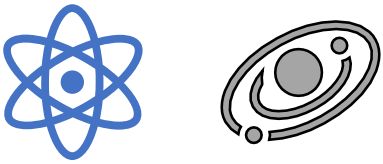
**Ileana Cătălina Nicolaescu** **Florica Constantinescu**

# *New environment and possibilities of teaching science*

Romanian / Polish / Italian / Turkish



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**Erasmus+ | Science Is Cool! | 2019-1-RO01-KA229-063363**

## Introduction

Liceul tehnologic de Transporturi Auto Targoviste provides a favourable learning environment, a quality, attractive vocational and technical education, equal opportunities for professional development, responsibility, tolerance, dialogue, mobility in the light of European values.

Teachers are challenged to make the most effective use of the Erasmus+ programme to engage pupils with learning difficulties, which is why we have decided under the Erasmus+ programme to establish a strategic partnership with other schools in the European Union.

Therefore, between 01.09.2019 and 31.10.2022 within the Erasmus+ project, key action 2 - cooperation for innovation and exchange of best practices, we are carrying out the strategic partnership in the field of school - inter-school exchange partnership entitled "Science is cool!"

The partners in the project are:

Liceo Scientifico Pasolini Potenza, Italy

Primary School in Gorzyce Wielkie, Poland

Bayrakli Nuri Atik Mesleki Ve Teknik Anadolu Lisesi, Turkey

The aim of the project is to introduce into the educational practice of the partner schools new approaches regarding integrated science learning, the acquisition by pupils of learning skills and competences that facilitate the understanding of scientific concepts and increase pupils' interest in studying science.

The objectives are:

O1. Improve the quality of science lessons, integration of ICT, non-formal methods through cooperation in European context in the field of education by the end of the project.

O2 improving specific skills to increase the graduation rate upon graduation and obtaining a successful job in the market economy within the next 2 years.

O3. development of social skills, communication skills in European languages, mutual knowledge, self-knowledge through participation in European programmes.

This brochure is the result of the meeting of the project partners in Poland at Szkola Podstawowa im. Ignacego Ulatowskiego w Gorzycach Wielkich in the period 04-08.04.2022 called "The importance of the experiment". Each team presented different laboratory sheets that were and will be used in the learning process in the partner schools but also by other teachers.

The brochure can be accessed free of charge on both the project website and the school's website.

Project coordinator,
Prof. Constantinescu Florica

**Activity sheet - Biology**

**Class: Xth**

Theme: ***Bean seed and seedling***

Benchmarks/Specific Competencies:

- starting from a very simple material, you will know the general organization of a very young plant;

- you will be able to demonstrate that the seed includes, in an embryonic state, all the organs of this plant.

Materials distributed to groups of 4 students: bean seeds soaked in water starting 24 hours before; bean seedlings of 25, 15 and 5 days (germination is carried out in boxes with moist soil; to dislocate the seedlings, insert the box, in which they germinated, into a larger vessel with water); magnifying glass (binocular if possible); forceps, scalpel.

*I. Observation of seedlings*

The root system includes the main root and the secondary roots or radicles (of the first order, of the second order...). Handle live material with forceps.

Recognize the main root and study the arrangement of the rootlets. To do this study, observe the youngest seedlings first. How many first-order roots does such a seedling have on average? Determine the arrangement of the roots of the second order. Observe with a magnifying glass the point of insertion of a certain root. Does it come from the periphery or the inside?

Distinguish, at a 25-day seedling, the main root. Investigate its tip.

Make the sketch of the root with the legend in your notebooks.

Aerial organs Examine the cotyledons (or the scar left by them, if they have fallen) in the 3 types of seedlings. Note the shape of the cotyledons, their color, the place of insertion in relation to the package.

The axis located below the cotyledons is the hypocotyl axis (stem) and the one located above is the epicotyl axis (the actual stem). The latter develops from the germ of the embryo.

On the 25-day seedling, notice the first node and the two leaves that insert here (simple and opposite leaves), then the other nodes and leaves. Are these also simple and opposite? What do you notice at the base of the leaves and at the tip of the epicotyl axis? Write down the answers.

Make the sketch of the aerial organs with the legend.

*II: Observation of the seed*

Seminal Integument Draw a seed - face and profile. Indicate the hilum (the scar of insertion in the fruit) and the micropyle (the indentation adjacent to the hilum). Dissect a seed and you will notice that the radicle is directed towards the micropyle. Press a seed soaked in water between two fingers. A drop of liquid will come out of the micropil.

