

# *STEPS TOWARDS FUTURE*

## THROUGH SCIENCE

handbook of good practices

experiments

educational films

lessons scenarios



Erasmus+

**Strategic Partnership**

PIM 2020





***„Ion Creangă” Secondary School***

**lassy**

# **STEPS TOWARDS FUTURE THROUGH SCIENCE**

handbook of good practices

## **Project Team**

***Mr. Marek Zarembski – project coordinator, Secondary School nr. 4, Torun, Poland***

Mr. Izabela Ziętara

Ms. Olga Zoltowska

Ms. Magdalena Kartanas

***Mrs. Gratiela Prodan – Romanian team coordinator, „Ion Creangă” Secondary School”, Iassy***

Mrs. Nicoleta-Cristina Crețu

Ms. Karla Toader

Mrs. Petronela Postolache

Mrs. Ana-Maria Dîrdăreă

Mrs. Anca Crețu

Mrs. Corina Roxana Bârlădeanu

Mrs. Camelia Grigoraș

***Mrs. Aekaterini Garifollou – Greek team coordinator, Secondary School nr.5, Volos***

Mr. Hristos Hristoforiadis

Mrs. Elena Vartolomei

Mrs. Kerasia Margarou

Mrs. Anna Kostaki

***Mrs. Dalila do Nascimento Mestre Chumbinho - Portuguese team coordinator, IBN Mucana School***

Mrs. Maria Teresa de Matos Lopes

Ms. Maria Isabel Mesquita Costa

Ms. Luisa Maria Geraldês Lourenço

## **CONTENTS**

### **Didactic Drafts of Discoverer's Club**

<i>a. Secondary School nr. 4, Torun.....</i>	<i>pag. 6</i>
<i>b. „Ion Creangă” Secondary School, Iassy.....</i>	<i>pag.12</i>
<i>c. IBN Mucana School .....</i>	<i>pag.18</i>
<i>d. Secondary School nr.5, Volos.....</i>	<i>pag.23</i>

### **From Erasmus's participants to Erasmus...**

<i>a. „Ion Creangă” Secondary School, Iassy, Romania.....</i>	<i>pag.28</i>
<i>b. IBN Mucana School, Portugal.....</i>	<i>pag.32</i>
<i>c. Secondary School nr. 4, Torun, Poland.....</i>	<i>pag.36</i>
<i>d. Secondary School nr.5, Volos, Greek.....</i>	<i>pag.40</i>

<b>Instead of conclusions.....</b>	<b>pag.43</b>
------------------------------------	---------------





*TO READ ... TO THINK ... TO CREATE*

# **Erasmus *Discoverer's* Club**

## **DIDACTIC DRAFTS**

Lab experiments



# Starch detection

Aim: to detect starch in different products

*Steps towards future*



Secondary School nr. 4, Torun

## Starch detection

---

Aim: to detect starch in different products

### Ingredients

- tincture of Iodine
- samples of different food (potato, bread, banana.....)

### Utensils

- petri shawles
- dropper

### Instructions

- put some drops of tincture of Iodine onto each sample of food
- observe change of colour
- If the food item contains starch, tincture of Iodine will change its colour from brow into navy blue.

# Tollens' Test

Aim: simple sugar detection (aldose)

*Steps towards future*



Secondary School nr. 4, Torun

## Tollens' Test

---

Aim: simple sugar detection (aldose)

### Ingredients

- aqueous silver nitrate
- aqueous sodium hydroxide
- aqueous ammonia
- glucose solution

### Utensils

- 1 beakers 250ml
- 2 test tubes
- tripod
- dropper
- burner
- test tube clamp

### Instructions

- add 2ml of 0,3M silver nitrate solution into a clean test tube
- add 1 – 2 drops of 0,3M sodium hydroxide solution. Brownish precipitate of silver oxide will be performed
- add 3 M aqueous ammonia solution drop by drop with a dropper until all the silver oxide precipitate is dissolved. Do not excess amount of the ammonia solution. The solution is known as Tollens' reagent.
- add some drops of glucose solution and mix gently by shaking
- warm the mixture in a warm water bath for 5 minutes.
- if the mixture contains aldehyde (glucose), a silver coating will form on the inner surface of the test tube

