Abstract. This study examines pre-service chemistry teachers’ understanding of concepts related to ionic liquids as cellulose solvents which include knowledge of cellulose, ionic compounds, and ionic liquids. This study used a descriptive method and involved 35 pre-service chemistry teachers from 6th semester who enrolled in the High School Chemistry unit. The research instruments of an open-ended questions which related to the concepts of ionic compounds, ionic liquids and cellulose. The results show that pre-service chemistry teachers have limited conceptions about of the concepts related to the dissolution of cellulose in ionic liquids. Based on the analysis of student answers to open-ended questions, students’ conceptions about definition of cellulose are quite good, but student have no sufficient knowledge about the structure and benefits of cellulose. Furthermore, students’ conceptions related to ionic compounds and ionic liquids are not good enough because student have not been able to mention the differences between ionic compounds and ionic liquids based on the structure, properties, and the constituent particles. This is because ionic liquids as cellulose solvents and the concepts related are not taught directly in the classroom so that it becomes an unfamiliar concept to student.

1. Introduction
Chemistry learning has an important goal to inverse an understanding of students about scientific concepts in chemical material content so that it can be applied to broaden students’ knowledge in the context of chemical learning. Context is a situation or event that helps students to get concepts, principles, law and so on [1]. Linking content with the context in chemistry learning is important because student mastery of content alone is not enough to make students understand learning material well. However, so far learning in the classroom has only been emphasized on chemical content, so that students’ understanding of the context of chemical learning is still lacking. Therefore, the teacher has an important role to create learning situations that can help students understand the concept and its relation to the context in the chemistry learning process, so that students are more motivated and have good knowledge of the concepts being studied.
In order to apply scientific concepts in certain contexts, students must have all understanding of scientific concepts [2]. The scientific concept is not just about science, but needs to be balanced with technology, given the increasing number of discoveries in the field of modern chemistry. One of the most interesting learning contexts to become a topic in chemistry learning is modern technology based on ionic liquids materials [3].

Ionic liquids are considered as one of the interesting and fast-growing topics in modern chemistry, technology and techniques that can be applied to chemical education [4]. On the topic of ionic liquids, there is a strong link between science and technology bridged by engineering or engineering activities, so that it becomes one of the concepts that can support prospective chemistry teacher students to improve their understanding of the context of learning related to technological advances in chemical education.

Ionic liquids are a new generation of green solvents, electrolyte materials, and technical fluids that are reliable, safe, and friendly for various purposes [5]. One of the benefits of ionic liquids as solvents can be found in the process of dissolving cellulose. In the industrial world, the use of cellulose is usually carried out through a dissolution process, so that a good solvent is needed to dissolve cellulose for the effectiveness of the dissolution process. The use of ionic liquids as solvents in the dissolution of cellulose is based on the nature of cellulose which is difficult to dissolve in water and conventional organic solvents [6]. At the dissolution of cellulose with ionic liquids, with the interaction of weak cations, it is easier for anions to break hydrogen bonds between cellulose molecules, thus, the cellulose dissolution process will be faster and can dissolve cellulose with higher concentrations [4]. Cations will attack O atoms from -OH group while anions will attack hydrogen atoms from –OH group [7].

The concept related to ionic liquids has great potential to increase the knowledge and ability of students to associate learning materials with related contexts before teaching them in class. The concept related to ionic liquids has a variety of advantages that are widely applied in current technological developments, so the discussion of ionic liquids has the potential to provide opportunities for students to associate content learned in class with contexts related to technology. Scientific explanations related to science and ionic-based technology can be used to strengthen chemical learning content and have great potential as a medium for developing students' thinking skills [8]. However, ionic liquid is a concept that is not yet known by prospective chemistry teacher students because there are no courses that directly teach the concept of ionic liquids. This shows that the concept related to ionic liquids as technology in the field of chemical education has not been touched on in lectures. Therefore, this research was conducted to determine the understanding of prospective chemistry students regarding concepts in the context of ionic liquids as cellulose solvents.

One way to present learning related to the topic of ionic liquids as cellulose solvents has been developed by Lokollo in the form of interactive simulations [8]. However, this learning media needs to be supported by the preparation of a learning strategy, so that a study is conducted that aims to develop strategies that can be used to assist the application process of the models that have been developed previously. The research discussed in this article is one part of a large study related to learning strategies on the topic of dissolving cellulose in ionic liquids, where the initial stage of the research is to explore student knowledge related to the concept of cellulose dissolution in ionic liquids which is expected to trigger students to improve their understanding of technology in modern chemistry so that it becomes a context that can be used by prospective chemistry teacher students to practice teaching.

2. Methods
In this article, the analysis of students' conception of ionic liquids is used as the basis for developing learning strategies that use the Didactical Design Research (DDR) research design developed by Suryadi [9]. The design of this study consists of three stages, namely: (1) didactical situation analysis before learning, (2) analysis of metapedadictactics, and (3) retrospective analysis, namely analysis that links
the results of didactic situation hypothesis analysis with the results of non-psychological analysis. In this article, the results of the first stage will be presented in the form of students’ conception on dissolution of cellulose in ionic liquids.

The data collection technique in this study was carried out by using instruments in the form of open questions about concepts related to the dissolution of cellulose in ionic liquids consisting of 11 questions and validated by expert validators.