The shelled seed Identify the cotyledons and the radicle. Remove a cotyledon. The other cotyledon remains with the rest of the embryo. Observe, interpret and draw.

*III. Complementary activities*

After the morphological study of the seeds of another species, place them in a moist substrate - cotton wool, moss or earth. Follow the transformations daily and draw the observed ones every two or three days. Date the sketches. Interpret the results, comparing with previous studies. We suggest you study the seed and its germination in peas. The comparison between the two species is an easy and interesting exercise.

***Evaluation sheet***

***Performing a microscopic observation***

| ***Evaluation criteria*** | ***At least*** | ***Success criteria*** |
|---|---|---|
| 1. The microscope is functional | 1.5 | The position of the microscope<br>Fixation of the blade with the microscopic preparation<br>Clarity done right |
| 2. Handling objectives | 1.5 | The lens used corresponds to the requirements / the lenses are used in ascending order of magnification / the choice of the lens is adapted to the observed object |
| 3. Vises are used correctly | 1.5 | Macrometric vise used for low or medium magnification objectives<br>The micrometer vise used for the high-magnification objective |
| 4. The biological object to be observed is well chosen and easily observable | 3 | The most favorable region for observation is well centered<br>The adjustments are fine |
| 5. The microscope is delivered in working condition | 1.5 | The lamp is unplugged and the mirror in a horizontal position<br>The lens that magnifies the weakest is positioned<br>The microscopic preparation is withdrawn from under the objective and reinserted into the box. |
| 6. Points awarded ex officio | 1 | |

**Physics**

***Experimental activity sheet*** (FAE 1)

**Subject**: Determination of the focal length of a thin converging lens.

**Objective**: Calculate the focal length of a converging lens using the lens formula.

**Didactic material**: optical bench, candle (S), opaque screen (E), converging lens (L), supports.

**Theoretical presentation**: The lens is thin if its thickness is smaller than its focal length. Using the notations specific to the object-lens and image-lens distances, we calculate the focal length using the first fundamental formula of thin lenses:

**Procedure**:

1) Place the candle, the lens and the screen, each on a support, on the optical bench.

2) center the system.

3) light the candle.

4) move the screen until you catch the clear image of the object.

5) write down the values for $-x_1$ and $x_2$ in the table

6) changing the distance from the candle to the lens 2 more times, repeat steps 4-5.

7) calculate the focal distance using the above formula, passing the value obtained in the table.

| Nr. crt. | $-x_1$ (cm) | $x_2$ (cm) | f (cm) | f (cm) |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

The average focal distance calculated with the data found experimentally is …….. cm.

**Physics**

***Experimental activity sheet*** (FAE2)

**Subject**: the analysis of the image of an object through the converging lens.

**The objective**: the experimental verification of the construction of the image of a luminous object in the case of the converging lens.

**Didactic material**: candle (S), converging lens (L), screen (E), optical bench.

**Procedure**:

1) construct the image of an object AB given by the converging lens for each situation in the table below (represented graphically in the indicated column).

2) Experimentally verify constructions 2, 3, 4 and 6 from the table using the lens from FAE 1 whose focal length you know.

3) Complete the table with the rest of the required information.

| **IMAGE** | **OBJECT** | | | |
|---|---|---|---|---|
| Object-lens distance Image type | Geometric construction | Image-lens distance | Real/ virtual Right/ inverted β | Magnification Subunit/ supraunit Positive/ negative |
| $x_1 = -\infty$ | | | | |
| $x_1 \in (-\infty; -2f)$ | | | | |
| $x_1 = -2f$ | | | | |
| $x_1 \in (-2f ; -f)$ | | | | |
| $x_1 = -f$ | | | | |
| $x_1 \in (-f ; 0)$ | | | | |

## Chemistry

### *I. Laboratory experimental activity sheet*

Determination of the acid-base character, the concentration of hydronium ions and the pH of a solution on the work table.

| **Substances and tools** | **Method of work** | **Processing the results** |
|---|---|---|
| 1. vinegar, ammonia, milk, coca-cola, soda, mineral water, plain water, tap water<br>2. distilled water<br>3. filter paper<br>4. Brezelius glasses<br>5. Digital pH meter or pH sensor | 10-15 ml of the sample to be analyzed from the work table are introduced one by one into different Berzelius glasses. Rinse the pH meter or pH sensor with distilled water and wipe off traces of water with filter paper*. Insert the digital pH meter or the pH sensor into the sample beaker and read the pH value on the screen. It is then compared with the pH value from the pH scale and the character of the solution is identified. The concentration of hydronium ions [H3O+] is then calculated. *After each determination, the pH meter or pH sensor is prepared as above. | pH = …….. .<br>The solution has a …… character.<br>The concentration of hydronium ions is [H3O+] = ……. . |