## Trommer's Test

Aim: simple sugar detection (aldose)

*Steps towards future*



Secondary School nr. 4, Torun

## Trommer's Test

---

Aim: simple sugar detection (aldose)

### Ingredients

- copper sulphate solution
- sodium hydroxide solution
- glucose solution

### Utensils

- 1 beakers 250ml
- 1 test tube
- tripod
- dropper
- burner
- test tube clamp

### Instructions

- add about 2ml of 0,3M sodium hydroxide solution into a clean test tube
- add about 2 ml of copper sulphate solution
- add several drops of glucose solution and shake gently the test tube
- hit the mixture over a burner for a few minutes or put it into a hot water bath
- if the mixture contains aldehyde ( glucose), red precipitate cuprous oxide appears

# Electrolysis of the NaCl solution

Aim: observe the conductivity of salt solutions  
to get some useful products from NaCl



*STEPS TOWARDS FUTURE*

ION CREANGA SECONDARY SCHOOL, IASI

## Electrolysis of the NaCl solution

Aim: observe the conductivity of salt solutions  
to get some useful products from NaCl

### Ingredients

- kitchen salt
- water
- phenolphthalein

### Utensils

- Berzelius beaker
- DC source
- Control light
- Graphite electrodes
- Electrical conductors

### Instructions

1. A solution of salt (NaCl) is obtained
2. The two electrodes are connected to the power source
3. The circuit is closed - the bulb lights up, the electrolysis begins
4. The electrodes release the two gases: Cl<sub>2</sub> and H<sub>2</sub>
5. The solution forms NaOH (sodium hydroxide) which is highlighted with phenolphthalein, which is colored red-carmin
6. The electrolysis process shows the students how salt is used in the chlorosodium industry. The salt is used to obtain the following substances: caustic soda, hydrogen and chlorine.



STEPS TOWARDS FUTURE

ION CREANGA SECONDARY SCHOOL, IASI

# The purification of sodium chloride

Aim: identify the method of sodium chloride purification



*STEPS TOWARDS FUTURE*

*4 October 2019*

ION CREANGA SECONDARY SCHOOL, IASI

# The purification of sodium chloride

Aim: identify the method of sodium chloride purification

## Ingredients

- Distilled water
- Sodium chloride

## Utensils

- Berzelius beaker
- Filtering funnel
- Filter paper
- Spatula
- Stirring sticks

## Instructions

1. The distilled water is poured into a Berzelius beaker, then sodium chloride is added;
2. The mixture is stirred until a solution is obtained;
3. This solution is poured into the filtering funnel in which filter paper has been inserted (it is poured on the stirring stick);
4. Impurities can be observed on the filter paper;
5. A clear solution of sodium chloride dissolved in water is obtained in the Berzelius beaker
6. The obtained solution is used for the process of recrystallization..



STEPS TOWARDS FUTURE

ION CREANGA SECONDARY SCHOOL, IASI

# The Shaping of the Crystalline Structure of NaCl

Aim: to identify the physical and chemical structure of the kitchen salt



*STEPS TOWARDS FUTURE*  
ION CREANGA SECONDARY SCHOOL, IASI

# The Shaping of the Crystalline Structure of NaCl

Aim: to identify the physical and chemical structure of the kitchen salt

## Ingredients

- green plasticine
- red plasticine
- toothpicks

## Utensils

- computer
- video projector

## Instructions

1. Ions of Na are shaped from red plasticine in the shape of a sphere
2. Ions of Cl are shaped from green plasticine in the shape of bigger spheres
3. The spheres shaped above are assembled using toothpicks into a cubic net, according to the presented models.



