APPENDIXES

APPENDIX A
Student’s Concept Survey

Matter survey

To student

1. Please complete every item. Your answers are valuable to me to understand how to teach science better.
2. Do not worry about the result. **This is not a test; your answers are not affecting your grade.**

1. Circle an option to show if the substances are solid, liquid, gas or unknown. Please explain why you think this.

1.1 I think that a stone is a

A. Solid
B. Liquid
C. Gas
D. none of these three

because

_____

_____

1.2 I think that air is a

A. Solid
B. Liquid
C. Gas
D. none of these three

because

_____

_____

1.3 I think that talcum powder is a

A. Solid
B. Liquid
C. Gas
D. none of these three

because

_____

_____

1.4 I think that lime juice is a

A. Solid
B. Liquid
C. Gas
D. none of these three

because

_____

_____

1.5 I think light from a light bulb is a

A. Solid
B. Liquid
C. Gas
D. none of these three

because

_____

_____

1.6 From your understanding, what is a solid, liquid and gas?
Solid is

_____

_____

_____

Liquid is

_____

_____

_____

Gas is

_____

_____

_____

2. Circle an option to show if the substances are matter or not. Please explain why you think this.

2.1 A tree is matter?

A. Yes
B. No
C. Don't know

Because

_____

_____

2.2 Heat from a candle is matter?

A. Yes
B. No
C. Don't know

Because

_____

_____

2.3 An iron pan is matter?

A. Yes
B. No
C. Don't know

Because

_____

2. Circle an option to show if the substances are matter or not. Please explain why you think this.

2.4 Water is matter?

A. Yes
B. No
C. Don't know

Because

_____

_____

2.5 Salt is matter?

A. Yes
B. No
C. Don't know

Because

_____

_____

2.6 Steam from a boiling pot is matter?

A. Yes
B. No
C. Don't know

Because

_____

_____

2.7 Your shadow is matter?

A. Yes
B. No
C. Don't know

Because

_____

_____

2.8 What do you think that matter is?

_____

_____

_____

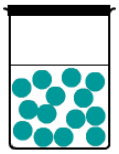
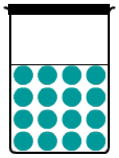
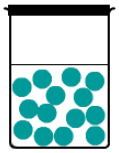
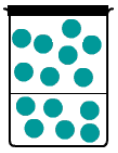
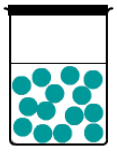
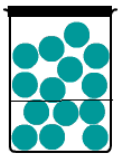
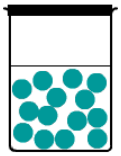
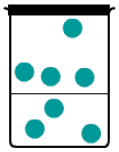
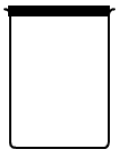
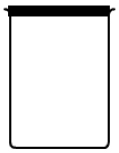
_____

Your tool

A special magnifier is used for observe inside a substance to see what you can not see using your eyes.

3. If you use your **special magnifier** to look at the water in a closed bottle after you have heated it, what would you see? Circle an option and explain why you think this.

P.S ● **is water particle**

	Before heating	After heating
A.		
B.		
C.		
D.		
E.		

None of these four (please draw your model)

Please explain your answer :

_____

_____

Picture 1: Wet clothes on clothesline on a sunny day

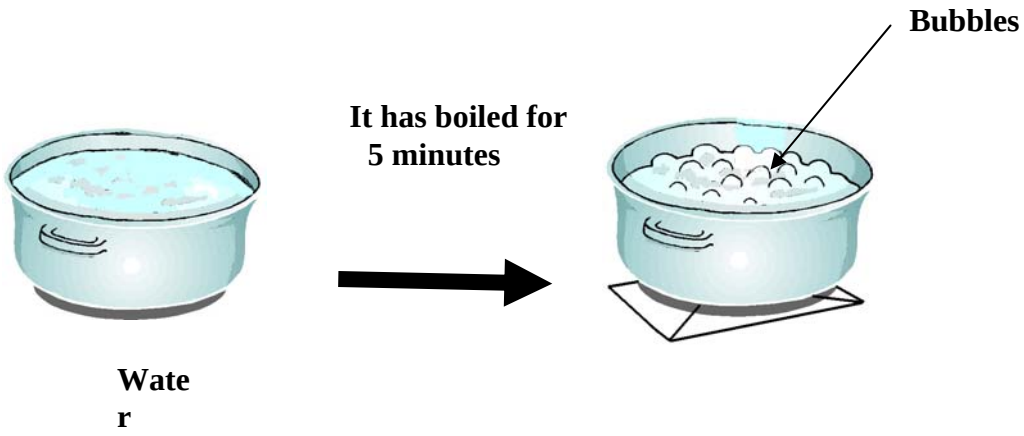
4. Please explain what has happened to the water in the dry clothes?

