Identification of medicinal tablets using chemical tests

化学の反応を用いた薬の錠剤の確認

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ABSTRACT

Identification of medicinal tablets is carried out to improve the experimental experience, rather than the theoretical knowledge in high school students and they will be assessed at the end of the lesson while they could identify the tablets properly. Reminding the specific tests for the specific ions are very important to carry out the practical properly and from this chemistry lesson is connected to the daily life. By following the correct procedure students will be able to identify the tablets properly and it will make interest to the lesson with different color changes for specific ions. The objectives of the lesson will be achieved by the identification of tablets properly, understanding the relationship between chemistry lesson and daily life applications as well as improving the students' practical skills.

Commercially available medicinal tablets

Identification of cations and anions is a very important unit in high school chemistry syllabus. This knowledge is applied in a wide range of day today activities. But students are confused while they apply the knowledge in the daily life due to the lack of practical experience. Medicinal tablets contain different

kinds of chemical ions. Therefore this lesson is used to improve the practical knowledge rather than the only theoretical knowledge about the **Identification of ions** in high school science students. This lesson is also applicable in Health education, integrated study subjects and pharmaceutical applications.

Ⅲ TEACHING PLAN.

1. **High school chemistry lesson**
2. **Duration** - Two periods (100 minutes)
3. **Main title** –Identification of medicinal tablets using chemical tests.
4. **Sub titles** –

(1) Specific reactions to identify metallic ions.

(2) Identification of acids and bases using indicators.

(3) Identification of medicinal tablets.

5. **Objectives**

(1) Improve the practical knowledge about identification of ions.

(2) Improve the practical skills in the proper usage of laboratory equipments and chemicals.

(3) Identify Fe^{3+}, Ca^{2+}, Zn^{2+} and a weak acid.

(4) Identify iron tablets, calcium tablets, Zink tablets and vitamin C tablets.

(5) Understand the application of chemistry knowledge in day today activities and the importance of practical experience.

(6) Ability to finish the work within the relevant time.

(7) Asses the students at the end of the lesson.

6. **Teaching materials –** Medicinal tablets, Chemicals required to identify tablets, Glass equipments required to do experiments, Posters to show off the reactions, Text books containing experimental details.

- Chemicals

Medical tablets (Nature Made, FIGURE 4.)

- iron — Fe^{2+}／Fe^{3+}
- calcium — calcium carbonate
- zinc — zinc gluconate
- vitaminC — ascorbic acid
- NaSCN (FIGURE 2)
- BTB solution (FIGURE 2)
- Methyl Orange (FIGURE 2)
- $K_3[Fe(CN)_6]$ (FIGURE 2)

FIGURE 1. Bottles contained medical tablets

FIGURE 2. Chemicals

(3) Materials

test tubes and stand, glass rode, beakers, filter paper, spatula, pipettes

TEACHING PLAN

table.1 Teaching procedure for the first period

Teacher's role	Students activity	Time/ duration
1. Introduction to the lesson.		5 minutes
2. Probe the prior knowledge for the identification of ions.	• Remind the lesson.	10 minutes
3. Explain the identification of metallic ions, acids and bases and its' medicinal applications.	• Remind and understand identification of ions.	15 minutes
4. Show the unlabeled bottles containing tablets and explain the unknown contents and their chemistry. (Bottles contain iron, calcium, Zink and vitamin C tablets; iron tablets contain Ferric citrate, calcium tablets-calcium carbonate, Zink tablets-zinc gluconate, Vic tablets-ascorbic acid.)	• Take down the important information.	10 minutes
5. Explain the given chemicals which are used to identify above ions.	• Take down the important information.	10 minutes
6. Explain the procedure to succeed the experiment such as labeling the bottles as A, B, C and D, take tablets into beakers and label them accordingly. Grind the tablets properly because incomplete solubility in water and take small samples in to labeled test tubes and identify the tablets stepwise.	• Understand and Take down the important information.	50 minutes

- Advice to identify the metallic ions first because sometimes ironic tablets contain Vitamin C as a substrate. Advice to write a flow chart for the experimental procedure and label the bottles correctly after identification the tablets. Teaching procedure for the second period is shown in the table.2.

table.2 Teaching procedure for the second period

Teacher's role	Students activity	Time/ duration
1. Let students to do the experiment group wise and supervise the activity by correcting the faults. 2. Collect the experimental results and evaluate the students. Explain the principal of the reactions. 3. Explain a correct procedure to do the experiment and importance of application in day today activities.	• Do the experiment following instructions and identify the medicinal tablets in the bottles... • Discuss with the teacher.	35 minutes 10 minutes 5 minutes 50 minutes

(1) **Exercise for students**

Show the unlabeled bottles containing tablets and explain the unknown contents and their chemistry. Bottles contain iron, calcium, Zink and vitamin C tablets; iron tablets contain Ferric citrate, calcium tablets- calcium carbonate, Zink tablets- , Vic tablets- ascorbic acid.

