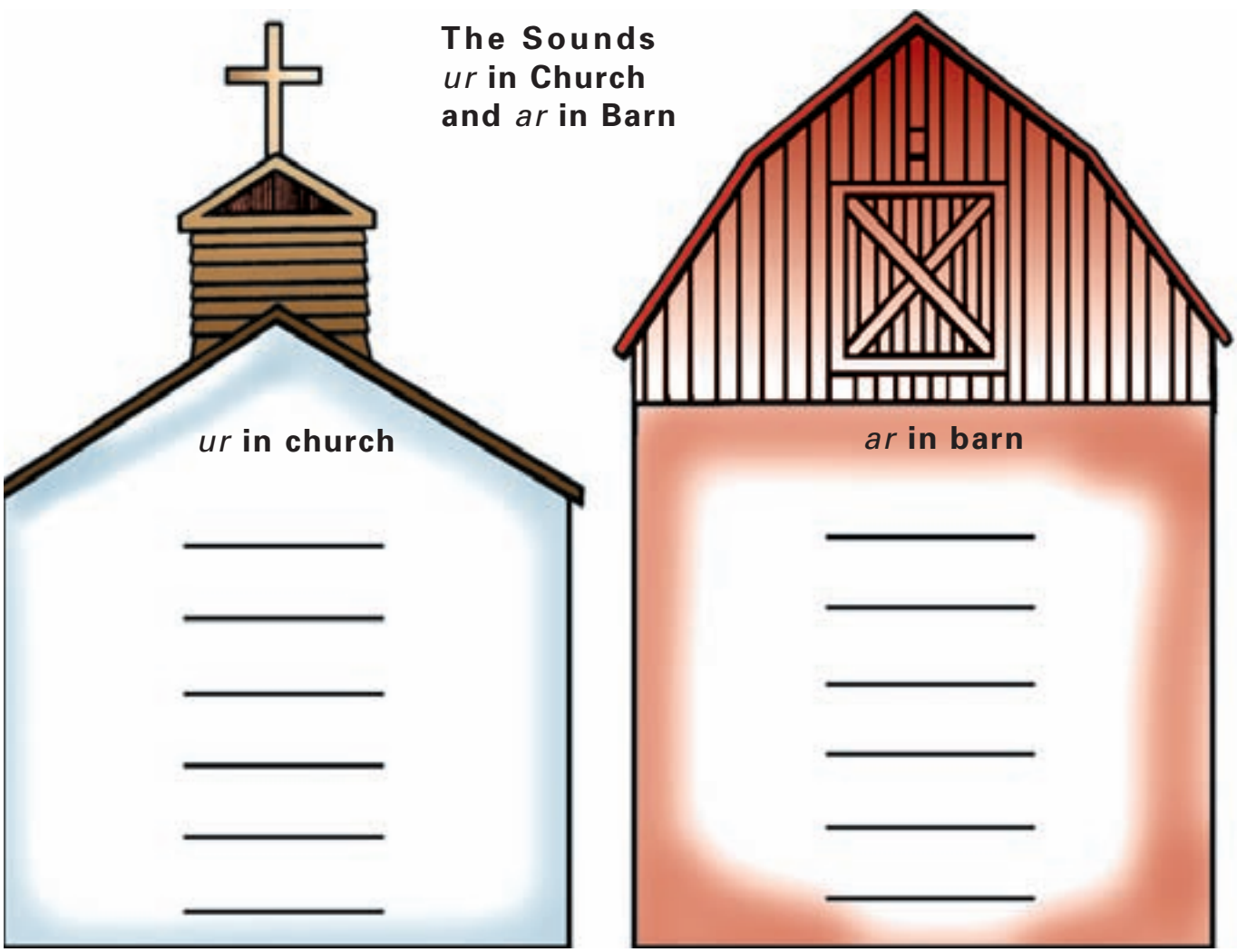
Do this activity.

The letter *r* likes to tell vowels what to say. It tells a vowel that goes before it to say another sound. It cannot change a vowel that goes after it. Remember, *r* can only change a vowel that goes right before it.

2.30 Write words from the list in the spaces in the barn and church building. Write the words that say *ar* as in *barn* in the picture of the barn. Write the words that say *ur* as in *church* in the picture of the church.

burst	curtain	hurry	quarter
churn	farm	large	scarlet
curl	fur	particle	snarl

The Sounds *ur* in Church and *ar* in Barn



In the sentences below, complete the word in the blank with one of the letter groups.