### *II. Laboratory experimental activity sheet*

Identifying the acid-base character of some solutions on the work table and their pH

| **Substances and tools** | **Method of work** | **Processing the results** |
|---|---|---|
| 1) vinegar, ammonia solution, milk, coke, soda, mineral water, plain water, tap water, wine, distilled water<br>2) pestle with distilled water<br>3) filter paper<br>4) 10 Brezelius glasses of 100 ml<br>5) 1 Berzelius glass of 250 ml<br>6) 10 test tubes<br>7) Digital pH meter and pH sensor<br>8) 2 glass wands<br>9) pH paper<br>10) phenolphthalein, methyl orange, litmus | 1. The acid-base character of the solutions in the 10 Berzelius glasses is tested using liquid acid-base indicators, as well as pH paper, by immersing the glass sticks in the solutions and then touching the pH paper sticks, respectively by dripping the liquid indicators into test tubes<br>2. The exact value of the pH of the solutions on the work table is determined with the help of the digital pH-meter or the pH sensor.<br>1. The observations are noted in the last column of the experimental activity sheet. | Vinegar has character ……. and its pH is ……. .<br>The ammonia solution has a …… character. and its pH is ……<br>Milk has character ……. and its pH is …..<br>Coca-cola has character ……. and its pH is ……<br>Fanta has character ……. and its pH is ……<br>Mineral water has a …… character. and its pH is ……<br>Flat water has a …… character. and its pH is ……<br>Tap water has a …… character. and its pH is ……<br>The wine has character ……. and its pH is ……<br>Distilled water has a character of ……. and its pH is …….. . |

**Electricity**

***WORKSHEET***

The title of the laboratory work: **Ampermeter calibration**

***Targeted work skills***:

Specific competence: determining the metrological characteristics of measuring devices

**Derived competences**:

Cd1 – to identify the devices and devices made available;

Cd2 – to carry out the assembly correctly according to the scheme;

Cd3 – to handle devices and devices;

Cd4 – to read measuring devices correctly;

Cd5 – write down the collected data correctly;

Cd6 – calculate the errors, determine the accuracy class of the device and the metrological characteristics;

Cd7 – to formulate personal conclusions on the content of the work;

Cd8 – to correctly mark the scale of the calibration device;

Cd9 – to comply with work safety regulations.

**Theoretical support**:

To perform the work, students must know:

- The role of each device and device in the circuit;
- The field of use of ammeters;
- Metrological characteristics of measuring devices;
- Correct installation of ammeters in the circuit and the consequences of incorrect installation;
- How to connect the circuit elements;
- Correct reading of devices;
- Error determination relationships.

**Way of working**:

Carefully analyze the work schedule

The necessary devices in the shelf are identified

The assembly is carried out according to the scheme provided by the teacher

The value of the current intensity is adjusted for integer values on the calibration device (1, 2, 3, 4, 5A) read on the calibration device

The current intensity is varied up and down and the values read on the standard ammeter and on the ammeter to be calibrated are noted.

Calculate the average of the increasing values and the average of the decreasing values indicated by the standard ammeter, at whole values of the current read on the calibration device

The average of the indications of the standard apparatus (in ascending and descending order) is compared with the average of the indications of the device to be calibrated.

The results of the readings and calculations will be entered in the following table

| **Current ammeter standard** | | | **Ammeter current to calibrate** | **$\Delta I=I_2-I_1$** |
|---|---|---|---|---|
| Ascending measurements | Descending measurements Average | Average | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Physics**

**Worksheet**

Topic: ***Determination of volume - Laboratory work***

I.

1. **The purpose of the work**: Determining the volume of irregularly shaped bodies

2. **Materials needed**: Irregular shaped body (eg a key), graduated cylinder (scale), water.

3. **Working method**:

• Pour water into the measuring cup and read the volume of the water (Vi ). Record the data in the table below.

• Insert the body into the graduated cylinder and read the new volume (Vf ).

• Calculate the volume of the body as follows: V = Vf - Vi

• Repeat the above operations at least 5 times

4. **Data processing**:

Calculate and write the result in the form: V = Vm ± Δ Vm

| Number | $V_i$ ($cm^3$) | $V_f$ ($cm^3$) | V ($cm^3$) | $V_m$ ($cm^3$) | Δ V ($cm^3$) | Δ $V_m$ ($cm^3$) |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |

II.

