

CHAPTER V

CONCLUSION, IMPLICATIONS, AND RECOMMENDATION

5.1 Conclusion

Based on the results and discussions described in the previous chapter, this research found that using the four-tier test instrument was very useful in providing in-depth information about the levels of students' conception, especially on the concepts of diffusion and osmosis. By utilizing the four-tier test, related parties can gain better insight into how students understand the subject matter and identify possible misconceptions. That way, efforts to improve learning can be more focused and on target. In this research, data from a sample of students showed that most of them, 62.12%, were at the "lack of knowledge" level, indicating a lack of basic understanding of the material being taught. As many as 24.19% of students are at the "scientific knowledge" level, showing students have a good understanding. Misconceptions were found in 6.54% of students, 4.44% experienced "false positives" and 2.70% experienced "false negatives". These results illustrate that special attention should be paid to students who experience lack of knowledge and misconceptions.

Even though some students had shown a good understanding, it was found that there were still misconceptions that affected their understanding of these processes. Even though the percentage is insignificant, it is crucial to overcome this misconception to deepen students' understanding. The results showed that students tend to have misconceptions about the "process of osmosis" and "process of diffusion". A misconception often arises regarding the direction of water molecules' movement in the osmosis process. Some students believe that water molecules move towards an area that has a lower concentration, when in fact water or solvent molecules move towards an area that has a higher concentration. In addition, misconceptions were also seen in students' understanding of plants stored in a high concentration of sugar solution. Some students believe plants wither because they cannot absorb the sugar solution because the sugar particles are too large. However, the plant wilts because of the process of osmosis that occurs. In this situation, water

molecules move from the plant to the area of the sugar solution, which causes the plant to lose water and cause wilting. Furthermore, there are misconceptions regarding diffusion that may arise from misunderstanding about particle motion. Some students believe that the particles move because they are assisted by wind energy, even though the diffusion process occurs spontaneously due to the random motion of the particles without the need for additional energy assistance. In addition, some students also mistakenly classify the diffusion process as "active transport", even though diffusion is a form of "passive transport" which does not require additional energy to occur. This research highlights the importance of overcoming students' misconceptions in learning science, especially in diffusion and osmosis. Even though the percentage is not significant, this misconception can affect students' understanding as a whole. The results of interviews with students also provide essential insights into the factors that lead to misconceptions, including incomplete or incorrect reasoning, wrong intuitions, and inappropriate learning methods.

5.2 Implications

The results of this research have several relevant implications. First, using the four-tier test instrument is very useful in identifying students' misconceptions about diffusion and osmosis. This can help educators better understand student understanding and design more effective teaching strategies. Second, the finding that some students still have misconceptions about the process of osmosis and diffusion emphasizes the importance of overcoming these misconceptions in learning. Third, the results of interviews with students involved in this research highlight the importance of listening to and understanding students' perspectives on learning. The implication is that educators must consider students' perspectives and adapt approaches and learning materials to support their needs and understanding better.

5.3 Recommendation

Based on the results found in this research, several recommendations can be given to related parties to develop and broaden understanding of the students'

conception of the concepts of diffusion and osmosis. The recommendations of this research cover several essential aspects in increasing students' knowledge of the concepts of diffusion and osmosis. First, the four-tier test instrument should be applied further and more broadly in evaluating students from various levels of education to provide a more comprehensive understanding of students' misconceptions about diffusion and osmosis. By involving more participants, research findings will be more representative, and stronger generalizations can be obtained. Then, adjusting the number of questions on each subtopic so that they are equal and do not bias the research. Second, developing more effective teaching strategies is necessary to overcome students' misconceptions. Application of an approach that focuses on identifying and correcting misconceptions and using relevant methods and approaches to help increase student understanding. Third, developing in-depth and detailed learning materials on the concepts of diffusion and osmosis is recommended. Learning materials must be prepared in easy-to-understand language, relevant examples, and exciting illustrations so students can more easily understand the material.

The second is a recommendation for teachers to use the four-tier test instrument to determine the level of students' conception, especially in the topic of diffusion and osmosis. The use of the four-tier test instrument should be applied further and more broadly in the process of evaluating students from various levels of education to provide a more comprehensive understanding of students' misconceptions about the concepts of diffusion and osmosis. By involving more participants, research findings will be more representative, and stronger generalizations can be obtained. So that misconceptions can be avoided and eliminated so that students' understanding becomes better. Third, the teacher must pay attention to preconceptions, the stage of students' cognitive development, other causes of misconceptions, and conduct research related to the concepts to be taught because diffusion and osmosis are related to other concepts. After that, it is necessary to develop more effective teaching strategies to overcome student misconceptions. Application of an approach that focuses on identifying and correcting

misconceptions and using relevant methods and approaches to help increase student understanding. The fourth is a recommendation to carry out further research related to students' conception of the concepts of diffusion and osmosis, such as comparisons between curricula and learning methods to overcome misconceptions and factors affecting students' confidence level.