Year 9 Science

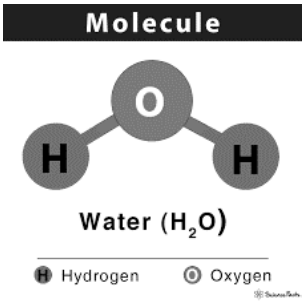
Term 3 Study Notes

	Page (study notes)	Page (MoE text book)	Weeks
God is Creator Part B MOE text book Chapter 2			**2**
Unit 3 – Reactions	**2**	**45**	
God is Wise - Recycling	**6**	**none**	**4**
Agricultural Science	**8**	**none**	**4**

God is Creator Part B

Questions and Answer

Unit 3: Reactions



1. **What is an element?**

An element is a pure substance made up of only one type of a particle or atom. Scientists use symbols to represent elements. Most of the symbols are the first letters of the element's name. These are the symbols shown on the periodic table.

2. **What is an ion?**

When an element reacts during a chemical reaction, it can either lose or gain electrons. When it loses or gains an electron, what results or forms is an ion.

3. **What is a molecule?**

A molecule is made up of two or more atoms of the same kind or of different kinds chemically combined together. For example, we write an oxygen molecule as O2. Hydrogen usually exists as H2 molecules.

4. **What are compounds?**

Compounds are substances which are made of more than one type of atom joined together. A compound may be made by chemically combining two or more elements.

A compound is represented using a chemical formula. For example, glucose (a sugar) is shown as $C_6 H_{12} O_6$. (6 atoms of carbon, 12 atoms of hydrogen, 6 atoms of Oxygen).

5. **What are the properties of acids?**

Most acids are corrosive ('burns' your skin) and react with many materials.

- All acids have a sour taste (e.g. lemons, vinegar). *Do not detect acids by tasting them.*
- Acids contain hydrogen ions (H+) when dissolved in water.
- Acids turn blue litmus paper to a red colour.
- Aqueous solutions of acids are good electrical conductors.
- Acids react with alkalis to form salt and water.
- Dilute acid reacts with metals to produce hydrogen gas.
- Dilute acid reacts with carbonates to produce carbon dioxide gas.

6. **What are the properties of bases, (also called alkalis)**

Concentrated alkalis are corrosive (‘burns’ your skin). They must be handled with care, (example- caustic soda)

• All alkalis have a bitter taste and a soapy feel.

• When heated, alkalis react with ammonia salts to form ammonia gas.

• Alkalis turn red litmus paper to a blue colour

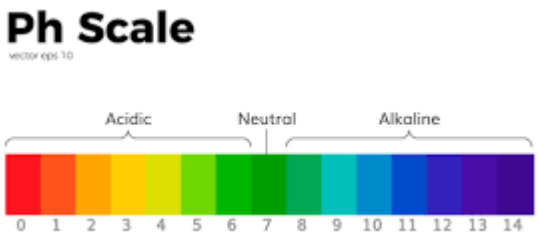
• Alkalis are good electrical conductors.

• Alkalis react with acids to form salt and water only

7. **What is the pH scale?**

The pH scale shows how acidic a substance is. It can be measured using a pH meter which gives a numerical value. The pH scale ranges from 0 (very acidic) through 7 (neutral) to 14 (very alkaline).

pH can be measured using an indicator and comparing the colour with a comparison chart.



Science Experiment: Color-changing Cabbage Chemistry

Materials:

A small red cabbage

Lemon or lime juice

Vinegar

Optional: Other foods to test, such as clear soda pop, baking soda solution, egg whites, tomatoes, cottage cheese

Small white paper cups, drinking glasses, or small white dish (at least 3)

Grater

Strainer

Optional: Large spoon

Boiling pot of water

Large bowls or pots (2)

Bleach cleaning product

Prep Work

Wear goggles or other protective eyewear. Use caution when handling bleach because it can irritate eyes and skin.