1. **The purpose of the paper**: Determining the volume of regularly shaped bodies

2. **Required materials**: Body of regular shape (e.g. parallelepiped), ruler.

3. **Working method**:

• Measure length (L), width (l) and height (h) in turn. Record the data in the table below.

• Calculate the volume of the body as follows: V = L · l · h

• Repeat the above operations at least 5 times

4. **Data processing**:

Calculate and write the result in the form: V = Vm ± Δ Vm

| Număr măsurare | **L** (cm) | ***l*** (cm) | **h** (cm) | **V** ($cm^3$) | $\mathbf{V_m}$ ($cm^3$) | **Δ V** ($cm^3$) | **Δ $V_m$** ($cm^3$) |
|---|---|---|---|---|---|---|---|
| 1. | | | | | | | |
| 2. | | | | | | | |
| 3. | | | | | | | |
| 4. | | | | | | | |
| 5. | | | | | | | |

## Physics

### Worksheet

***Theme: <u>Melting. Solidification – Laboratory work</u>***

**1.** ***Purpose of the work:*** Determination of the melting-solidification temperature. Graph.

**2.** ***Theoretical considerations*****:**

| | **Melting** | **Solidification** |
|---|---|---|
| **Definition** | The process of transferring the substance *from the solid state to the liquid state*, at a well-determined temperature, is called **melting** | The process of passing the substance *from* the *liquid state to the soli stategives*, at a well-determined temperature, is called **solidification** |
| **Heat transfer** | Receive warm | Gives off heat |
| **Temperatures** | $T_{Melting}$ = $T_{Solidification}$ | |

**3. *Materials required:*** stand, test tube in which there is a quantity of naphthalene in solid (liquid) state, thermometer, gas bulb, paper with mathematical line, millimeter paper.

**4. *Procedure:***

Arrange the bodies as in the next figure

| Melting | Solidification |
|---|---|
| ▪ Ignites the gas and records the evolution of temperature over time | ▪ After bringing the liquid to a temperature above the melting temperature, extinguish the gas and record the temperature of the liquid naphthalene |
| ▪ Repeat the experiment using larger or smaller amounts of naphthalene. | ▪ Repeat the experiment using larger or smaller amounts of naphthalene. |
| ▪ Read at least 5 times, the temperature $T_t$(ºC) after different time intervals $t_t$(s) | ▪ Read at least 5 times, the temperature $T_s$(ºC) after different time intervals $t_s$(s) |

**5. *Data processing:***

Pass the data in the table below and draw the graph of the time temperature dependence

| Measurement number | $T_t$ (ºC) | $t_t$ (s) | $T_s$ (ºC) | $t_s$ (s) |
|---|---|---|---|---|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |
| 7. | | | | |
| 8. | | | | |

**6. *Conclusions:***

1. The melting of a solid occurs at a certain ....., called *the melting temperature*.
2. Throughout the melting period, the temperature of the solid-liquid mixture remains .....
3. The solidification of a liquid occurs at a certain .....
4. Throughout the melting period, the temperature of the solid-liquid mixture remains .....
5. For the same substance, the temperature of ..... is equal to the temperature of ..... (at the same pressure).

**Chemistry**

**Laboratory fiche No. 1**

- Determine the density of the liquid in flask No. 1 by the areometric method and by the picnometric method. To note in the comparative table the obtained data. Two determinations will be made.
  1. **Necessary materials**: 1. Measuring cylinder, 100 ml;
     2. The liquid to be analyzed;
     3. Areometers (densimeters);
     4. Pycnometer;
     5. Analytical balance.
- **How to work for the areometric method**:
  a. fills the measuring cylinder to the 100 ml mark;
  b. slowly, carefully inserts the areometer into the liquid;
  c. read the density indicated by the graduation;
  d. notes the result in the table in the worksheet
  e. the second determination is carried out with another densimeter.
- **Procedure for picnometric method**:
  1. Weigh the empty pycnometer;
  2. Weigh the full pycnometer to the mark with distilled water;
  3. Weigh the picnomter filled with the liquid to be analysed;
  4. All the data obtained shall be noted on the worksheet;

5. The calculation formula is applied and the results are noted in the table;
6. The results obtained shall be compared and the final conclusions shall be drawn up;
7. The results are communicated by the expert of the group of the entire class, after the demonstration work is carried out, in front of the class; the other colleagues will follow the correctness of the determination and will observe the way of working; they can intervene if the situation so requires.

