CHAPTER II
LITERATURE

2. 1 Subjects

One task of educators is to provide a fun learning environment. Educators must find ways to make the learning becomes fun and ignore threats during the learning process. One way to make learning becomes fun is to use materials that fun anyway, namely the teaching materials that can make learners feel interested and excited to learn the instructional materials.

2.2 Forms - Form of Subjects

According Prastowo (2013) in terms of shape, materials can be divided into four types, namely: teaching materials printing *(printing)*, teaching materials hear *(audio)*, teaching materials point of view heard *(audio-visual)*, teaching materials interactive *(interactive teaching material)*.

2.3 Development of Instructional Materials

There are a number of reasons why teachers need to develop teaching materials, namely:

1. Characteristics Target

Teaching developed materials that other people are often not suitable for our students. There are a number of reasons why, for example, social, geographical, cultural, etc. To that end, the self-developed teaching materials can be tailored to the characteristics of the target. In addition to the social, cultural, and geographical characteristics of the target also includes the stages of development of students, who have mastered the initial capabilities, interests, family background, etc. To that end, the self-developed teaching materials that can be tailored to the characteristics of students as the target.

2. Availability of Materials According Demands Curriculum

Development of teaching materials must consider the demands of the curriculum, learning materials means that we will have to develop in accordance with the curriculum. At the educational level curriculum, standards of competency

set by the government, but how to achieve it and what teaching materials to use is left entirely to educators as professionals. In this case, teachers are required to have the ability to develop their own teaching materials. To support the curriculum, a teaching material may occupy a position as principal or supplementary teaching materials. Is a principal teaching materials teaching materials that meet the demands of the curriculum. Meanwhile, supplementary teaching materials are materials that are meant to enrich, add or deepen the content of the curriculum.

3. Demands Troubleshooting Learning

Development of teaching materials should be able to answer or solve problems or learning difficulties. There are a number of students' learning material that is often difficult to understand or teachers is difficult to explain. Difficulties can occur because the material is abstract, complicated, foreign, and so on. To overcome this difficulty by developing an appropriate instructional materials. If the learning material to be delivered is abstract, the materials should be able to help students describe something abstract, for example with the use of drawings, photographs, charts, schematics, etc. Similarly, a complex matter must be explained in a simple manner, according to the students' level of thinking, so that it becomes easier to understand.

2.4 Laboratory Practical Activities

Laboratories often defined as a room or place to do experiments or research. Space can be a building is bounded by walls and a roof, or outdoors for example the botanical garden. In learning science, where lab becomes very important. In the context of science teaching and learning processes in schools often term is defined in the narrow sense lab is a room in which there are a number of tools and lab materials (Maharani, 2013).

A laboratory activity is a very important activity in the learning activities of Natural Sciences (IPA), particularly Chemistry. Natural Science is a field that examines the empirical facts that exist in nature, so as to learn to go through the assessment in the laboratory that is designed as a miniature universe. In addition

to laboratory activities are a means to develop and apply the science process skills, arouse interest in learning and provide evidence for the theory or concepts students have learned so theories or concepts are becoming more significant in the cognitive structure. (Nugraha and ahcmad, 2013)

Generally, the activities that take place in the laboratory is often called the lab that conducted the student after getting a concept or theory taught by teachers in the classroom. A laboratory activity is an appropriate means to develop process skills and increase student interest to science more meaningful for students. Laboratory activities which in this case is known as the lab is a very important component and parcel of the teaching of science in general and chemistry in particular is known as a science experiment (Nugraha, 2005).

This lab activity is one method of learning refers to learning by constructivism. Learning by using practical methods provides an opportunity for students to conduct experiments, both individuals or in groups, to understand chemistry concepts. Practical methods serve as one of the main factors of learning activities in finding a particular principle or explain the principles developed. From the practical activities of interest, will provide the opportunities for students to understand and at the same time students are involved in the process of constructing knowledge through deeds done (Arifin, 2010).

Besides practical activities to improve student competence in using a variety of data sources to satisfy their curiosity about a phenomenon that occurs, the data are systematically recorded and included the results (Jahro, 2009).