STEPS TOWARDS FUTURE

ION CREANGA SECONDARY SCHOOL, IASI

## Influence of light on plant development



**Steps Towards Future**

**Agrupamento de Escolas Ibn Mucana**

## Influence of light on plant development

### Materials:

- 6 glass jars;
- Cotton;
- Seed
- Splash of water;
- Shoe boxes;
- Earth;
- Ruler;
- Vessels;
- Labels;
- Pen;
- Scissors;
- Aluminum;
- Sticky tape;

### Procedures:

#### First part of the activity-

1. Put cotton in 6 glass jars;
2. Put in each one of the jars a seed of the same specie;
3. Drink the cotton

#### Second part of the activity:

1. Gather all necessary materials;
2. Chose three plants with the same development;
3. Put earth in the three vessels;
4. Transplant the plants;
5. Identify the vessels with the letters A, B, C;
6. Cut and identify the boxes;
7. Put the plant C in the ambient light, the plant B in a closed box and the plant A in a boxe with a hole;
8. Record over three weeks the development of each of the 3 plants (measure and water).

# What are the nutrients in: milk, egg, potato and oil?

Biuret test, Fehling's solution test, Lugol's test, Filter paper test



**STEPS TOWARDS FUTURE**

5 de novembro de 2019  
Escola Básica e Secundária Ibn Mucana

# What are the nutrients in: milk, egg, potato and oil?

Biuret test, Fehling's solution test, Lugol's test, Filter paper test

**Biuret test** – it's a chemical test used for detecting the presence of peptide bonds, indicating the presence of proteins. If the solution turns purple, protein is present.

**Fehling's solution test** – it's a test used for detecting the presence of monosaccharides (simple sugars). The test has a positive result when there is a red copper precipitate after the mixture is heated.

**Lugol's test** – it's a test used for detecting the presence of starches. The test has a positive result when the mixture turns into dark blue.

**Filter paper test** – it's used for detecting the presence of lipids. If the filter paper becomes translucent (slightly see-through), there are lipids.

## Ingredients

- Aqueous solution of egg white at 20%
- Boiled potato
- Milk
- Distilled water
- Oil
- Aqueous solution of sodium hydroxide at 10%
- Aqueous solution of copper sulfate at 1%
- Fehling's solution A and Fehling's solution B
- Lugol's solution

## Utensils

- Test tubes
- Test tube rack
- Wood test tube holders
- Alcohol burner
- Filter paper
- Pipette
- Dropper / Pasteur pipette

# What are the nutrients in: milk, egg, potato and oil?

## Instructions

### 1. Search for proteins – Biuret test

- Put, in each one of the test tubes (A) 2mL (milliliters) of distilled water, (B) 2mL of egg white, (C) a small portion of potato, (D) 2mL of oil and (E) 2mL of milk.
- Add 2mL of sodium hydroxide to each one of the tubes and stirr.
- Add 3 drops of copper sulfate to each one of the tubes and stirr again.

→ In the test tubes where proteins are present, the solution is purple.

### 2. Search for simple carbohydrates – Fehling's solution test

- Put, in each one of the test tubes (A) 2mL (milliliters) of distilled water, (B) 2mL of egg white, (C) a small portion of potato, (D) 2mL of oil and (E) 2mL of milk.
- Add 1mL of Fehling's solution A and 1mL of Fehling's solution B to each one of the tubes.
- Holding the test tubes with the test tube holder, one at a time, heat them in the alcohol burner until they start to boil.

→ In the test tubes where simple carbohydrates/monosaccharides, there is a copper precipitate.

### 3. Search for starch – Lugol's test

- Put, in each one of the test tubes (A) 2mL (milliliters) of distilled water, (B) 2mL of egg white, (C) a small portion of potato, (D) 2mL of oil and (E) 2mL of milk.
- Add 3 drops of Lugol's solution to each one of the tubes.

→ In the test tubes where starches are present, the mixture is dark blue.

### 4. D – Search for lipids – Filter paper test

- Using filter paper, put a small portion of each one of the foods and register whether it was absorbed or not.

→ In the foods that made the filter paper become translucent (slightly see-through), there is presence of lipids.