_____

_____

_____

_____



Picture 2: Water has boiled in the pot

5. When water boils, bubbles form and the level of the water go down. What are the bubbles and what has happened to the water? Please explain.

What has happened to the water?

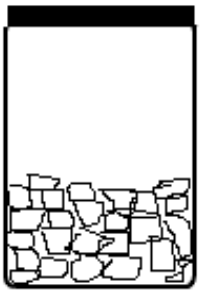
_____

_____

What are the bubbles made of?

_____

_____



Picture 3: Ice cubes in a closed bottle.

6. What happens to the ice in the bottle, if it is left for one hour? Circle an option and explain why you think this.

A. The ice changes into water and is still in the bottle.

B. The ice disappears and nothing left in the bottle.

C. The ice changes into an invisible gas and is still in the bottle.

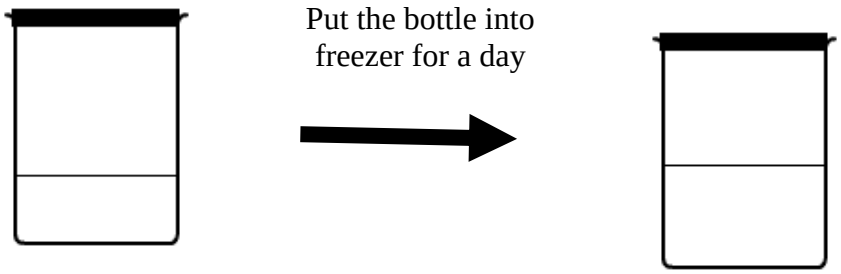
D. The ice change into water and goes through the glass to the outside of the bottle.

Please explain your answer :

_____

_____

_____



Water in bottle **Ice in bottle**

Picture 4: water in a closed bottle

7. What happens to the water in the bottle? Circle an option and explain why you think this.

A. It has mixed with air and some has changed into the ice in the bottle and some has changed into the ice on the wall of the freezer.

B. It has changed into an invisible gas.

C. It has changed into ice in the bottle.

D. It has changed into the ice on the walls of the freezer.

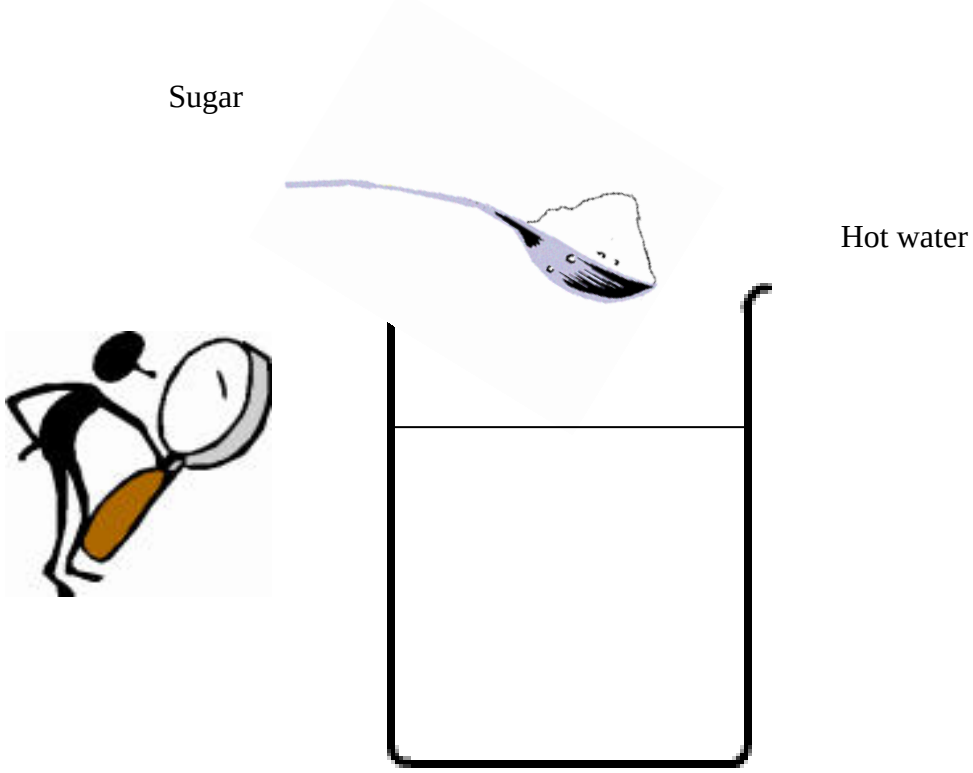
Please explain your answer :

_____

_____

_____

8. When sugar ***dissolves*** in hot water, it seems to disappear. What has happened to the sugar? **Please explain and draw picture** what you would see? You use your **special magnifier** to look at the dissolved sugar in water.