FIGURE 3.unlabeled bottles

FIGURE 4.Labeled bottles as A,B,C and D

(4) **Caution**

・Advise to do the experiment carefully and mention the precautions to be taken in emergencies.

・Advise to identify the metallic irons first. (Because iron tablets contain vitamin C.)

(5)**Correct procedure and explanation**

1. **Preparation of samples**

Grind the tablets properly because incomplete solubility of tablets in water. (FIGURE 5. and 6.)

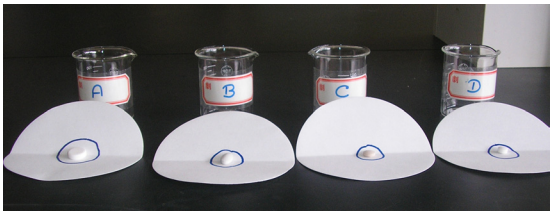

FIGURE 5. Medical tablets and beakers.

FIGURE 6. Grind the tablets , put it in each beakers and add water.

2. **Identification of Fe^{3+} using NaSCN**

Take about 2 ml from each sample into labeled test tubes. (FIGURE 8.) Add NaSCN to each sample, and shake. Observe the color change. Color of the sample C only is changed into red.(FIGURE 9.)

NaSCN changes the color of an solution containing Fe^{3+} into red.

$$Fe^{3+} + SCN^{-} \rightarrow Fe(SCN)^{2+} \quad \text{red}$$

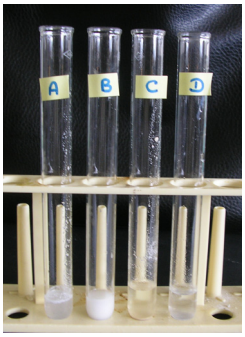

FIGURE 7. Take small samples in to labeled test tubes.

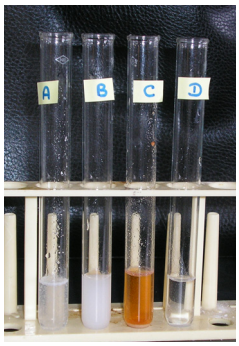

FIGURE 8. The reaction by NaSCN, color changes red only sample C

- **Therefore the sample containing Fe^{3+} is identified as C; the bottle of iron tablets.**

3. **Identification of $CaCO_3$ using BTB solution**

- Take about 2 ml from each sample into labeled test tubes except C (sample A, B and D) and add BTB solution into each test tubes. Blue color is shown only in the Sample B. (FIGURE 10.)

- Blue color is indicated for bases by BTB solution, The pH range is 6.2～7.8, $CaCO_3$ is the only base out of the above three solutions.

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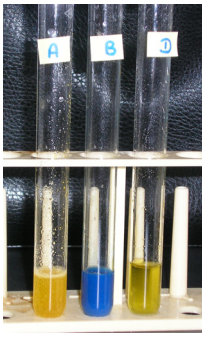

FIGURE 9. Blue color is shown by only sample B with BTB solution.

- **Therefore the sample containing Ca^{2+} is identified as B; the bottle of calcium tablets.**

4. Identification of Zn^{2+} using $K_3[Fe(CN)_6]$ solution

Take about 2 ml from the remaining sample into labeled test tubes (sample A and D only) and add $K_3[Fe(CN)_6]$ solution into each test tubes. Yellow precipitate is shown only in Sample D. (FIGURE 10.)

- $K_3[Fe(CN)_6]$ makes Yellow precipitate in solution containing Zn^{2+}.
  $3Zn^{2+} + 2Fe(CN)^{3-} \rightarrow Zn_3[Fe(CN)_6]_2$ yellow↓

- **Therefore the sample containing Zn^{2+} is identified as D; the bottle of zinc tablets.**

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FIGURE10. Yellow precipitate is shown only in the Sample D with $K_3[Fe(CN)_6]$ solution.