# Acid and Base effect upon Oil

Aim: Using bases in detergents

*Steps towards future*



Secondary School nr. 5, Volos

# Acid and Base effect upon Oil

---

Aim: Using bases in detergents

## Ingredients

- de-ionized water
- olive oil
- vinegar
- index tincture
- laundry detergent

## Utensils

- 2 beakers 250ml
- 2 beakers 100ml
- stirring rod
- dropper

## Instructions

1. Pour de-ionized water into beakers.
2. Pour vinegar into the first beaker of 250ml and into the beaker of 100ml.
3. Pour detergent into the second beaker of 250ml and into the beaker of 100ml and stir well.
4. Add some drops of index into the two beakers of 100ml and stir well.
5. Add a few drops of olive oil into the beakers of 250ml and stir well.

Acid and Base effect upon Oil 10/10/2019

# Acid and Base effect upon Oil

Aim: Using bases in detergents

*Steps towards future*



Secondary School nr. 5, Volos

## Acid and Base effect upon Oil

---

Aim: Using bases in detergents

### Ingredients

- de-ionized water
- olive oil
- vinegar
- index tincture
- laundry detergent

### Utensils

- 2 beakers 250ml
- 2 beakers 100ml
- stirring rod
- dropper

### Instructions

1. Pour de-ionized water into beakers.
2. Pour vinegar into the first beaker of 250ml and into the beaker of 100ml.
3. Pour detergent into the second beaker of 250ml and into the beaker of 100ml and stir well.
4. Add some drops of index into the two beakers of 100ml and stir well.
5. Add a few drops of olive oil into the beakers of 250ml and stir well.

Acid and Base effect upon Oil 10/10/2019



# **From Erasmus's participants to ERASMUS**

**testimonials of participating students and  
teachers**





*„I took part in a lot of activities which improved me as a person and helped me learn how to deal with children and adults from other countries, using only English. It was a unique experience.” (Andrei, Romania)*

*„I was impressed by the way the foreign children worked in teams and I was happy to join them.” (Cosmin, Romania)*

*„Each activity was in our interest, with every activity we have increased our knowledge and we found out things that we can use in our daily life, not just in school.” (Alexandra, Romania)*

*„I was very pleasantly surprised to work with my colleagues , but also with other students that are in the project, meeting wonderful people and learning new things about science.” (Cristina, Romania)*

*„I've participated with great interest in many of the activities of this Strategic Partnership, carried out under the auspices of Erasmus, which benefited the Ion Creanga School. There were, indeed, two full years, with constructive mobilities for both, students and teachers involved in the project. For me, as a school manager, this Erasmus project offered me very interesting ideas in terms of modernizing the educational process in our school, but also the achievement of more attractive, more motivating school spaces to support students' motivation to come to school with pleasure. Erasmus Steps Towards Future - #professional development, #examplesofgoodpractice, #interesting activities” (Mrs. Nicoleta Cretu, headmistress)*

*„I was impressed by the way all the students from Portugal, Greece, Poland and Romania worked in groups to make Kahoot. I was very glad to see how our students managed to speak English so well. All the students became more confident in working in groups. I was proud to discover that our students have a lot of knowledge about*

*Biology, Chemistry and Physics and are able to express it in English."*  
(Ms. Anca Cretu, Romania)

*"A project in which I participated with great joy and curiosity! A project in which we tried to put the sciences in the children's soul, but also to put a little soul in the way we approach the sciences ... We hope to have taken some small but important steps towards their future."* (Mrs. Ana-Maria Dărdăreă)

*"The meetings and activities carried out within the Erasmus project were an opportunity to interact intensely with the students and colleagues in the team. Thus, I had the chance to experience intense emotions, to visit beautiful places in the country and in Poland, to realize the advantage offered by this type of projects. It is a pleasure to be part of the Erasmus team!"* (Mrs. Petronela Postolache)

*"From my perspective, the great accomplishment of this project is the extent to which each of us, those involved, have personally developed (new knowledge, English communication, teamwork abilities, adaptation to new situations, socialization, tolerance to diversity)." (Mrs. Corina Bărlădeanu)*

*"This European project was for me the first Erasmus experience and now, at the end of the project, I can say with certainty that all Erasmus stories turned out to be true. I met wonderful teachers in the three partner schools, I had examples of good practice of unquestionable educational quality. I believe, however, that the greatest advantage of the projects of this kind is the opportunity to print the application content of school content, curriculum in general. And the Steps Towards Future project has certainly managed to develop skills and competencies, to guide young people in their educational path.." (Mrs. Gratiela Prodan)*