Instructions

- Grate a small red cabbage. Put the grated cabbage into a large bowl or pot.
- Boil a pot of water. Use caution when handling the boiling water. Pour the boiling water into the bowl with the cabbage pulp until the water just covers the cabbage.
- Leave the cabbage mixture steeping, stirring occasionally, until the liquid is room temperature. This may take at least half an hour. The liquid should be reddish purple in color.
- Place a strainer over another large bowl or pot and pour the cabbage mixture through the strainer to remove the cabbage pulp. Press down on the pulp in the strainer, such as by using a large spoon, to squeeze more liquid out of the pulp.
- In the bowl, you should now have a clear liquid that will either be purple or blue in color. (It should look darker after the pulp is removed.) This will be your indicator solution.
- Fill a small white paper cup, drinking glass, or small white dish with 1 tablespoon (tbsp.) of your cabbage indicator solution. What is the color of your indicator solution?
- Add drops of lemon or lime juice to the indicator solution until you see the solution change in color. Gently swirl the solution and make sure the color stays the same.

Think about:

What color did the solution become?

The color of the solution will change depending upon how acidic or alkaline it is. This is based on the pH of the solution. pH is a numerical measure of how acidic or basic something is. A solution with a pH between 5 and 7 is neutral, 8 or higher is a base (alkaline), and 4 or lower is an acid. The solution will be the following colors based on its pH: Red indicates pH 2; Purple indicates pH 4; Violet indicates pH 6; Blue indicates pH 8; Blue-green indicates pH 10; Greenish-yellow indicates pH 12. In summary, acidic solutions should be red or purple in color, neutral solutions should be violet, and basic solutions should be blue, blue-green, or greenish-yellow in color.

Based on its color, what is the pH of the lemon or lime juice solution?

In another small white paper cup, add 1 tbsp. of your original cabbage indicator solution. Add drops of vinegar until you see the solution change color.

Think about:

What color did the vinegar solution become? What is the pH of the solution? Is it an acid or a base?

In a third small white paper cup, add 1 tbsp. of your original cabbage indicator solution. Handling it with caution, add drops of the bleach cleaning product until you see the solution change color.

Think about:

What color did the bleach solution become, and what does this indicate about its pH? Is it an acid or a base?

If you want to test the pH of other foods, again add 1 tbsp. of your original cabbage indicator solution to a small white paper cup and add drops of the food until you see the solution change color. If the food is not in liquid form, crush it or dissolve it in a small amount of water before adding

it to the indicator solution. What color did the solution become, and what does this indicate about its pH, and whether it is an acid or a base?

Cleanup

Dilute the bleach solution with water before pouring it down a drain.

What Happened?

A solution with a pH between 5 and 7 is neutral, 8 or higher is a base, and 4 or lower is an acid. Lime juice, lemon juice, and vinegar are acids, and so they should have turned the indicator solution a red or purple color. Bleach is a strong base and so it should have turned the indicator solution a greenish-yellow color.

Digging Deeper

Acids are solutions that lose hydrogen ions, "donating" them to the solution, and usually taste sour. Some very common household solutions are acids, such as citrus fruit juices and household vinegar. Bases are solutions that pull hydrogen ions out of solution and onto itself, "accepting" them, and usually feel slippery. Bases have many practical uses. For example, antacids like TUMS are used to reduce the acidity in your stomach. Other bases make useful household cleaning products.

To tell if something is an acid or a base, a chemical called an indicator is used. An indicator changes color when it encounters an acid or base. There are many different types of indicators, some that are liquids and others that are concentrated on little strips of "litmus" paper. Indicators can be extracted from many different sources, including the pigment of many plants. For example, red cabbages contain an indicator pigment molecule called flavin, which is a type of molecule called an anthocyanin. Very acidic solutions will turn a red color, while neutral solutions will make it purplish, and basic solutions will turn it greenish-yellow.

Test

1. What is an element?
2. What is an ion?
3. What is a molecule?
4. What are compounds?
5. What are the properties of acids?
6. What are the properties of bases, (also called alkalis)
7. Give an example of a) an acid, b) a base
8. What is the pH scale?