2.4.1 The Role of Laboratory in Learning

In learning science, laboratory acts as a point of support activities from classroom activities. It might even reverse that played a major role in the learning of science is a laboratory, while the class as a supporting activity. Another function of the laboratory is as a display or exhibition. For example, we can see that a number of animal or plant specimens were deliberately shown for learning. Sometimes in the laboratory also collected a number of species of rare or even

extinct, both the microscopic and the macroscopic. In this case the laboratory was also able to act as a small museum. (Anwar, 2014).

2.4.2 Factors Inhibiting Laboratory Management

Based on the monitoring results of Secondary Education Directorate General and the Inspector General (2003), the Chemical Laboratory of the utilization and management as a learning resource that is not optimal or not used due to various factors, namely;

1. Ability and mastery of teachers to the equipment and material utilization is still inadequate practice
2. Less adequate in quality and quantity of laboratory personnel. Many of laboratory equipment and materials that have been damaged are not held back
3. Insufficient / limited tools and materials resulting in not every student had the opportunity to learn to conduct experiments (Anwar, 2014).

2.5 Practical Guidance

Decree of the Minister of National Education No : 36/D/O/2001 explain the meaning of practical guidance is the guidance of practical implementation which contains procedures for preparation, implementation, data analysis and reporting. In the learning method requires a user lab practicum. The practical instructions intended to guide students in doing practical work and help teachers to achieve the learning objectives. Practical instructions compiled and written by a group of faculty who handle the lab and follow the rules of scientific writing (Maharani, 2013).

One of the facilities is a vital lab practicum guides. "Guidance lab practicum is a facility that has been used since a long time". Guidance lab is intended to help and guide the students to be able to work continuously and directed. Guidance lab is used as a guide to the stages of practical work for both students and teachers themselves (Umah, at al., 2014).

The rapid development of Natural Sciences (IPA) at this time, not in spite of the approach and scientific methods that have been used. One way to provide an understanding of chemical materials to students with the scientific method is through practicum. According to Indonesian dictionary, the lab is part of the teaching aims to enable students get the opportunity to test and implement in real situations subject matter that has been obtained in theory. Practical implementation of learning has several advantages, including:

1. Students can describe the concrete circumstances of an event
2. students can develop the skills of inquiry
3. Students can develop a scientific attitude
4. Helping teachers to achieve the learning objectives more effectively and efficiently (Maharani, 2013).

Practical activities can be divided into several types. Maharani (2013) describes the practical activities in terms of implementation methods can be grouped into two. Types of practical activities are as follows.

1. Demonstration is the process of showing something either the process or activity to another person or another group. In the method of demonstration, practicum conducted in front of the class by the teacher or group of students. Other students just pay attention and not directly involved with the activity.
2. Trial or experiment is the process of solving the problem through variable manipulation and observation or measurement. In the trial process activities are performed by all students depend on the type of experiments and laboratory equipment available at the school.

2.5.1 Components of Practicum Guidelines

Arifin (2010) mentions components that must be present in the lab instructions are as follows.

1. Title practicum, should be brief and can describe in general the practicum conducted. Title practicum in question, which is the name or

identity given to each type of lab work. The title can be customized with lab materials and refrain from using the name and legal tools are used.

2. Laboratory objectives, describe what will be done, tested, proven, or what will be learned during the lab activities take place.
3. Basic theory, is a matter relating to the practical activities and serve as reference in practical activities. The material is expected to be useful for the practitioner at the time of preparing the report practicum. Basic theory is presented explicitly and succinctly written, clear, comprehensible, interesting and challenging, serves to provide the insight think that is estimated facilitate practical in doing practical work and achieve the purpose of the lab.
4. Tools and materials, this component contains a list of tools and materials needed to do the practicum. When required to use a diagram that shows what and how the tools and the materials used.
5. How to work or practical instructions, are steps that must be done in a lab. How can work be descriptions or points.
6. Questions contained in a manual lab will test the ability of the practitioner after the practicum, so it can determine understanding lab toward the material.