- At the same time, the determination of the density of a solid body (wood, AAC) can be performed.
- **Procedure**: The sides of the parallelepiped are measured, the data obtained in the volume determination formula are noted, the volume calculation is performed, the body is weighed, the density calculation formula is applied.

| No. determination | Areometric method ρ 1 (g/cm3) | Picnometric method ρ 2 (g/cm3) | Differences |
|---|---|---|---|
| 1 | | | |
| 2 | | | |

## Laboratory fiche No. 2

a. Volume measurement with burette, pipette, measuring cylinder
- principle of the method .....
- reagents used: …….

- realization of the titration installation
- the titration itself
- recording the data on the sheet
- V 1 = the initial volume of the burette
- V2 = final volume (remaining)
- V= V1-V2

b. **materials**: burette, distilled water, HCl, NaOH, phenolphthalein, methyloxide, Berzelius glasses, graduated cylinder, pipette, tweezers, indicator paper, Hanna pH-meter, white porcelain plate

c. determination of pH with Hanna pH-meter
d. pH determination with pH indicator paper

- **Procedure**

1. place a few drops of indicator in different samples
2. compare color with table data
3. take with tweezers the indicator paper that is inserted 1 second in the sample, fix the paper on the white plate
4. compare with the color on the color scale
5. the pH of the samples is established.

| POINTER | Acidic environment | Neutral environment | Basic environment |
|---|---|---|---|
| Phenolphthalein | Colourless | Colourless | Pink-purple |
| Methyloxide | Red | Orange | yellow |

**Results obtained:**

## Laboratory fiche No. 3

Prepare a solution of a certain concentration using the mixing rule and the percentage concentration formula
A= 50%; B=20%; C=25%
Determine the quantity in ml and parts of solution A and B to obtain by mixing solution C of the given concentration (25%)

- Prepare a quantity of 100 ml solution of NaCl C = 50% (solution A) and a quantity of 100 ml of NaCl solution C = 20% (solution B)
- From the calculation formula according to the rule of mixtures will be determined how many parts (ml) of each solution we will mix to result in solution C of 25% concentration
- A%+B%=C%; C-B=parts A; A-C=parts B

## Laboratory fiche No. 4

To prepare 500 ml of NaCl solution of 20% concentration.

**Stages of preparation**

- Making the necessary calculations
- Weighing of solids
- Measurement of liquid volumes
- Introduction of solids into the quoted flask
- Washing with distilled water
- Stirring the quoted flask for dissolving
- Addition of distilled water
- Rest for a few minutes
- Filling up to the sign.

## Laboratory sheet

| Experiment | Reagents and utensils | Procedure | Results obtained |
|---|---|---|---|
| Preparation of a 20% percentage solution | Analytical balance<br>Salt<br>Glass funnel<br>Volumetric balloon<br>Kitty<br>Distilled water | Follow the stages of preparation | |

**Biology**

**Activity sheet**

Class: Xth

Theme: **Seedand bean plantula**

Specific reference objectives/competences:

- starting from a very simple material, you will know the general organization of a very young plant;
- you will be able to prove that the seed includes, in its embryonic state, all the organs of this plant.

Materials distributed to groups of 4 pupils: bean seeds soaked with water starting 24 hours before; bean seedlings of 25, 15 and 5 days (germination is carried out in boxes with moist soil; to dislodge the seedlings, insert the box, in which they have germinated, in a larger bowl of water); wolf (binocular if possible); brush, scalpel.

### *I. Observation of seedlings*

The root apparatus comprises the main root and the secondary roots or radiceles (of order I, of order II...). Handle the living material with the pensa.

Recognizethe main root and research the arrangement of the radiceles. To do this study, first observe the youngest seedlings. How many first-order radicles does such a plant have on average? Determine how to arrange the second order radiceles. Notice with the magnifying glass the insertion points of any radicele. Does it come from the periphery or from the inside?

Distinguish, in a 25-day plant, the main root. Investigate the tip of it. Make in your notebooks the sketch of the root with the legend.

Investigated aerial organs, in the 3 types of seedlings, the cotyledons (or the scar left by them, if they have fallen). Write down the shape of the cotyledons, their color, the place of insertion in relation to

the package. The spindle located under the cotyledons is the hypocotyl axis (stem) and the one located above is the epicothyl axis (the stem itself). The latter develops from the gemula of the embryo.