*„At first, concerning the second mobility, I was hesitant about going to meet new people and a new culture, but all of my fears and insecurities simply vanished as soon as I met my host and his family. they were great people and tried their best to teach me as much as they could about Greece and its culture.*

*During that week, I learned a lot about Greece and about topics related to the project Steps Towards Future such as robotics, industry and many more.*

*Then, in Portugal, for the third mobility, I hosted someone myself, too, a Polish boy. It was kind of difficult at the beginning but getting to know him was easier than what I thought. Since I had such a great experience in Greece, I tried to give him the best experience in Portugal as well, and I hope I did a good job.*

*In conclusion, I have to say I learned a lot about Europe, about jobs and what our future can offer us, and about how easy it is to actually make friends from different parts of the world, if you just put some effort into it. I hope this testimony helps other people, as well, on getting the courage to jump in projects like this in the future and have a great time learning and making new friends.” ( Idálio Câmara, Portugal)*

*„My experienced in Erasmus project was very interesting and I learned a lot of new things. It was a good opportunity to meet new people and know more about Greek traditions and culture. Hosting and being hosted was also a very challenging experience. The Greek family that hosted me was very friendly.*

*During the project we made a lot of activities at school and teachers and students helped during those activities. I enjoyed every*

*moment of the project. It was a lovely experience." (Maria Mendes, Portugal)*

*"The Erasmus+ is a project that changed my life a lot. At first, I was very nervous because it was all new to me ...The thought of going to a country where I had never been to and staying with a host family made me hesitate... but when I arrived in Greece all that fear and nervousness disappeared. The host family was amazing with me, I made new friends, I got to know a new culture, I saw beautiful places and tasted amazing food. But the best of all, was that I learned a lot about Europe and Greece with this project and I also improved my English. I can say that I won a lot with this project and experience. I recommend anyone who has the opportunity to participate and live this incredible xperience!" (Carolina Reis, Portugal).*

*"Taking part in this project has been an amazing experience. As a teacher of Sciences, I could develop new activities with my students in Ibn Mucana (Portugal) and afterwards, in the 5<sup>th</sup> Gymnasium of Volos, during the second mobility. The experiments made in Portugal could be seen abroad and the lesson scenarios will spread it forever. My students and I loved the experience abroad, in Volos. We could all learn new things, and have fun at the same time. As it is the first time I take part in an Erasmus+ project, this experience is quite special for me. In my opinion, the program in Greece was very interesting, specially because it involved students of the four countries. In Ibn Mucana we also developed activities linked with sciences and culture. Poland was another good experience." (Ms. Maria Isabel Mesquita Costa, Portugal).*

*"Taking part in this Erasmus project based in Sciences has been a big challenge to me as I teach Literature and Language. It has made me think about the importance of Chemistry and Biology in everything we breath and consume. I love watching the students doing the experiments and feeling they can learn in a different way with their foreign partners, spreading their horizons of knowledge. Most of the*

*students would never had the chance to be abroad if it weren't this Project. For me, it has also been a challenge to organize the visits and meet the different partners abroad and in Portugal. To know that in Greece, Poland and Romania I can meet teachers with the same interests is also important, as it means we can build up bridges though we are far. I am sure that at the end of the project, students, teachers and families will say "it was worthy". (Mrs. Dalila do Nascimento Mestre Chumbinho, coordinator Portugal Erasmus team)*







*„Erasmus+ was a great adventure for us. It was a chance to improve our skills in English. In an interesting way, we could get familiar with new culture and traditions. One of the more important points of project was a possibility of meeting new people. We still keep in touch with our hosts. Contact with them let us practice English. Of course, this project has given us many fantastic memories that now we have together in a group. The project helped us to develop our knowledge. We took part in numerous lessons where we could do experiments and learn a lot. It was very interesting and exciting part of the project. We can say that the project helped us to become smarter.” (Students Polish Team)*