What is dissolving?

_____

_____

_____

What happens to the sugar?

_____

_____

_____

9. Thinking about question 8, could you get the sugar back? Circle an option and explain why you think this.

A. Yes

How?

_____

_____

_____

B. No

Why?

_____

_____

_____

C. Don't know

10. When coffee dissolves, why does the water change colour? Circle an option.

A. The colour comes out of the coffee particles and turns the water brown.

B. The brown particles of coffee are separated out and surrounded by water.

C. The brown particles of the coffee combine with water particles to make a new substance.

11. What is the black material that comes from burning paper? Circle an option and explain why you think this.

A. It is heat which is formed.

B. It is a new substance formed from the white paper.

C. It is the same paper but its colour has changed.

Please explain your answer:

_____

_____

_____

12. Thinking about question 11, could you get the white paper back from this black material? Circle an option and explain why you think this.

A. Yes

How:

_____

_____

_____

B. No

Why:

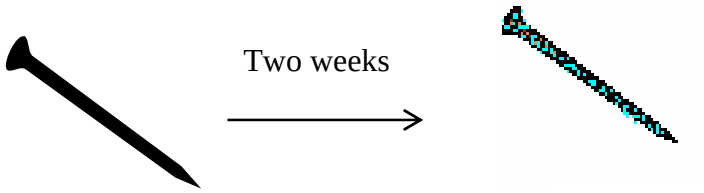
_____

_____

_____

C. Don’t know

13. A shiny nail goes rusty when is left for two weeks in water. **Before** such a nail goes rusty, where is the rust? Circle an option and explain why you think this.



Shiny nail Rusty nail

A. It has not formed yet.

B. It is in the air.

C. It is in the water.

D. It is already in the nail.

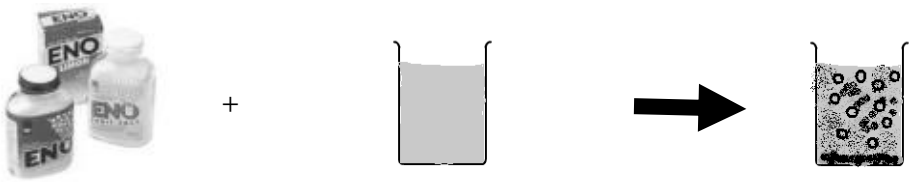
Please explain your answer:

_____

_____

_____

14. When Eno (Antacid) is put in water many bubbles are seen. What do you think is the best explanation for why the bubbles formed? Circle an option and explain which is your answer:



Eno Eno in

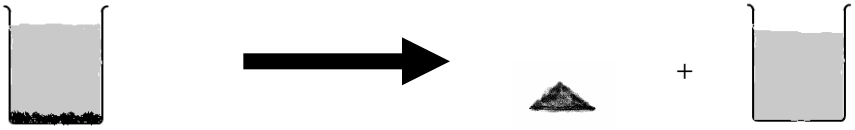
A. When the Eno was made, the bubble was built into it.

B. The bubbles came from the water.

C. The bubbles were formed when Eno combined with the water.

D. Bubbles were sucked into the water from the air as the Eno sank.

15. You have a mixture of sand and water. Describe or draw how you would separate out the sand and water.



A mixture of sand in

Sand

Water

Your method is

_____

Please explain why can you separate sand and water this way?

_____

_____

_____

APPENDIX B
Example of Lessons in a Conceptual Change-Based Instructional Unit

Lesson Plan

Science subject **Grade 6 Semester 2**

Lesson 1 the change in state of matter (1.5 boiling and sublimation) 1 hour

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Expected learning outcomes

Students will be:

1. Explaining the definition of boiling and sublimation
2. Doing experiment and explaining the differences between evaporation and boiling
3. Doing experiment and explaining that some solid can sublimate
4. Explain that processes of changes in state of matter can be reversed.
5. Using science instruments namely thermometer, alcohol burner, and beaker
6. Working in cooperative group