God is Wise – Recycling and Waste Management

Introduction

God's original creation was perfect and unpolluted. With the fall of man, sin entered the world, and so did imperfection. Instead of caring for the creation, man started exploiting it.

God has provided for us richly through the creation. These resources need to be used wisely. Conservation of soil, water, plants and animals requires wisdom and foresight. Many species of plants and animals are currently endangered because of people's greed and carelessness. People have polluted and destroyed many of the Earth's ecosystems. Although the creation in this present world can never be perfect, there are steps we can take to conserve it.

Activities for Teaching About Recycling

1.) Make 6 headings and list the types of things that can be recycled under each heading: plastic; paper/cardboard; aluminium & steel cans; glass; clothes; old furniture
2.) Make a list of things that cannot be recycled, e.g. batteries, paint, polystyrene
3.) How can your family cut down on waste packaging?
4.) Many people today are buying new clothes at such a rate, that there are too many clothes to be sold as second hand, and many clothes go into land fill. How can we stop this happening?
5.) Recyclable Inventions. Each student can bring along 4 recyclables and/or 4 nonrecyclables. They create an invention for them. Students have to come up with a useful way to use their "trash."
6.) Create a Packaging Hall of Shame. Look for products with excessive packaging. Gather and bring to school. Set up a display and brainstorm ways to reduce waste. Then discuss ways to reuse some of the excess packagings. For writing practice, students can write letters to the manufacturers with suggestions on how they can reduce some of this waste.
7.) Make Recycled Paper. Students can work in small groups. Each group has one page of a newspaper. Students tear that page up into small pieces. They place those small pieces into a metal pan with water and soak for 10 minutes. The water should cover the paper. Next, mix 1/4 cup of water with 1/8 cup of corn starch (per piece of newspaper) until the corn starch dissolves. In a blender, place the torn-up paper and the cornstarch mixture and run on high for 2 minutes. When finished, pour the mixture on to a screen that is over the aluminum pan. Spread the mixture evenly so it is thin and flat. Cover it with wax paper and roll it out flat to squeeze out any extra water. Remove the wax paper, if desired, and let it dry completely for a few days. You've just made recycled paper.

8.) Guess how long these things take to break down.

    banana

    paper bag

    cotton rag

wool sock

cigarette butt

leather boot

rubber sole of the boot

tin can (soup or vegetable can)

aluminum can (soda pop can)

plastic 6-pack rings

plastic jug

Styrofoam cup

glass bottle

(Conditions could result in some items degrading more or less quickly than the list indicates, e.g. heat rain).

Here are the scientists' approximations listed below:

banana -- 3 to 4 weeks

paper bag -- 1 month

cotton rag -- 5 months

wool sock -- 1 year

cigarette butt -- 2 to 5 years

leather boot -- 40 to 50 years

rubber sole (of the boot) -- 50 to 80 years

tin can (soup or vegetable can) -- 80 to 100 years

aluminum can (drink can) -- 200 to 500 years

plastic 6-pack rings -- 450 years

plastic jug -- 1 million years

Styrofoam cup -- unknown? forever?

glass bottle -- unknown? forever?

NOTE: The data above was gathered from sources such as the Oregon Department of Environmental Quality.

9.) Create a recycling plan for Fiji, so that fewer of the above products go into land fill. Think about ways to improve rubbish collection; Think about ways to educate the public on

choosing products with less packaging; Think about ways to cut down on single-use plastic bags

10.) What are some of the consequences of waste products entering our waterways and the sea? What will happen when there is no more space for waste going into land fill?

God is a Servant – 4 weeks

Serving through occupations: Agricultural Science

God serves us through the creation. He has provided food, clothing, shelter and protection through families. Farmers use the Creation to serve us, in the production of food and other products we need to survive.

Over the next 4 weeks, the class will grow a vegetable garden with the assistance of an experienced grower.

Each student will keep a diary.

Enter details of how you set up your garden, how you have prepared the soil, what you are planting, how often you are watering, amount of sun, added fertilizer if any, rate of growth of plants, any setbacks.

Final report:

How successful was your effort?

What would you have done differently next time?