*„This is the third project Primary School no 4 in Toruń has been working on so far. This is probably the most successful Erasmus project we have taken part in. Not only the topic, but also partners made it possible to develop the project into a very exciting local and international activity. During the project we have taken students to many interesting places to take part in educational workshop. Thanks to cooperation with Nicolaus Copernicus University in Toruń our students could take part in lectures and lab activities organised specially for them. They could learn a lot and feel like real university students.*

*Educational school trips gave us a lot of fun and knowledge. One of the most exciting visits was a visit to the National centre of Nuclear research in Świerk, close to Warsaw. We could even have a look into the very centre of the nuclear reactor. Not many people had done it before.*

*The most exciting part of the project is both for students and teachers were mobilities. It is a unique opportunity to share ideas, experience, and warm feelings between partners. It has made our partnership really strong. Now we are not partners, but close friends.*

*No school should hesitate over whether to take part in Erasmus+ or not. Learning and having friend at the same time is possible only with Erasmus+." (Teachers Polish Team)*









*„What we learn in theory, is eventually put into practice.” (Sofia, Greece)*

*„How meaningful things can get when you see them!” (Dimitris, Greece)*

*„The best lesson ever.” (Stefania, Greece)*

*„I wish we had more classes like that.” (Charalabos, Greece)*

*„It's boring when you only listen. We enjoyed observing, participating, experimenting”. (Nefeli, Greece)*

*“Student's response was enthusiastic.” (Ms Kerasia Margarou, Greece)*

*„My students were intrigued and eager to participate in the experiment. (Ms Anna Kostaki, Greece)*

*It's really important to reach conclusions through observation and experiments. (Mrs Anna Kostaki, Greece)*

*It turned out that successful teaching is a matter of an adequate theoretical background combined with experimental procedure. (Ms Aikaterini Garyfallou, headmistress)*





## Instead of conclusions

*„This is the third project Primary School no 4 in Jorun has been working on so far. This is probably the most successful Erasmus project we have taken part in. Not only the topic, but also partners made it possible to develop the project into a very exciting local and international activity. During the project we have taken students to many interesting places to take part in educational workshop. Thanks to cooperation with Nicolaus Copernicus University in Jorun our students could take part in lectures and lab activities organised specially for them. They could learn a lot and feel like real university students. (Mr. Marek Zarembski, coordinator Erasmus Project)*

*“This European project was for me the first Erasmus experience and now, at the end of the project, I can say with certainty that all Erasmus stories turned out to be true. I met wonderful teachers in the three partner schools, I had examples of good practice of unquestionable educational quality. I believe, however, that the greatest advantage of the projects of this kind is the opportunity to print the application content of school content, curriculum in general. And the Steps Towards Future project has certainly managed to develop skills and competencies, to guide young people in their educational path..” (Mrs. Gratiela Prodan, coordinator Romanian Erasmus team )*

*„Taking part in this Erasmus project based in Sciences has been a big challenge to me as I teach Literature and Language. It has made me think about the importance of Chemistry and Biology in everything we breath and consume. I love watching the students doing the experiments and feeling they can learn in a different way with their foreign partners, spreading their horizons of knowledge. Most of the*

*students would never had the chance to be abroad if it weren't this Project. For me, it has also been a challenge to organize the visits and meet the different partners abroad and in Portugal. To know that in Greece, Poland and Romania I can meet teachers with the same interests is also important, as it means we can build up bridges though we are far. I am sure that at the end of the project, students, teachers and families will say "it was worthy". (Mrs. Dalila do Nascimento Mestre Chumbinho, coordinator Portugal Erasmus team)*

*It turned out that successful teaching is a matter of an adequate theoretical background combined with experimental procedure. (Ms Aikaterini Garyfallou, coordinator Greek Erasmus team)*

## SCIENCE IS AMAZING, SCIENCE IS INSPIRING

*„This is probably the most successful Erasmus project we have taken part in. Not only the topic, but also partners made it possible to develop the project into a very exciting local and international activity. Learning and having friend at the same time is possible only with Erasmus+.” (Marek Zarembski)*

Erasmus+, Steps Towards Future

ISBN:

*The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.*