Conceptions

- Some changes of states occur by adding heat. When water is heated, it will change into gas because the particles of water move faster and move further apart. During this process, bubbles are formed. During the process water changes into gas and rises to the surface of water in the form of bubbles. At the surface, they may break free and escapes as water vapor. The water level goes down. This process is known as "***boiling***". Boiling takes place at a fixed temperature called the boiling point.
- Some substances change straight away from a solid into a gas without change through the liquid state. Particles of solid move faster and move further apart and become gas. This process is called ***"sublimation***"

Teaching sequence

Introduction (5 minutes)

1. The students are explored their prior conceptions using a transparency no.1 (evaporation and boiling). The questions a teacher use are:
   - What happens with the water in the picture? (pic.1-water evaporates to water and pic.2-water is boiling)
   - What are different between two situations? (both situations are the process of water changes into water vapor, but there are bubbles in water in pic.2)
   - How do both situations occur? (water gets heat and changes into water vapor)
   - What do the bubbles in water made of? (bubbles are some parts of water which change into water vapor)

Teaching (45 minutes)

1. The students do an activity on a worksheet no.1 (why does the water boil?). Before doing an activity, the teacher and the students discuss about the sequences and the cautions of the activities such as how to use thermometer and the incidents from fire and hot water.
2. The students discuss the results and the answers for the questions after the "why does the water boil?" experiment.
   - What is boiling? (The water gets heat and reach to the boiling temperature and then change into gas)
   - What is boiling point? (The temperature which the substances boil such as water' boiling point is 100 degree Celsius)
3. The students and the teacher summary the ideas about the change in state of matter in term of solid to liquid, liquid to solid and liquid to gas. The teacher leads to discuss about the change in solid to gas using these questions.

- What happen with liquid and solid when their heat has transferred? (Liquid will freeze into solid, gas will condense into water)
- What happen with liquid and solid when they have get heat? (Solid will melt into liquid and liquid will evaporate into gas)
- What kind of substance which do not change as these processes?

1. The students do an activity on a worksheet no.1 (special substances) and summary that some solid can change directly to gas. This process is called **sublimation**. The questions for the teacher used to probe students' understanding are
   - Which do substances sublime?
   - What are the advantages from sublimation process?
2. The teacher presents examples of substance which can sublime such as borneol, naphthalene, deodorizer and camphor ball product.

Conclusion (10 minutes)

The students do a worksheet 1.5 boiling and sublimation process.

Formative assessment

1. Observe students' discussion
2. Observe students' participation in the activities
3. Observe students' science process skills
4. Students' experiment reports
5. Cooperatively group wok

Instructions media materials needed

1. Alcohol burner, wire gauze and lamp stand
2. 250 mL beaker
3. Thermometer
4. Evaporation dish

5. Watch dish
6. Water
7. Borneol, naphthalene, deodorizer and camphor ball product

Examples of students' alternative conceptions

1.Evaporation and boiling are the same processes
2.Water disappears after it boils
3.Water changes its places such as go to the sky
4.Bubbles in boiling water made of heat or air or water or water vapor or oxygen and/or hydrogen
5.Water vapor from boiling water is liquid or gas or hot air or heat or smoke or mist or air

Scientific terms

Boiling, boiling point and sublimation

Note for teacher

1. Teacher's self assessment (findings, problems and suggestions from teaching)

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2.Students' learning assessment

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(.....)

Teacher

Name……Class……group……date……..……

Worksheet 1- Why does the water boil?

Problems: what is boiling? Why does boiling different from evaporation?

Objective: To observe the change of water while it boils

Materials:

1. One 250 mL beaker
2. Alcohol burner, wire gauze and lamp stand
3. One thermometer
4. Water
5. Marker

Caution !!! Be careful boiling water

Methods:

1. Put 100 mL into a 250 mL beaker
2. Use marker to line on the beaker the level of water
3. Measure and record the water temperature on a table below
4. Put the beaker on fire and observe the changes
5. When water boils, measure and record the water temperature again

Table: The changes of water in beaker

Time	Observation results
Begin (Temp ……°C)	 **Water in beaker** There is 100 mL water in beaker is clear liquid
Water boiling (Temp ……°C)	 **Water in beaker** There are bubbles, water vapor in water. The water is going down when the heat is stopped.

Post questions

1. From this activity, what is boiling?

The boiling is process which water changes into gas at 100 degree celsious.

2. What are different between boiling and evaproation?

Water changes into gas both in evaporation and boiling processes. In evaporation, water changes into gas at the surface of water but for boiling, water changes into gas at all parts.

3. What are the bubbles in boiling water made of?

Bubbles made of water vapor which came from water.