***GRADE 9 NATURAL SCIENCES***

ASSESSMENTS: TERM 3

Please prepare using the worksheets below.

One task for 40 marks based on Term 2 work (pg. 29 -42)

This task will take place next week on:

**THURSDAY – 10/09/20 for 9B, 9J**

**FRIDAY – 11/09/20 for 9A, 9C, 9L, 9M**

**TOPIC: Chemical reaction**

**Question**

What is a balanced chemical reaction?

**Answer**

*An equation in which there is exactly the same number of atoms on the reactant side (or left hand side) as the product side (or right-hand side).*

**BALANCING EQUATIONS**

1. When you write a chemical equation it must be balanced.

2. In a balanced equation the total number and type of atoms in the reactants are the

same as in the products.

3. You cannot change the composition of a molecule or atom in order to balance a

chemical equation, but you can change the number of molecules or atoms.

4. When balancing an equation, do not change the small numbers. Only change the big

numbers. By doing this, you change the number of molecules.

5. By changing the number of molecules or atoms, you are able to conserve or keep the matter in the chemical reaction

**Example**

**AN UNBALANCED EQUATION**

Fe + O2→ Fe2O3 (brown rusty coating)

**A BALANCED EQUATION**

4Fe + 3O2 → 2Fe2O3

Explanation:

a. The first equation is unbalanced because there is not the same number of Fe atoms on

the reactant side and product side; and O atoms on the reactant side and product side

of the reaction arrow.

b. In the first equation, there is one Fe atom on the reactant side and two Fe atoms on the

product side.

c. In the first equation, there are two O atoms on the reactant side and three O atoms on

the product side.

d. The second equation is balanced because there are the same number of Fe atoms on

the reactant side as on the product side. The same number of O atoms appears on the

reactant side as on the product side of the reaction arrow.

e. In the second equation, there are four Fe atoms on the reactant side and four Fe atoms

on the product side of the reaction arrow.

f. In the second equation, there are six O atoms on the reactant side and six Fe atoms on

the product side of the reaction arrow.

**Question**

a. How do you balance a chemical equation?

b. Is this statement true or false? *In a balanced equation, the number of atoms on the lefthand side of the reaction arrow should be the same as the number of molecules on the*

*right-hand side of the arrow.*

**Answers:**

*a. A chemical equation is balanced by changing the big numbers in front of the formula so*

*that there is the same number and type of atoms on both sides of the reaction arrow.*

*b. False*

**TOPIC: REACTION OF METALS WITH OXYGEN**

1. A metal is a material that conducts electricity, and which is malleable and shiny.

2. Oxygen is colourless and odourless.

3. About 21% of the atmosphere consists of oxygen.

4. Some metals react with oxygen during burning (combustion).

5. Combustion produces heat and light.

6. When a substance reacts with oxygen, the reaction is called oxidation.

7. When a metal is oxidised, a new compound called an oxide is formed.

**THE GENERAL EQUATION FOR OXIDATION**

metal + oxygen → metal oxide

Explanation:

a. Oxygen is a non-metal – get learners to find the element oxygen

on the Periodic Table and to provide information about it.

*Answer: It is element number 8 and is a non-metal.*

b. Oxygen is a gas at room temperature.

c. About 21% of the **atmosphere** consists of oxygen, so there is oxygen in the air we

breathe.

d. Some metals, for example, iron, react with oxygen during burning.

e. Another word for the process of burning is combustion.

f. Combustion is usually a rapid reaction that produces heat and light.

3. Use the flashcards (Resource 8 and 9) as you discuss the general reaction of metals with

oxygen.

a. When a substance reacts with oxygen, the reaction is called **oxidation**.

b. When a metal is burned in air, the metal reacts with the oxygen in the air and a **metal**

**oxide** is formed.

c. Not all metals react with the oxygen in air to form metal oxides, because some metals

are unreactive.

d. Some metals burn in the presence of oxygen. This process is called combustion.