Good practical instructions in addition to having the components as described above must have the safety aspects of carrying out practical work. Safety aspects of practical instructions may include written warnings, or symbols included. Hint selected high school chemistry lab manual for class XI publisher developed differences. The difference is not added to the aspect of salvation, yet there is the introduction of a tool, not always supplied the material and not drafted by a group of faculty who handle practicum.

2.5.2 Stages of Practical activities

Learning activities with the experimental approach or trying carried out in three phases, namely, preparation, implementation and follow-up. The third stage of practicum or tried in question are described below:

A. Preparation

1. Setting goals experiments
2. Prepare tools and materials
3. Preparing an experimental area in accordance with the number of students as well as tools or materials available. Teachers need to consider whether the student will carry out experiments, trying simultaneously or divided into several group in parallel or turns.
4. Health and safety issues to consider in order to minimize or avoid potential risks.
5. Provide an explanation of what to watch and stages a student must do, including things that are forbidden or dangerous.

B. implementation

1. During the process of the experiment or try, teachers participated guide and observe the trial process. Here the teacher must provide encouragement and assistance to the difficulties faced by the students to activities that work well.
2. Teachers should pay attention to the overall situation, including helping to overcome and solve the problems that will hinder the learning activities.

C. follow-up

1. Students collect experiment report results to the teacher.
2. Teachers check students' experimental results.
3. Teachers provide feedback to students on the experimental results.
4. Students are mentored teachers to discuss problems encountered during the experiment.
5. Students facilitated teacher checks and keep the back of materials and tools used (Maharani, 2013).

2.5.3 Importance of Practical Science

The importance of practical activities in science learning cannot be denied, because through science process skills practicum students can developed.

Appropriate support students' understanding of concepts learned, activities practicum is a means to familiarize students on the real problems in the world work so as to produce students who are ready to field work that will be willing (Kusnadi, at al., (2005).

There are four reasons for the importance of the practicum.

a. Practical generate motivation to learn.

   Through laboratory activities, students are given the opportunity to instruct her impulse of curiosity and want to be. This principle will who practicum where students discover knowledge through the exploration of nature.

b. Practicum developed basic skills to experiment.

   By practicum students are trained to develop basic skills to experiment with train their ability to observe carefully, measure accurately measuring devices are simple or more sophisticated, use and handle tools safely, designing, performing and interpreting experiments.

c. Practical became a vehicle to learn the scientific approach.

   In the practicum, a student are required to formulate the problem, designing experiments, assembling tools, measurement carefully, interpret the data acquisition, as well as communicates through reports to be made.

d. Practical support the subject matter (Anwar, 2014).

2.6 Standard Guidance Practicum Based BSNP

According BSNP (National Education Standards Agency) set out some criteria for the quality of textbooks Indonesian who meet eligibility requirements, which includes four components:

A. Feasibility contents

Feasibility contents in assessing the quality criteria of writing Indonesian language text include several components:

A. Compliance with the material of core competencies (CC) and the Basic Competency (BC)

CC and BC is a measure of guidance in learning and the achievement of learning objectives. Description of the material in the book implicitly contains materials that support the achievement of a minimum of CC and BC complete with the following conditions:

- $40 \leq SC \leq 60$, in the category of a very good
- $21 \leq SC \leq 40$, into either category
- $SC \leq 20$, enter into the category quite well
- And if it does not comply with the above in the category of poor.

CC and BC is not written explicitly (explicit) in the textbook, but written implicitly.

1. Conformity curriculum materials with

   Guidance labs qualify the eligibility criteria based BSNP must be in accordance with the applicable curriculum (Curriculum K13). The curriculum is an attempt to convey the principles and characteristics that are important from an educational plan in a form such that it can be carried out by teachers in schools.
2. Accuracy of the material
3. Regency of the material
4. Encouraging curiosity
5. Substance scientific and *life skill*
6. Enrichment
7. Diversity value

Feasibility content is also seen from the diversity of values and norms prevailing in society. Good laboratory Guidance does not provide descriptions that lead to processing prevailing values.