In this study, the subjects were 35 of semester 6 chemistry teacher candidates who took high school chemistry at Yogyakarta State University. The subject was chosen because at that level, students at the university had taken several courses as a prerequisite for learning concepts related to the dissolution of cellulose in ionic liquids.

3. Result and Discussion

Table 1 shows the results of conception of prospective chemistry teacher students regarding concepts related to the topic of dissolving cellulose in ionic liquids.

Table 1. Percentage of students’ conception which related to the concepts of ionic compounds, ionic liquids and cellulose.

| Questions | Indicators                                    | Results | Correct (%) | Incorrect (%) |
|-----------|-----------------------------------------------|---------|-------------|---------------|
| 1-2       | Explain the meaning of cellulose              |         | 65          | 35            |
| 3         | Shows the type of chemical bond contained in  |         | 49          | 51            |
|           | cellulose                                     |         |             |               |
| 4         | Shows the difference between the bonds found   |         | 31          | 69            |
|           | in the cellulose chain                        |         |             |               |
| 5         | Analyze the relationship of structure to      |         | 34          | 66            |
|           | cellulose properties                          |         |             |               |
| 6         | Mention the benefits of cellulose based on    |         | 88          | 12            |
|           | the properties                                |         |             |               |
| 7         | Explain the differences in structure and      |         | 34          | 66            |
|           | properties of NaCl and ionic liquids          |         |             |               |
| 8         | Explain the causes of low melting point in    |         | 9           | 91            |
|           | ionic liquids                                 |         |             |               |
| 9         | Analyzing factors that influence the nature   |         | 43          | 57            |
|           | of ionic liquids                              |         |             |               |
| 10        | Analyze the factors that affect the solubility|         | 20          | 80            |
|           | of cellulose in ionic liquids                 |         |             |               |
| 11        | Mention the benefits of ionic liquids in      |         | 54          | 46            |
|           | various technologies                          |         |             |               |

Students’ knowledge related to the concepts of ionic compounds; ionic liquids; and cellulose are determined based on the students’ responds of the questions. Then, the students’ responds are calculated and stated in percentage of correct and incorrect answers. If the percentages of students’ responds are more than 75%, then students have good knowledge; about 50%-75%; then students have sufficient knowledge, and less than 50%, then the students’ knowledge are insufficient on the concepts of ionic compounds, ionic liquids and cellulose.
Based on the Table 1, students do not have sufficient knowledge on intermolecular forces, bonding and chemical structure in cellulose and relationship to its physico-chemical properties. Although students were able to define the definition of cellulose and nanocellulose correctly, but the students’ understanding of cellulose structure was not good enough, because only a few students could show the type and location of the bond to the cellulose structure. Students do not yet have knowledge about the effect of tensile forces on hydrogen bonds that can affect cellulose properties. Cellulose is difficult to dissolve in water and most organic solvents due to extensive tissue formation from inter-molecular and intra-molecular bonds of hydrogen between cellulose [10].

Students’ knowledge about the benefits of cellulose is good enough because most of the students have been able to mention the benefits of cellulose dissolution before being applied in various fields. Cellulose dissolution is widely used in the technology of fiber, paper, membrane, polymer and paint industries [7].

As well students do not have sufficient knowledge on defining ionic liquid and its properties. Based on the results, students have not been able to explain the difference between ionic compounds (NaCl) and ionic liquids seen from the structure, properties, and constituent particles. Most students can only mention the differences in the structure or melting point of NaCl and ionic liquids. Students also do not have a good understanding of the causes of the low melting point of ionic liquids when compared to the melting point of NaCl.

Regarding the knowledge of the concept of ionic liquids, most students do not yet know that the types of anions and cations and the interactions between anions and cations are factors that can affect the nature of ionic liquids. In the concept related to the benefits of ionic liquids, students do not yet know that the benefits of ionic liquids are as solvents and their benefits in the industrial field. Cellulose dissolution is widely used in the technology of fiber, paper, membrane, polymer and paint industries [7]. Student knowledge that is not good enough causes students to have difficulty in deducing factors that can affect the solubility of cellulose in ionic liquids.

Based on the analysis of student answers, students’ knowledge is still minimal regarding concepts related to cellulose dissolution in ionic liquids because students’ understanding of the context of chemical learning is still lacking. Although students at the university had taken several courses as a prerequisite for learning concepts related to the dissolution of cellulose in ionic liquids, but linking content with the context in chemistry learning is important because student mastery of content alone is not enough to make students understand learning material well. Scientific explanation related to ionic liquid context contains a lot of facts, concepts, principles, laws, models, and theories that can be used to reinforcing high school chemistry content as a medium for developing thinking skills [4].

To prepare good chemistry learning in the future, it is necessary to prepare chemistry teacher candidates who have an understanding of chemical material content in order to connect with the context in chemistry learning. Understanding of content in relation to context can help students to obtain concepts and principles in learning [1].

4. Conclusion
Based on the result of the research, it can be concluded that students’ conceptions about definition of cellulose are quite good, but student have no sufficient knowledge about the structure and benefits of cellulose. Furthermore, students’ conceptions related to ionic compounds and ionic liquids are not good enough because student have not been able to mention the differences between ionic compounds and ionic liquids based on the structure, properties, and the constituent particles. This is because the students’ understanding of the context in chemistry learning are still lacking. Students’ understanding of chemistry content is not enough to make students understand learning material without linking content with the context in chemistry learning.
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