**TABLE TO SHOW REACTANTS AND PRODUCTS IN THE OXIDATION PROCESS**

|  |  |
| --- | --- |
| **Reactants** | **Metal oxide formed** |
| Sodium and oxygen | Sodium oxide |
| Potassium and oxygen | Potassium oxide |
| Calcium and oxygen | Calcium oxide |
| Zinc and oxygen | Zinc oxide |
| Copper and oxygen | Copper oxide |
| Sodium and oxygen | Sodium oxide |

Example:

**REACTION OF IRON WITH OXYGEN**

1. Iron is a metal.

2. Combustion occurs when iron burns in the presence of oxygen.

3. Oxygen is present in the air.

4. When the metal iron is burned in air (which contains oxygen), the reaction forms iron

oxide as a product.

5. Iron oxide is a reddish-brown powder.

**WORD EQUATION FOR REACTION OF IRON WITH OXYGEN**

iron + oxygen → iron oxide

**THE FORMATION OF RUST**

**1. Rusting** is a slow chemical reaction of iron metal with oxygen and water.

2. A complex compound is formed as a result of the reaction.

3. Part of the compound formed is iron oxide (Fe2O3).

4. Rust is a form of **corrosion**.

5. We can prevent the formation of rust by painting or **electroplating** a product which

contains iron.

6. Electroplating is the process of coating a metal object with a thin layer of another metal

by means of **electrolysis**.

7. Electrolysis is the process of dipping an iron or steel object in a zinc-based or

chromium-based solution through which an electric current is passed.

**WORD EQUATION FOR REACTION OF MAGNESIUM WITH OXYGEN**

iron + oxygen → iron oxide

**TOPIC: REACTION OF NON-METALS WITH OXYGEN**

1. A non-metal is an element that does not have the properties of a metal.

2. Oxygen forms a diatomic molecule (O2).

3. When non-metals react with oxygen the product is a non-metal oxide.

4. The reactants when a non-metal reacts with oxygen are the non-metal and oxygen.

5. Some non-metals combust (burn) more easily than others in the presence of oxygen.

6. When a substance reacts with oxygen, the reaction is called oxidation.

**THE GENERAL EQUATION FOR THE REACTION OF A NON-METAL WITH OXYGEN**

non-metal + oxygen **→** non-metal oxide

**TOPIC: Acid, bases and pH value**

ACIDS, BASES AND pH VALUE

1. An acid is a substance with a pH between 0 and 7.

2. A base is a substance with a pH between 7 and 14.

3. pH is a measure of how acidic or basic a substance is.

4. pH is a number between 0 and 14.

5. Acids taste sour and feel rough.

6. Bases taste bitter and feel slippery.

7. Some acids and some bases are dangerous.

**Explanation:**

**a. Acids** and **bases** are all around us – we use them every day.

b. Both acids and bases can be strong or weak.

c. Strong acids have a low **pH** value – close to 1.

d. Strong acids are dangerous to taste or feel and can cause serious burns.

e. Strong acids are **corrosive** – they can eat away metals and other strong materials.

f. Acids can be useful – the acid in our stomach helps us to digest our food.

g. Some fruit and fruit drinks are acidic.

h. Strong bases have a high pH value – close to 14.

i. A base that can dissolve in water is called an **alkali**.

j. Strong bases are dangerous to taste or feel and can cause serious burns.

k. A **neutral** substance has a pH of 7.

**USE OF INDICATORS TO FIND pH VALUE**

1. An indicator is a dye that turns a different colour in acids, bases or neutral substances.

2. We use indicators to tell us whether a substance is an acid, base or neutral.

3. We can use red cabbage water as a pH indicator.

4. Red cabbage water is reddish-pink in acid, purple in a neutral substance and bluish green

in a base.

5. The independent variable is the one thing that the experimenter changes in an

experiment.

6. The dependent variable is the quantity or quality that is measured or observed in an

experiment. pH is an example of a dependent variable.

**A UNIVERSAL INDICATOR**

1. A **universal indicator** is a pH indicator made up of different substances so that it

produces colour changes across the whole pH range.

2. A universal indicator produces the following colour changes:

strong acid – red

neutral – green

strong base – purple.

