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APPLICATION OF DIAGNOSTIC TEST INSTRUMENTS TO DETECT STUDENT'S MISCONCEPTIONS ON ACID-BASE MATERIALS

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ABSTRAK

Miskonsepsi adalah kesalahan suatu konsep yang harus diidentifikasi sejak dini, hal tersebut sangat penting agar tidak menjadi penyebab kesalahan pada konsep selanjutnya. Penelitian ini bertujuan untuk menganalisis penyebab miskonsepsi peserta didik kelas X di SMK Negeri 2 Banjarmasin pada materi asam basa yang diukur menggunakan instrumen four-tier diagnostic test. Metode penelitian ini adalah deskriptif kuantitatif-kualitatif. Pengumpulan data dilakukan menggunakan teknik tes dengan instrumen four-tier diagnostic test dan non-tes melalui wawancara. Hasil penelitian menunjukkan bahwa 41,46% peserta didik mengalami miskonsepsi sub konsep teori asam basa sebesar 46,73% (kategori sedang), miskonsepsi terhadap konsep sifat larutan asam basa sebesar 29,44% (kategori rendah), miskonsepsi terhadap konsep indikator asam basa sebesar 41,43% (kategori sedang), miskonsepsi terhadap konsep kekuatan asam (pH) sebesar 44,86% (kategori sedang) dan miskonsepsi terhadap perhitungan pH dari konsentrasi larutan sebesar 44,86% (kategori sedang). Penyebab miskonsepsi adalah intuisi yang salah, pemikiran asosiatif, kemampuan peserta didik dan minat belajar peserta didik.

ABSTRACT

Misconceptions are errors in a concept that must be identified early; it is essential so that it does not become the cause of errors in the next concept. This study aims to analyze the causes of misconceptions of class X students at SMK Negeri 2 Banjarmasin on acid-base material, which was measured using a four-tier diagnostic test instrument. This research method is descriptive quantitative-qualitative. They are collecting data using test techniques with four-tier diagnostic test instruments and non-tests through interviews. The results showed that 41.46% of students experienced misconceptions of acid-base theory sub-concepts by 46.73% (medium category), the nature of acid-base solutions had misconceptions of 29.44% (low category), acid-base indicators had misconceptions of 41, 43% (medium category), acid strength (pH) 44.86% (medium category) and the calculation of the pH of the solution concentration of 44.86% (medium category). The causes are misconceptions of wrong intuition, associative thinking, students' abilities, and learning interests.

1. INTRODUCTION

Education is an important part of the life of a nation. Based on the Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System, Article 3 reads, "National education functions to develop capabilities and shape the character and civilization of a dignified nation in the context of educating the nation's life, aiming at developing the potential of students to become human beings who believe and are pious. To God Almighty, have a noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. To realize the expected goals, it is necessary to have a qualification profile of graduates' abilities which is then used as a graduate competency standard (Kristanti et al., 2021; Slamet et al., 2021). So, based on the law above, after going

through the learning process, students are expected to be able to experience improvements in various things, namely their potential, personality, intellectual, and knowledge.

Chemistry is part of the Natural Sciences; chemistry not only contains knowledge in the form of facts, concepts, and principles but also provides direct experience to students in understanding natural phenomena scientifically (Darari et al., 2022; Dewi et al., 2018; Gani et al., 2022). Hidayah et al. (2018) and Nata (2021) state that the characteristics of concepts in chemistry have levels starting from simple concepts to higher-level concepts. Teachers are expected to help the success of learning through understanding the concepts given to students. When the delivery of the concept given is wrong, the conception formed in students' understanding is also wrong (Setyaputri & Destya, 2022). Learning activities, of course, it is not always as expected; sometimes, it also encounter various kinds of obstacles that make the process of teaching and learning activities disrupted. One of the common obstacles is that the concepts conveyed by teachers or educators cannot be adequately understood by students (Alfiyah et al., 2021). When students try to build their understanding of a concept, it is possible that the concepts built by students will not match the actual concept (Nuryati & Fauziati, 2021; Rahayu & Afriansyah, 2021). Daily experiences and information from the surrounding environment obtained by students result in an understanding of early concepts that occur naturally (Irianti, 2021). This initial concept plays a role in triggering misconceptions.