B. Feasibility Language

1. Straightforward

   The language used should be straightforward (whatever they are), not complicated, just include the translation of basic materials, it is important, and what's necessary. For example, with regard to:

   a. The accuracy of sentence structure

b. Sentence Effectiveness

c. Rigidity of the term

2. Communicative

Guidance practicums that meet eligibility is that using communicative language, so it is easy to understand and be understood by students. Messages or information submitted with interesting and unusual language in daily communication.

3. Dialogic and interactive

Guidance good practical use language to motivate students, the language used evoke a sense of fun when the students read them and encourage them to study the book in complete. In addition that text books should also encourage students to think critically, the language that is used to stimulate learners to question something further, and look for the answer independently from textbooks or other sources of information.

4. Compliance with the development of learners

Guidance practicum must be compliance with the level of intellectual development of students, language used in explaining a concept must be in accordance with the level of cognitive development of learners. Compliance with the level of emotional development of learners is also a matter of concern.

5. Compliance with the rules of Indonesian

In writing practical guide shall observe the rules of Indonesian well and correctly, in accordance with the guidelines spelling enhanced, and KBBI.

6. The use of terms, symbols, and icons

In guiding practical use of the term and the depiction of symbol or an icon depicting a concept must be consistent between the parts in the lab guide.

C. Feasibility Presentation

1. Presentation Technique

Technical presentation is an important determinant of a quality lab module. Presentation techniques include:

a. Consistency systematics of grain in chapter

Consistency systematic presentation within each chapter, which should have an introduction, contents and cover.

b. Composing concept

Composing concept in the presentation of lab work related to the presentation of the concept presented in cascading ranging from easy to difficult, from the concrete to the abstract and from simple to complex, from the known to the unknown. Material previous section could help understanding of the material in the next section

2. Supporting presentation

Supporting presentation, include:

a. Generating motivation in learning
b. Examples of questions in each chapter
c. Words new key at the beginning of each chapter
d. Problem exercises at the end of each chapter
e. Introduction
f. Glossary
g. Index List (subjects)
h. bibliography
i. Appendix

3. Learning Presentation

Presentation in guiding practical should be interactive and participatory is no section that invites readers to participate. Presentation of methods and approaches related to the presentation that is usually directed to a method of inquiry / experimentation, and at the end of each chapter contains a minimum of material / exercises that can be practiced by learners.

4. Coherence and the demands of the thought line

Coherence and the demands of the thought line associated with the delivery of messages between the section with the other sections, the section

with a section or between linear, in an adjacent section reflect the demands and linkages.

D. The writing procedure

1. size book format

Of use of the format that is standardized, usually use book format with fonts between 12-14 to Times New Roman, or comparable with it for the font type, except the title of the custom-tailored

2. Design of the leather

Design of the skin should be attractive, simple and illustrations. Neither of the selection of fonts, colors, and illustrations. It is also a determining factor guiding good quality.

3. The design of the contents of

The content design should be easy to read and support material. It is seen from the font, font size, font color, illustrations, and illustrations.

4. The quality of paper

The paper quality must be strong and qualified. For example, using paper Power Mac G4.

5. Print quality

Is good printing quality print quality that is clean, clear and contrast. Either white, black, and other colors.

6. The quality binding

Of the binding quality of the should use a good quality and strong binding, that are not easily damaged (bent or torn).

2.7 Material Acids and Bases

THEORY ACIDS AND BASES

An acid in chemistry is a chemical compound that when dissolved in water to produce a solution with a pH less than 7. In the modern definition, an acid is a substance that can give a proton ($H^{+)}$ to another substance (called bases), or can receive a free electron pair of a base. Or acid is a substance (compound)

that causes a sour taste in a variety of materials. Examples of acid: lime, lemon, and tomato.

Traits - traits: - It was sour
- May produce corrosive
- Change the blue litmus paper to red
- pH < 7
- Generate ion H^+

Type acid solution: - Strong acids - Weak acid

Base is a chemical compound that absorbs hydronium ions when dissolved in water. Bases have a pH greater than 7. Or bases are substances (compounds) which can react with the acid, produces compounds called salts. Examples of bases: soap, laundry soap, shampoo, toothpaste, fertilizer, medicine mag.