-*er* as in her
-*ear* as in dear
-*or* as in short
-*eer* as in steer
or -*ur* as in curl

2.31 Roses are pretty, but their th___ ___ns can hurt.
2.32 Our most imp___ ___tant material is water.
2.33 A d___ ___ ___can run very fast.
2.34 We go to ch___ ___ch to worship God.
2.35 They heard a loud bang when the balloon b___ ___st.
2.36 A mountain of ice in water is an iceb___ ___g.
2.37 Salt or sugar disapp___ ___ ___s when mixed with water.
2.38 One th___ _momet___ _is named for Gabriel Daniel Fahrenheit.
2.39 The number of days in a y___ ___ ___ is 365.
2.40 When the enemy attacked, the soldiers were filled with f___ ___ ___.
2.41 We paid the cl___ ___k in the store.
2.42 Praise God and be full of good ch___ ___ ___.

Do this activity.

In this LIFEPAC you have studied prefixes. In the following exercise you will review the prefixes that you have previously studied.

2.43 What is the meaning of the prefix *un*-?_____

2.44 What is the meaning of the prefix *in*-?_____

2.45 What is the meaning of the prefix *re*-?_____

2.46 What is the meaning of the prefix *ex*-?_____

2.47 Write a prefix with the root word *soluble* to make it mean *not soluble.*_____

2.48 Write a prefix with the root word *excusable* to make it mean *not excusable.* _____

2.49 Write a prefix with the root word *apply* to make it mean *apply again*._____

2.50 Write a prefix with the root word *child* to make it mean *one that used to be a child* (former child)._____

2.51 Write a prefix with the root word *happy* to make it mean *not happy*._____

2.52 Write a prefix with the root word *equal* to make it mean *not equal*._____

Before you take this last Self Test, you may want to do one or more of these self checks.

1. _____ Read the objectives. See if you can do them.
2. _____ Restudy the material related to any objectives that you cannot do.
3. _____ Use the SQ3R study procedure to review the material:
   a. **S**can the sections.
   b. **Q**uestion yourself.
   c. **R**ead to answer your questions.
   d. **R**ecite the answers to yourself.
   e. **R**eview areas you did not understand.
4. _____ Review all vocabulary, activities, and Self Tests, writing a correct answer for every wrong answer.

SELF TEST 2

Match these items (each answer, 3 points).

2.01	_____	everything in the world
2.02	_____	building blocks of molecules
2.03	_____	Cu
2.04	_____	two elements
2.05	_____	two tests of matter
2.06	_____	the shape of a solid
2.07	_____	the shape taken by a gas
2.08	_____	a material that will not dissolve
2.09	_____	the boiling point of water
2.010	_____	the freezing point of water
2.011	_____	different materials that make matter
2.012	_____	water as a solid
2.013	_____	mountain of ice floating in the water
2.014	_____	a material that floats on water
2.015	_____	a material that will not dissolve any more of a material
2.016	_____	the name given to a material that will dissolve other materials

a. saturated solution
b. ice
c. hydrogen and oxygen
d. container
e. iceberg
f. oil
g. has weight; takes up space
h. 212° F
i. definite
j. matter
k. a symbol for copper
l. elements
m. insoluble
n. atoms
o. 32° F
p. expand
q. solvent

Answer *true* **or** *false* (each answer, 2 points).

2.017 _____ Ice floats because it is lighter than water.
2.018 _____ Oil is heavier than water.
2.019 _____ Water is an element.
2.020 _____ Water is a wonderful solvent.
2.021 _____ Sand and water form a solution.
2.022 _____ Everything in the world is made of matter except you.
2.023 _____ Air always has the same shape.
2.024 _____ All solids have a definite shape.
2.025 _____ Snow is frozen water vapor.
2.026 _____ Water can be round or square-shaped.
2.027 _____ Air we breathe has no special shape of its own.
2.028 _____ Wood will dissolve in water.

Complete these statements (each answer, 4 points).

2.029 A molecule of water has _____ hydrogen atoms.

2.030 A name of an element is _____.

2.031 A huge amount of ice on land is a _____.

2.032 Atoms are joined together to make _____.

2.033 Liquids and gases take on the shape of the _____.

2.034 A mountain of ice floating in the ocean is an _____.

2.035 Matter is anything that takes space and has _____.

Possible Score 100 My Score _____

Teacher check _____
Initial Date

Before taking the LIFEPAC Test, you may want do one or more of these self checks.

1._____ Read the objectives. See if you can do them.

2._____ Restudy the material related to any objectives that you cannot do.

3._____ Use the SQ3R study procedure to review the material.

4._____ Review activities, Self Tests, and LIFEPAC vocabulary words.

5._____ Restudy areas of weakness indicated by the last Self Test.