The misconception is a mistake in connecting a concept, namely between a new concept and a concept already owned by students (Nasution et al., 2021; Putri et al., 2021; Wulandari et al., 2021). Students are classified as having misconceptions if they make these mistakes, and when they are dug deeper, they experience misunderstandings in terms of understanding, interpreting, and implementing a concept (Nurkamilah & Afriansyah, 2021). Misconceptions can make someone make mistakes on an ongoing basis because that person already believes and applies a wrong basic concept (Putri et al., 2021; Yuzianah & Fatimah, 2022).

According to Mulyana (2021), the difficulties experienced by students are also caused by the complexity of chemical calculations and various chemical terms that are rarely used in everyday life. When explaining the material, not all students can understand the given concept (Alfiyah et al., 2021; Zaifullah et al., 2021). This condition triggers the emergence of various understandings of different concepts in each student, thus allowing misconceptions to occur. If students experience misconceptions, it interferes with the learning process, and they find it difficult to connect the knowledge they have just received with the knowledge they already have (Mansyur & Kendek, 2021; Wahyuni et al., 2021).

Misconceptions can occur only, regardless of cognitive abilities, so smart or ordinary students can still experience misconceptions. In contrast to students who do not understand the concept, students who experience misconceptions tend to believe in what they understand, while students who do not understand the concept tend not to have any basic grip or knowledge regarding the concepts they are learning (Wulandari et al., 2021).

The result of an erroneous understanding of the concept creates a continuous effect that needs to be minimized so that misconceptions can be reduced little by little. However, to reduce misconceptions, it is necessary to know the causes of these misconceptions (Nasution et al., 2021). Knowing the occurrence of a misconception cannot be known directly, so it is necessary to carry out diagnostic tests (Amaliyah et al., 2022; Saputri et al., 2021). Prastiwi et al. (2022) and Widiastutik & Isnawati (2020) stated that diagnostic tests help teachers obtain clearer information about misconceptions experienced by students. According to Laksono et al. (2021), a diagnostic test is a test that can be used to identify and accurately ascertain the weaknesses and strengths of students in a lesson. Diagnostic tests also identify students' problems and difficulties (Ebiati, 2021). One of the efforts to find out the occurrence of misconceptions in students can be made using a four-tier diagnostic test. The four-tier test instrument is the most effective instrument for identifying misconceptions in students because it covers all the advantages of the previous diagnostic test instrument (Wulandari et al., 2021). The research results by Nazura et al. (2021, stated that the four-tier was feasible and valid based on the validity and reliability test in the high category level. The four-tier diagnostic test is an extension of the three-tier diagnostic test. This development can be seen in the increase in students' confidence level in choosing answers and reasons (Rahayu, 2021). The four-tier diagnostic test consists of the first level, namely questions, then the second level contains the level of confidence in choosing the answer at the first level. The third level contains the reasons for the answers at the first level, and the fourth level contains the confidence level in the reasons for the answers at the third level. (Inggit et al., 2021).

Acid-base material is a solid concept consisting of several concepts that need to be carefully understood. Previous research has shown that students have difficulty understanding the concept of acid and base (Rohmah & Virtayanti, 2021). Acid-base material is a broad and complex material that has a

large enough potential to cause misconceptions (Elvinawati et al., 2022). According to Sitepu & Panjaitan (2021), the subject of acid-base is a prerequisite to understanding the next concept, namely buffer solution, salt hydrolysis, and acid-base titration. In addition to observable concepts, the concepts discussed in the acid-base material also discuss invisible concepts and concepts that involve the representation of symbols. The complexity of the concepts on the subject of the acid base can lead to a tendency to experience misconceptions.

The results of research conducted by Wahyuningtyas et al. (2020) regarding misconceptions were analyzed using a four-tier diagnostics test on acid-base material, with an average percentage of 45.64% of students experiencing symbolic, microscopic, and macroscopic misconceptions. Another research that supports the research by Wahyuningtyas et al. (2020) is that the four-tier diagnostic test instrument can minimize the time used in identifying misconceptions.

In efforts to prevent or avoid the impact of misconceptions, this research needs to be done to identify students' misconceptions on acid-base material using a four-tier diagnostic test at SMKN 2 Banjarmasin totaling 107 people, consisting of class X TKJ A 36 people, class X TKJ B 36 people, and class X RPL A 35 people.

2. METHOD

This study was designed with a quantitative-qualitative method; then, this study used a descriptive type of research design. The results of this study will be able to get the misconceptions experienced by students and find out the causes of misconceptions from students.