Traits - traits: - It was bitter
- feels smooth on the skin
- Change red litmus paper turns blue
- Generate OH^- in water

Alkaline solution type: - Strong bases - A weak base

ARRHENIUS THEORY ACID ALKALI

This theory first put forward in 1884 by Svante August Arrhenius. According to the Arrhenius definition of acids and bases, namely:

- Acid is a compound which, when dissolved in water releasing H^+ ions.
- Bases are compounds that when dissolved in water releasing OH^- ions.

Gas hydrochloric acid (HCl) which is highly soluble in water Arrhenius acid classified as HCl can be decomposed into H^+ and Cl^- in the water. Unlike the case with methane (CH_4)are not Arrhenius acid because it cannot produce H^+ ions in the water even though it has an atomic H. Sodium hydroxide (NaOH) including Arrhenius bases as NaOH are ionic compounds that dissociate into ions Na^+ and

OH^- when dissolved in water. Arrhenius concept of acids and bases is limited to water as a solvent condition.

BRØNSTED-LOWRY ACID-BASE THEORY

In 1923, Johannes N. Brønsted and Thomas M. Lowry separately proposed a definition of acids and bases wider. The proposed concept is based on the fact that the acid-base reaction involves the transfer of protons $(Hions)^+$from one substance to another substance. This proton transfer process always involves acid as a giver / proton donors and bases as a receiver / proton acceptor. Thus, according to the definition of Brønsted-Lowry acid-base,

- An acid is a proton donor.
- Base is a proton acceptor.

If viewed with the Brønsted-Lowry theory, the ionization reaction HCl when dissolved in water, serves as the acid HCl and H_2O as a base.

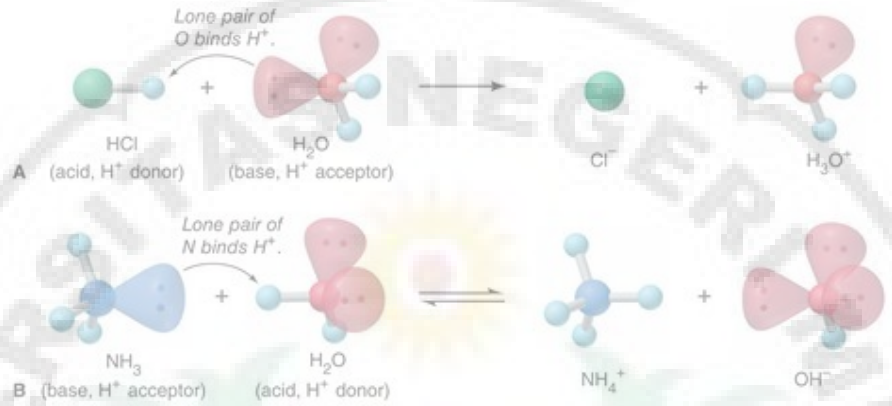
$$HCl\ (aq) + H_2O\ (l) \rightarrow Cl^-(aq) + H_3O^+(aq)$$

HCl transformed into ions Cl^- after giving a proton $(H^{+})$to H_2O. H_2O accepts a proton by using a pair of free electrons in an atom O to bind H^+ to form hydronium ions (H_3O^+).

While the ionization reaction of NH_3 when dissolved in water, NH_3 acts as a base and H_2O as the acid.

$$NH_3(aq) + H_2O\ (l) \rightleftharpoons NH_4^+(\ aq\ ) + OH^-(aq)$$

$_{NH3}$ accept a proton (H^+) of H_2O by using a pair of free electrons in the atom N to bind H^+ thus forming ammonium ion (NH_4^{+}).H_2O turn into ions OH^- after giving a proton (H^+)to the NH_3



Of the two examples can be seen that (1) Brønsted-Lowry acid must have hydrogen atoms which can be detached as H ions;$^{+}$ and (2) Brønsted-Lowry bases must have a free electron pair that can bind H ions $^{+}$. Over by Brønsted-Lowry definition than the definition by Arrhenius was able to explain the reaction of acid-base reactions in the gas phase, solid, liquid, a solution with solvents other than water, or a heterogeneous mixture. For example, the reaction between the gases NH_3 (base) and HCl gas (acid) form of smoke NH_4Cl.

$$NH_3(g) + HCl\ (g) \rightarrow NH_4Cl\ (s)$$

Some substances can act as an acid, but also as a base in another reaction, for example, H_2O, HCO_3^- and $H_2PO_4^-$.Thus a substance called amfiprotik. Amfiprotik a substance (eg, H_2O) will act as an acid when reacted with a more alkaline substances thereof (eg, NH_3) and act as a base when reacted with a more acidic substances thereof (eg, HCl).