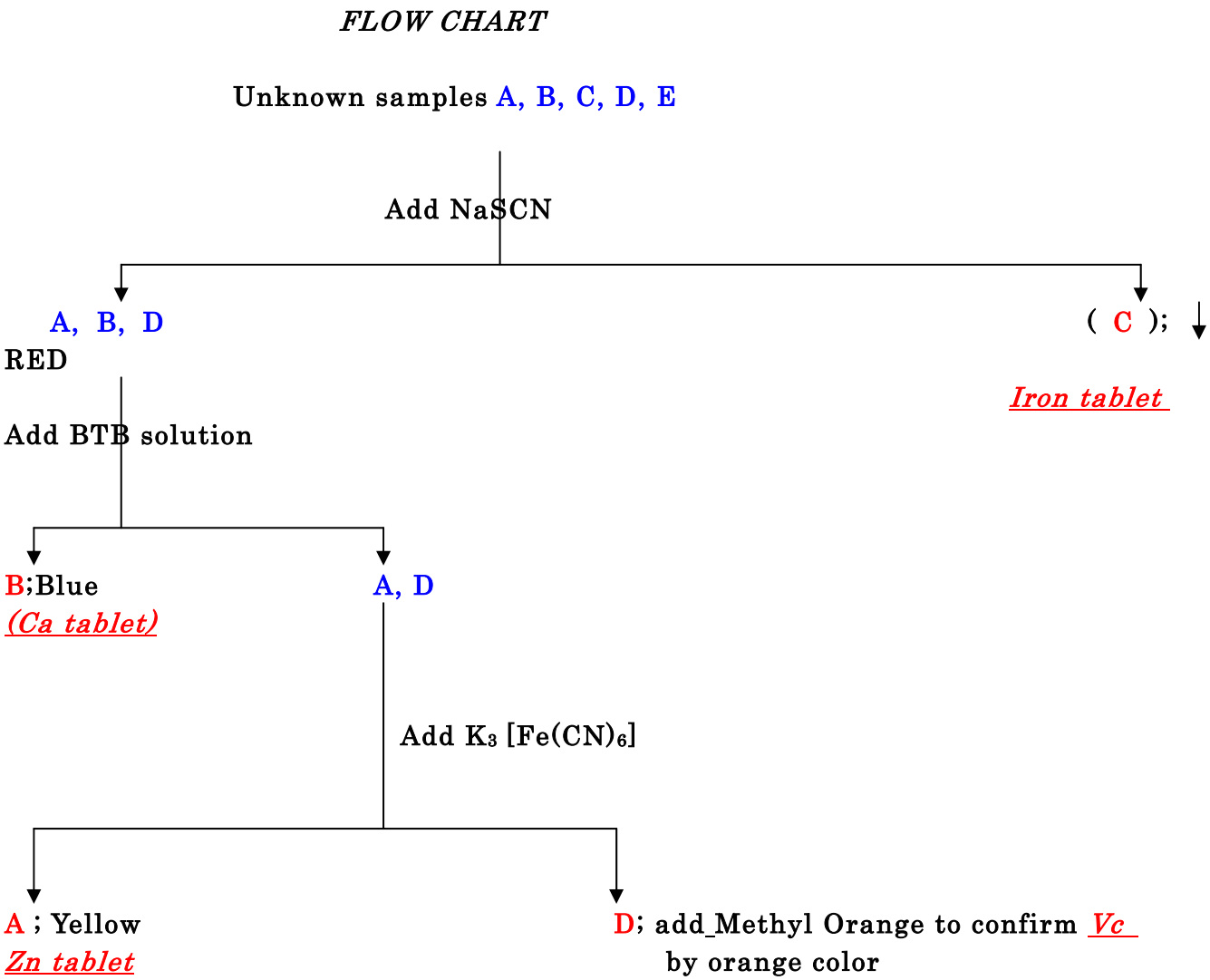
5. Identification of Vitamin C using Methyl Orange solution

- Take about 2 ml from the remaining sample in to labeled test tubes (sample A) and add Methyl Orange to the test tube.Confirm the solution A as Vc by the Orange color in the Sample A. (FIGURE 12.)
- Red ～ orange color of solutions is indicated by Methyl

Orange solution, that range is pH3.1～4.4, so sample A is acid.

FIGURE 11.
Orange color is shown Sample A

- . **Therefore the sample containing Ascorbic acid is identified as A; the bottle of Vitamin C tablets.**



(6) **Conclusion**

The unknown samples could be identified using the above procedure as follows.
Bottle A, B, C and D contains;

Bottle A – vitamin C
Bottle B – calcium tablets
Bottle C – iron tablets
Bottle D – zinc tablets

Students are assessed and evaluated by considering the experimental procedure, recording results, time management, correct identification of medicinal tablets and understanding the value of the lesson.

References

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