This data collection technique uses to test and non-test techniques. The test technique is carried out by giving a series of questions to students in the form of multiple choice accompanied by reasons and the level of confidence in the answers and reasons for their beliefs; the four-tier diagnostic test, this test is used to measure students' misconceptions. The test technique in the study was carried out online using google classroom media. In the process, students are expected to do well and correctly according to their abilities. In the non-test technique, it is done by interview.

The research instrument is structured to find answers to the proposed research statements. The instrument used in this study is a four-tier diagnostic test instrument, namely multiple choice questions with reasons and the level of confidence in the answers and reasons. The research instrument used by researchers to determine the percentage of student's misconceptions about acid-base material.

Data analysis in this study used a four-tier diagnostic test instrument that aims to identify students' misconceptions. This analysis of students' misconceptions is obtained through the results of students' answers and the percentage of misconceptions obtained.

The interpretation results are made in tabular form, containing the answer column, the level of confidence in the answers, the reasons, the level of confidence in the reasons, and the criteria. According to Fariyani et al. (2017), the four-tier diagnostic test guidelines have grouping criteria, as presented in Table 1.

Table 1. Four-tier criteria

Category	Answers	Confidence Answers	Reasons	Confidence Reasons
Understand	Correct	Sure	Correct	Sure
Not Understand	Correct	Not sure	Correct	Not sure
	Correct	Sure	Correct	Not sure
	Correct	Not sure	Correct	Sure
	Correct	Not sure	Wrong	Not sure
	Correct	Not sure	Wrong	Not sure
	Wrong	Not sure	Wrong	Not sure
	Correct	Sure	Wrong	Not sure
	Wrong	Not sure	Correct	Sure
Misconception	Correct	Not sure	Wrong	Sure
	Correct	Sure	Wrong	Sure
	Wrong	Sure	Correct	Not sure
	Wrong	Sure	Correct	Sure
	Wrong	Sure	Wrong	Not sure
	Wrong	Not sure	Wrong	Sure
	Wrong	Sure	Wrong	Sure

(Fariyani et al., 2017)

After categorizing student test results and calculating the percentage of students experiencing misconceptions, then conducting interviews that aim to determine the cause of students experiencing misconceptions. The next stage is to categorize the misconceptions based on Table 2.

Table 2. Level of Misconception Criteria

Misconception Percentage Range	Misconception Criteria
61 – 100%	High
31 - 60%	Fair
0 - 30%	Low

(Jayanti & Susantini, 2021)

3. RESULTS

Based on the student's answers, there are three categories, namely understanding concepts, misconceptions, and not understanding concepts. This study focuses on identifying the level of misconceptions that occur in students. Next, analyze the causes of misconceptions and difficulties from the students, which are traced through student interviews. The average percentage of the level of understanding of class X students at SMK Negeri 2 Banjarmasin on acid-base material can be seen in Figure 1.

Figure 1 Percentage of the average degree of understanding of students

Figure 1 shows that class X students at SMK Negeri 2 Banjarmasin have a high average percentage of misconceptions, namely 41.46%. The high level of misconceptions shows that many students still cannot answer correctly at all four levels of the four-tier diagnostic test. The average percentage of students who do not understand the concept is 19.10%, and students who understand the concept of 39.50%.

This study shows the level of misconception in each concept of acid-base material. The sub-concept of acid-base theory has the largest percentage, namely class X TKJ A in question number 3 of 63.89%. Furthermore, in the sub-concept of the nature of the acid-base solution, which has the largest percentage, namely class X RPL A in question number 7 of 34.29%. In the sub-concept of acid-base indicators, the largest percentage is class X TKJ A in question number 12 of 55.56%. Furthermore, in the sub-concept of acid-base strength (pH), which has the largest percentage, class X TKJ B in question number 11 is 63.89%. In the last sub-concept calculation of pH in solution in question number 15, class X TKJ A has the largest percentage of 55.56%.

The four-tier diagnostic test instrument test questions for acid-base materials are divided into five sub-concepts, including 1) Acid-base theory, 2) Acid-base properties, 3) Acid-base indicators, 4) Acid-base strength, and 5) Calculation of pH in solution.

The percentage of students who experience misconceptions per acid-base sub-concept can be seen in Figure 2.