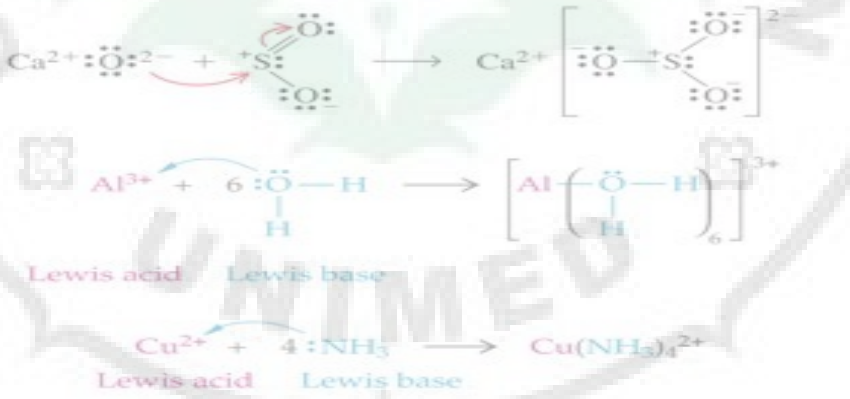
ACID BASE THEORY LEWIS

In 1923, GN Lewis acid-base theory suggests a broader than the two previous theories by emphasizing the electron pair concerning the structure and bonding. According to the Lewis acid-base definition,

- An acid is an electron pair acceptor.
- Bases are electron-pair donor.

Based on the definition of Lewis acid that acts as a specific recipient electron pair not only $H^{+.}$ Compounds that have orbitals empty in the valence shell such as BF_3 can also serve as an acid. For example, the reaction between BF_3 and NH_3 is an acid-base reaction, in which BF_3 as the Lewis acid and NH_3 as a Lewis base. NH_3 provides a pair of electrons to the BF_3 to form a covalent bond of coordination between the two.

Excess Lewis acid-base definition is able to explain the reactions of other acid-base in a solid phase, gas and solvent medium other than water that does not involve the transfer of a proton. For example, reactions between oxides of acid (eg, CO_2 and $SO_{2)}$with alkaline oxides (eg MgO and CaO), reactions such as the formation of the complex ion $[Fe\ (CN)6]^{3-,}$ $[Al\ (H_2O)6]^{3+,}$ and $[Cu\ (NH3)4]^{2+,}$ and most reactions in organic chemistry.



THE CONCEPT OF pH AND pOH

1. pH and pOH

What is pH? Basically, scale / degree of acidity of a solution depend on the concentration of H^+ ions in solution. The greater concentration of H^+ ions more acidic the solution. Generally, the concentration of H ions$^+$ is very small, so as to simplify the writing, a chemist from Denmark named **Sorrensen** proposed the concept of pH to explain concentration ion +. The pH value is equal to **the negative logarithm of the concentration of H ions**$^+$ and mathematically expressed by the equation:

$$\mathbf{pH = - \log [H^+]}$$

Analog to the pH, the concentration of OH ions$^-$ can also be expressed with way the same, namely pOH.

$$\mathbf{pOH = - \log [OH^-]}$$

Additionally, the pH of which is hydronium ion concentration in the solution mathematically shown to scale with the number of 0 to 14. The pH scale is an appropriate way to describe the concentration of hydrogen ions in acidic solutions, and the concentration of hydroxide ions in an alkaline solution. When the solution has the exact same pH with 7, the solution is said to be neutral. If not, it may be acidic or alkaline.