**Explanation:**

a. We use an indicator to indicate (show) whether a substance is an acid, base or neutral

substance.

b. Indicators made from red cabbage leaves or red onions are not as accurate as

chemical indicators such as universal indicator.

c. A universal indicator is a pH indicator made up of different substances so that it

produces colour changes across the whole pH range.

d. A universal indicator is available in liquid or paper form. The paper form can only be

used if the substance is in liquid form.

e. A universal indicator has a colour chart that shows the full pH range from 1 – 14.

f. Acids change the colour towards the yellow, orange and red side of the colour scale.

g. Bases change the colour towards the blue and purple side of the colour scale.

h. Neutral substances change the colour of universal indicator to green.

3. Advance preparation: Prepare 10 test tubes. Each test tube should be about ¾ full. Place

one liquid in each test tube and make a small label stating what liquid is in each test tube.

4. Use the following 10 liquids: black Ceylon tea, rooibos tea without milk, milk, black coffee,

fruit juice, fizzy drink, lemon juice, vinegar, tartaric acid, liquid soap, solution of bicarbonate

of soda and water.

**REACTION OF AN ACID WITH A METAL OXIDE**

**THE NEUTRALISATION REACTION**

1. A **metal oxide** is a compound formed when a metal reacts with oxygen.

2. When metal oxide reacts with an acid, the products that form are a salt and water.

3. A salt is a compound made up of a metal and a non-metal.

4. The general equation is:

acid + metal oxide **→** salt + water

**Explanation**

a. When a metal oxide reacts with an acid, the reactants are the metal oxide and the

metal.

b. A metal oxide is a compound formed when a metal reacts with oxygen.

c. When a metal oxide reacts with an acid, the products are a salt and water.

d. A salt is a compound made up of a metal and a non-metal.

e. The type of salt formed will depend on the specific acid and metal oxide used in the

reaction.

f. The general equation for the reaction of a metal oxide with an acid is:

acid + metal oxide **→** salt + water.

g. Magnesium oxide (MgO) is an example of a salt. It is formed after the reaction of

magnesium and oxygen.

h. In a balanced equation, the number and type of atoms on each side of the reaction

arrow must be the same.

**ACID RAIN**

1. Acid rain is a weak acid that sometimes forms in the atmosphere.

2. Acid rain is formed when non-metals such as carbon and sulfur react with oxygen to

form sulfur dioxide and carbon dioxide, which dissolve in rain water.

3. Formula for formation of sulfurous acid:

SO2 + H2O → H2SO3

4. Formula for formation of carbonic acid:

CO2 + H2O → H2CO3

5. Acid rain can corrode buildings, structures such as bridges, historical landmarks and

statues.

6. Acid rain changes the pH of the soil – this affects agriculture and forestry.

7. Acid rain causes rivers and ground water to become acidic.

8. Acid rain threatens the habitat of some species.

**TOPIC:REACTION OF AN ACID WITH A METAL CARBONATE**

**THE NEUTRALISATION REACTION**

1. A **metal carbonate** is a compound consisting of a metal and a carbonate.

2. CaCO3 is an example of a metal carbonate.

3. A **carbonate ion** is formed when a carbon atom and three oxygen atoms bond together.

4. An alkali is a base that can dissolve in water.

5. Metal carbonates are bases (they have a pH greater than 7).

6. The products of an acid-metal carbonate reaction are salt, water and carbon dioxide.

7. The reactants in an acid-metal carbonate reaction are a metal carbonate and an acid.

8. The word equation for the general reaction of an acid with a metal carbonate is:

9. metal carbonate + acid **→** salt + water + carbon dioxide

**Explanation**

a. A metal carbonate is a compound consisting of a metal and a carbonate.

b. CaCO3 is an example of a metal carbonate. Calcium is the metal and CO3

c. is the carbonate.

d. A carbonate ion is formed when a carbon atom and three oxygen atoms bond together.

e. Metal carbonates are bases (they have a pH greater than 7).

f. The word equation for the general reaction of an acid with a metal carbonate is:

g. metal carbonate + acid **→** salt + water + carbon dioxide

h. The metal carbonate and the acid are the reactants.

i. The salt, water and carbon dioxide are the products of an acid-metal carbonate

reaction.

\*\*\*Learners use this information together with your study guide to prepare.\*\*\*