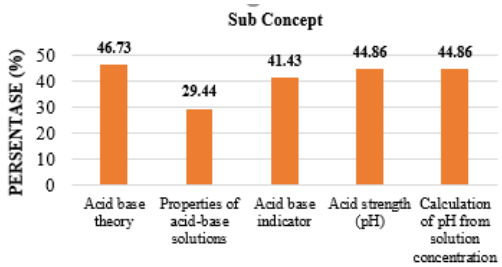

Figure 2 Percentage of students in class X SMKN 2 Banjarmasin who have misconceptions based on acid-base sub-concepts

Figure 2 shows the misconceptions of class X students at SMK Negeri 2 Banjarmasin, which are the highest in the subconcept of acid-base theory with a percentage of 46.73%. Furthermore, the lowest misconception of SMK Negeri 2 Banjarmasin students is in the sub-concept of the nature of acid-base solutions, with a percentage of 29.44%. The data from the calculation of the percentage of class X students at SMK Negeri 2 Banjarmasin who experience misconceptions per sub concept of acid and base.

The percentage of answers that have misconceptions on each item of acid-base questions can be seen in Figure 3.

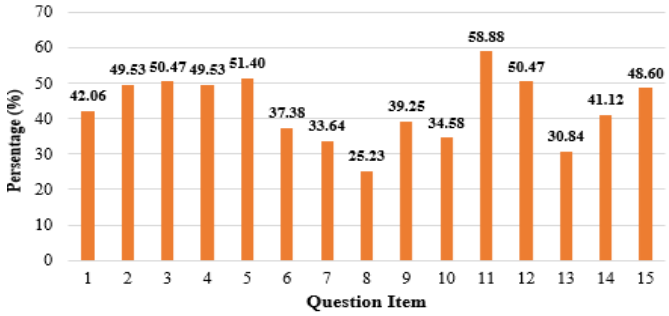

Figure 3 Percentage of students of SMK Negeri 2 Banjarmasin who have misconceptions based on acid-base questions

Figure 3 shows that students at SMK Negeri 2 Banjarmasin experienced the biggest misconception in question number 11, 58.88%. Problem number 11 indicates the relationship between some pH and the strength of acids and bases. Then the students who experienced the lowest misconception on item number 8 with a percentage of 25.23%. Question number 8 has an indicator that is determining the nature of bases in everyday life.

The percentage of answers for class X TKJ A who have misconceptions about each item of acid-base questions can be seen in Figure 4.

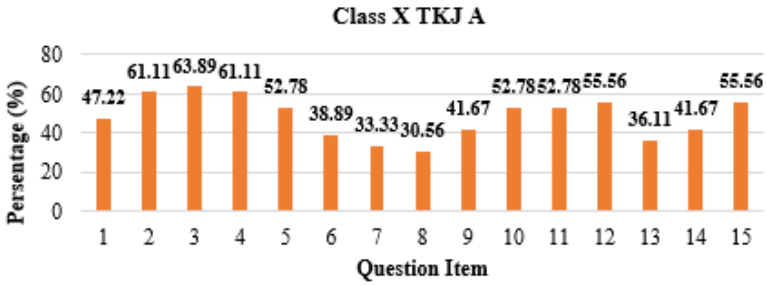

Figure 4 Percentage of students in class X TKJ A who have misconceptions based on acid-base questions

Figure 4 shows that the students of class X TKJ A at SMK Negeri 2 Banjarmasin who experienced the biggest misconceptions in question number 3 amounted to 63.89%. Problem number 3 indicates the species of ion that acts as a Bronsted-Lowry acid. The percentage of answers of class X TKJ B students who experience misconceptions on each item of acid-base questions can be seen in Figure 5.

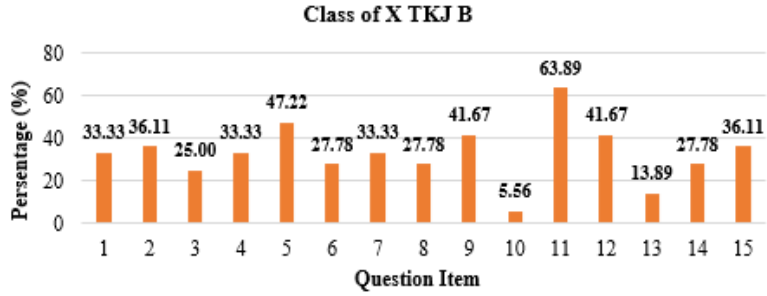

Figure 5 Percentage of students in class X TKJ B who have misconceptions based on item questions