$$\mathbf{pH = -\log [H^+]}$$
$$\mathbf{pOH = -\log [OH^-]}$$

a pH less than 7 are acidic solution, equal to 7 neutral solution, and a greater than 7 alkaline solution. So we can write the following relationship.

$$\mathbf{[H_3O^+] > [OH^-], \text{ acid is } pH < 7}$$
$$\mathbf{[H_3O^+] = [OH^-], \text{ neutral is } pH = 7}$$
$$\mathbf{[H_3O^+] < [OH^-], \text{ a base is } pH > 7}$$

To determine the relationship between pH with pOH, consider the following description.

$$\mathbf{Kw = [H^+][OH^-]}$$

If both sides of the equation have taken a negative price logarithm, then

$-\log Kw = -\log \{[H^+][OH-]\}$

$-\log Kw = \{-\log [H^+]\} + \{-\log [OH^-]\}$

With p = -log, then

$$\mathbf{p\ Kw = pH + pOH}$$

2. Acidity level (pH) acid / alkaline strong

pH Determination of the acid / strong base is calculated by the equation

$$\mathbf{pH = - \log [H^+]}$$

$$\mathbf{pOH = - \log [OH^-]}$$

In one liter of pure water, there are ions $\mathbf{H^+}$ and $\mathbf{OH^-}$

With each concentration 10^{-7} M. Thus, the pH of pure water is

$$\mathbf{pH = - \log [10^{-7}]}$$

$$\mathbf{pH = 7}$$

The product ions [H^+] and [OH-] in the water is always constant, and is called the constant of water (Kw).

$$\mathbf{kw = [H^+][OH^-]= 10\text{-}14}$$

$$\mathbf{pH + pOH = 14}$$

3. The degree of acidity (pH) Acids / Bases Weak

Acid and weak base only partially biodegradable in water.

Bi He weak acid decomposes in water: $HA + H2O \leftrightarrow H3O^+ + A^-$

Equilibrium constant for **ACID weak** (Ka) is expressed as:

$$\mathbf{Ka} = \frac{[H3O+].[A-]}{[HA]} \quad \frac{[H3O+].[A-]}{[HA]}$$

Due to the volume / size of the $[H3O^+]= [A^-]$, then $[H3O^+]2 = Ka. [HA]$

The value *pH* **weak acids** expressed as

$$\mathbf{[H^+]}= \sqrt{Ka.M}\sqrt{Ka.M}$$

M is the value of concentration to be determined the degree of acidity.

Weak base decomposes in water with the reaction: $NH_3 + H_2O \leftrightarrow NH4^+ + OH^-$

Equilibrium constant for **the weak Bases** (Kb) is expressed as

$$\mathbf{Kb} = \frac{[NH4+].[OH-]}{[NH3]} \quad \frac{[NH4+].[OH-]}{[NH3]}$$

Value *pOH* **weak base** is expressed as

$$[OH] = \sqrt{Kb.M}\sqrt{Kb.M}$$

2.8. Conceptual Framework

Its main activity is part of the teaching aims to enable students get the opportunity to test and implement in a real situation, what has been gained from the theory lessons and practice. There are several factors that led to the implementation of practical activities cannot be run optimally include: lack of tools and lab materials, the difficulties of teachers in providing guidance practicum in schools, inadequate both in quality and quantity of laboratory personnel, ability and mastery of teachers to the equipment and material utilization practices still inadequate.

Unavailability of practical guidance is also one inhibiting the implementation of practical activities so that the learning process is not optimal because it does not meet the standards of competence for the practical guidance is absolutely necessary. In this study is expected to produce a practical guide that corresponds to the needs of high school students of class XI, easily understood and can be implemented making it easier for students to master the subject matter and is expected to improve the competence of students.

2.9. Hypothesis

Based on review theoretical and framework think and aim from research above, then hypothesis from research conducted are:

1. Guides practice based on PBL in class XI SMA on material acid and bases that used in schools not yet fulfill BSNP standard.
2. Guides practice based on PBL in class XI SMA on material acid and bases that have been developed has fulfill BSNP standard.
3. The effectiveness of student learning achievement using practical guides based on PBL in class XI SMA which has been developed.