Figure 5 The percentage of students in class X TKJ B who have misconceptions in Figure 5 shows that students in class X TKJ B at SMK Negeri 2 Banjarmasin experience the biggest misconceptions on question number 11, which is 63.89%. Problem number 11 has an indicator that analyzes the relationship between several pHs on the strength of acids and bases. Furthermore, students who experienced the lowest misconceptions on item 10 with a percentage of 5.56%. Question number 10 has an indicator to determine an accurate indicator to detect acid-base based on the question items.

The percentage of students in class X RPL A who experience misconceptions about each acid-base item can be seen in Figure 6.

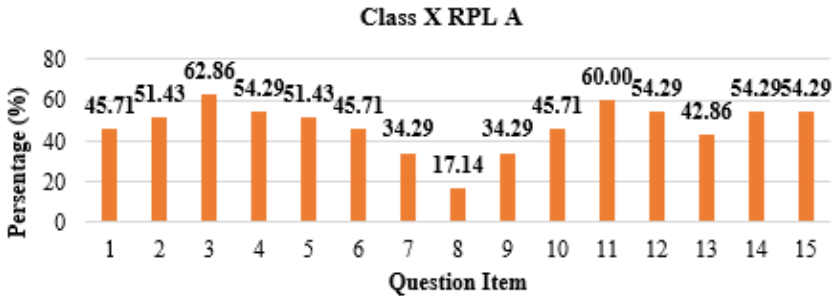

Figure 6 Percentage of students in class X RPL A who have misconceptions based on acid-base questions

Figure 6 shows the students of class X RPL A at SMK Negeri 2 Banjarmasin who experienced the biggest misconception in question number 3, 62.86%. Problem number 3 has an indicator to determine the ion space that acts as a Bronsted-Lowry acid. Then, students who experienced the lowest misconceptions on item number 8 with a percentage of 17.14%. Problem number 8 has an indicator that is determining the nature of bases in everyday life.

The difference in the percentages in the three classes was due to the research being conducted online, so it was not possible to directly observe the process of students answering these questions. So that they don't know whether students answer honestly, share answers, or use internet assistance when working on these questions.

4. DISCUSSION

The misconceptions that occur in students in each item can be described as follows:

Item question number 1

Students are dominated by true-false-true pattern answers (B-A-C-A) where the answer is correct, and the reason is wrong, but students are sure of the answer and reason. Students assume the answer is correct but is actually still wrong. Furthermore, students' answers with a pattern of wrong-true-true (C-A-E-A). In this case, students can understand the concept of acid, according to Lewis, but students are not able to apply the theory in the form of a reaction equation.

Item question number 2

Students answers with a true-false-true pattern (E-A-D-A), students with this pattern believe that acid-base compounds, according to Bronsted-Lowry and Lewis, are limited to water solvents (answer choice E); in fact, it is wrong because of the Lewis concept not only limited to water solvents. Furthermore, the next student's answer is with a wrong-true-wrong-true pattern (B-A-D-A); answers with this pattern only occur in some students. The way in this answer, students believe that the answers and reasons chosen are correct, this is the nature of students' intuition that is wrong, and students still have difficulty with questions related to analysis.

Item question number 3

Students answers with a true-false-true pattern (B-A-D-A); in this pattern, students believe that an acid is a proton acceptor (H^+), but that is wrong because in the Bronsted-Lowry concept, an acid is not a proton acceptor (H^+), but an acid is a proton acceptor (H^+). Proton donor (H^+). The following student's answer with a pattern of wrong-true-true (C-A-E-A) students considers the answer of the ion species that acts as an acid in numbers 1, 3, and 4 is correct, even though it is still wrong.

Item question number 4

Students' answers with a pattern of wrong-true-true (A-A-D-A) and (C-A-D-A); based on the results of these answers, students believe that water is a base because it can donate a proton (choice A) and HSO_4^- and H_2O are conjugate acid-base pairs (choice C). Based on the results of interviews with students, said

that students were confused and had difficulty with the meaning of conjugate acid-base pairs. The misconception that occurred to students was that they assumed that the reaction results were conjugate acid-base pairs; the alternative concept was obtained because students did not know the definition of acids and bases. Conjugate base correctly and completely.

Item question number 5

Students' answers with a pattern of wrong-true-true (C-A-E-A) students assume that the answer is an Arrhenius acid-base concept but is wrong. Students can understand the concept of acid-base according to Arrhenius, but students still cannot write down the theory of acid-base in the form of a reaction equation. Furthermore, the student answers with a pattern of wrong-true-wrong-true (A-A-D-A), the answers to this pattern only occur in some students. Based on this pattern, students believe that the answers and reasons chosen are correct but are wrong. This is the nature of the intuition of students still having difficulty answering questions related to the application.

Item question number 6

Students answers with the wrong-true pattern (C-A-E-A), In this answer pattern, students, already understand the concept of Bronsted-Lowry. However, students still cannot distinguish which conjugate acid-base is in the reaction equation. Students answers with a pattern of wrong-true-wrong-true (D-A-B-A), and students in the pattern believe that the selected answer is correct; this is the nature of students' intuition that is wrong, and students are still having difficulty with questions related to the application. This confidence level indicates that students have not understood the concept from the context of the questioning.

Item question number 7

The students' answers were dominated by the wrong-true-true (B-A-B-A) pattern of answers, the students believed that vinegar was alkaline, but it was still wrong. Vinegar is a weak acid because when it is dissolved in water, it only partially ionizes. Students' answers with a wrong-true-wrong-true pattern (D-A-D-A); answers with this pattern only occur to some students. In this answer pattern, students believe that the answers and reasons chosen are correct; in fact, they are still wrong. This is the nature of students' intuition that is wrong, and students still have difficulty with questions related to the application.

Item question number 8

Students answer with a pattern of wrong-to-true answers (D-A-C-A); students believe benzalkonium chloride is acidic even though it is wrong. Benzalkonium chloride is a salt because it acts as a disinfectant usually found in eye wash solutions or eye drops. Students' answers with a wrong-true-wrong-true pattern (A-A-A-A); answers with this pattern only occur to some students. In this answer pattern, students believe that the answers and reasons chosen are correct; they are still wrong. Sodium benzoate is a strong base, that's true, but it has nothing to do with the answer.

Item question number 9

Students answer with a true-false-true pattern (B-A-C-A); based on the results of these answers, a misconception is that students believe that blue litmus has a pH value of <7. Understanding students' concepts are wrong; it is true that pH <7 is acidic, but it is not blue litmus but red litmus. Students answer with a pattern of wrong-true-true (C-A-D-A); based on the results of these answers, the misconception that occurs is that students cannot understand the exact relationship between changes in the color of the litmus paper indicator and the acidic and basic properties of the solution. This can be called a false negative; the cause of a false negative is that students get some information (deficiency information) or the information obtained is incomplete.

Item question number 10

Students' answers are dominated by the wrong-true-wrong-true pattern (B-A-B-A), students believe that litmus paper is the most accurate indicator, but it is still wrong. The misconception is that students know the indicators to measure pH but do not know the most accurate indicator for determining pH. Based on the results of interviews, students admitted that during practicum, they often used litmus paper indicators and universal indicators. In contrast, for pH meters, students admitted that they had never seen and used them.

Item question number 12

Students' answers with a true-false-true pattern (D-A-A-A), based on the results of interviews, students admitted that they did not know how to work on the items, and it could be concluded that students answered correctly only from the results of guessing the answers contained in the items. Students with a pattern of wrong-true-true (B-A-E-A), students have a high level of confidence in answering questions but are still wrong when choosing answers. Based on the results of the interviews, students admitted that they did not understand and could not determine the pH route.

Item question number 11

Students answers with a true-false-true answer pattern (D-A-C-A); based on the results of these answers, the misconception that occurs is that students believe the greater the [OH^-] value, the closer the pH value of acid will be. The correct concept is that the pH value is influenced by the hydrogen concentration and is directly proportional to the pOH value in an acidic or basic solution. Students' answers with a pattern of wrong truly (C-A-B-A); based on the results of these answers, the misconception that occurs in students is that they cannot correctly relate the values of pH, pOH, [H^+], and [OH^-], at each solution. Based on the results of the interviews, students are still confused in determining the relationship between pH, [H^+], and pOH because the teacher is more focused on explaining the calculation of pH.

Item question number 13

Students answers with a true-false-true pattern (E-A-A-A); based on the results of these answers, students believe that acid has a higher pH than the base; the reason chosen by the student is not appropriate. Students' answers with a pattern of wrong-true-true (C-A-B-A); based on the results of these answers, students believe that samples S and R are the most acidic wastes. Samples S and R, respectively, had a pH of 9.4 and 7.6, classified as basic. The misconception is that students think a high pH is acid, but the correct concept is that an acid pH is lower than a base. Students choose the correct answer but choose the wrong reason.

Item question number 14

Students' answers with a true-false-true pattern (D-A-C-A). The misconception that occurs is that students do not understand the questions well. Students are unable to relate the answers to the reasons chosen. It can be said that students only guess the answer. Students answers with a wrong-true-wrong-true pattern (B-A-A-A); based on the results of these answers, students cannot answer the answer choices correctly. The misconception is that students believe that the pH value of the solution is 9, even though it is wrong. The mistake of students is not understanding the formula for calculating the pH of a strong acid so students cannot determine the right formula to calculate the pH value.

Item question number 15

Students' answers with a pattern of wrong-true (C-A-D-A); based on the results of these answers, students believe they can determine the pH value correctly, but it is still wrong. The misconceptions are that students are less thorough in understanding the questions and doing calculations, so students do not get the exact final result calculation. Students answer with a true-false-true pattern (E-A-C-A); based on the results of these answers, the misconceptions that occur assume the pOH value $= 5$; if students are careful, then the correct pOH value is 4-log 5. So it can be said that the choice. reasons students choose are just guessing.

Based on the description above, it can be summarized the causes of students experiencing misconceptions for several reasons, namely as follows: 1) Positive misconceptions or false positives are conditions where students can respond correctly but are unable to provide scientific reasons to strengthen their opinions (Firdaus & Wisanti, 2021).); 2) There is a wrong intuition in students. Students only memorize the given theory without understanding the concept's meaning so that when asked different questions, they cannot answer it (Sugiarni et al., 2021); 3) Difficulty in problems related to the application. This is because students only understand the concept partially without going deep into it, so they are confused in choosing answers (Sadhu, 2019); 4) Negative misconceptions or also referred to as false negatives, namely conditions where students give the right reasons for the wrong concept (Firdaus & Wisanti, 2021); 5) Students still have difficulty in dealing with questions with a cognitive level (C3), namely applying, so that the ability of students to use a concept is still relatively low (Sugiarni et al., 2021); 6) Students cannot interpret but only shallow learning and just memorizing (Fitriani & Rohaeti, 2020); 7) The carelessness of students in choosing answers to the concepts given (Dahlan & Kurniasari, 2022); 8) Generalizing a concept argues that misconceptions due to generalization are types of misconceptions based on general statements and students immediately provide conclusions before actually having more information in concluding. This indicates that teaching and learning activities experienced by students are only shallow learning and simply memorizing without meaning (Nurkamilah & Afriansyah, 2021); 9) Students still have difficulty dealing with questions with a cognitive level of C4 (Nenoliu et al., 2021); 10) Students are less careful in understanding questions and doing calculations so that students do not get the exact final result calculation (Faturrochmah et al., 2021).

In addition to those mentioned above, there are other reasons, namely the low interest and interest in studying chemistry, because their concentration is more focused on the material of their respective majors, especially with practical learning. Another obstacle faced by students when learning is online learning. So that their interest decreases, they find chemistry difficult and will get more difficult. In terms

of understanding, it can be understood that not all have been able to adapt to access learning content properly, especially chemistry learning related to calculations. Another inhibiting factor is the availability of the internet network as well as the learning styles of students at home and in a less conducive environment.

5. CONCLUSION

Based on the results of research conducted at SMK Negeri 2 Banjarmasin, it can be concluded that (1) Students of SMK Negeri 2 Banjarmasin have misconceptions, with an average percentage of 41.46% of students experiencing the highest misconception in the sub-concept of the acid-base theory of 46.73% (medium category), the nature of the acid-base solution has a misconception of 29.44% (low category), the acid-base indicator has a misconception of 41.43% (medium category), acid strength (pH) 44.86% (medium category) and calculation of the pH of the solution concentration of 44.86% (medium category). (2) The causes of misconceptions in students on acid-base material include wrong intuition, associative thinking, students' abilities, and learning interests.

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