At the 25-day plantula you notice the first node and the two leaves that are inserted here (simple and opposite leaves), then, the other knots and leaves. Are they also simple and opposite? What do you notice at the underside of the leaves and at the end of the epicole spindle? Write down the answers.

Make the sketch of the aerial organs with the legend.

### *II: Observation of the seed*

Seminal integument Draw a seed – face and profile. Indicate the helium (the scar of insertion into the fruit) and the micropile (the recess adjacent to the hilul). Do the dissection of a seed and you will notice that the radicula is directed towards the micropile. Press between two fingers a seed soaked with water. From the micropile will come out a drop of liquid.

Decorticated seed Identify the cotyledons and radicula. Remove a cotyledon. The other cotyledon remains with all the rest of the embryo. Observe, interpret, and draw.

### *III. Complementary activities*

After the morphological study of the seeds of another species, place them in a moist substrate – cotton wool, moss or earth. Track the transformations daily and draw the observed ones every two to three days. Date the sketches. Interpret the results, comparing with previous studies. We suggest that you study the seed and its germination in peas. Comparingthe relationship between the two species is an easy and interesting exercise.

## Math - Recap sheet

**Theme**: ***"Decompositions into factors using abbreviated calculation formulas" - Mosaic method***

Class XIIth

Mosaic is a method based on collaboration between students. After each student becomes an "expert" through learning, he/she must in turn teach the other colleagues in the group the assimilated aspects related to the studied topic.

The class is divided into groups of 3 students. Each student of a group receives one of the sheets: The Green Badge, the Blue Badge or the Red Badge. Now the expert groups are formed: the students who have the green badge form the expert group Green Badge, the students who have the blue badge form the expert group Blue Badge, and the students who have the red badge form the expert group The Red Badge.

● ***Expert sheet: The green badge***

Exercise 1. Read one sentence at a time and fill in where appropriate. Two students calculate the area of the rectangle.

Who calculated the area correctly?

The area was correctly calculated by .....

Complete the phrase to get a true relationship: $a^2 - b^2 =$ .....

This is a method of decomposition into factors using an abridged calculation formula.

Exercise 2: Break down into factors using the model below:

$16x^2 - 9 = (4x)^2 - 3^2 = (4x - 3)(4x + 3)$

a) $x^2 - 25 =$

b) $x^2 - 81 =$

c) $4x^2 - 9 =$

d) $25x^2 - 4 =$

e) $9x^2 - 5 =$

f) $3x^2 - 1 =$

g) $5x^2 - 7 =$

h) $49x^2 - 16y^2 =$

Exercise 3. Together with your teammates you find a way to convey to your colleagues what you have learned.

● ***Expert sheet: Red badge***

Exercise 1. Read one sentence at a time and fill in where appropriate.
Two students calculate the area of the large square.
Who calculated the area correctly?
The area was correctly calculated by .....
Complete the phrase to get a true relationship: $a^2 + 2ab + b^2 =$ .....
This is a method of decomposition into factors using an abridged calculation formula.

Exercise 2: Break down into factors using the model below:
$16x^2 + 24x + 9 = (4x)^2 + 2 \cdot 4x \cdot 3 + 3^2 = (\ 4x + 3\ )^2$

a) $x^2 + 10x + 25 =$
b) $x^2 + 18x + 81 =$
c) $4x^2 + 12x + 9 =$
d) $25x^2 + 20x + 4 =$
e) $9x^2 + 6x + 1 =$
f) $36x^2 + 60x + 25 =$
g) $25x^2 + 10x + 1 =$
h) $49x^2 + 56xy + 16y^2 =$

Exercise 3. Together with your teammates you find a way to convey to your colleagues what you have learned.

● ***Expert sheet: The blue badge***

Exercise 1. Read one sentence at a time and fill in where appropriate.
Two students calculate the area of the blue square.
Who calculated the area correctly?
The area was correctly calculated by .....
Complete the phrase to get a true relationship: $a^2 - 2ab + b^2 =$ .....
This is a method of decomposition into factors using an abridged calculation formula.

Exercise 2: Break down into factors using the model below:
$16x^2 - 24x + 9 = (4x)^2 - 2 \cdot 4x \cdot 3 + 3^2 = (\ 4x - 3\ )^2$

a) $x^2 - 10x + 25 =$
b) $x^2 - 18x + 81 =$
c) $4x^2 - 12x + 9 =$
d) $9x^2 - 30x + 25 =$
e) $9x^2 - 6x + 1 =$
g) $25x^2 - 30x + 9 =$
h) $49x^2 - 56xy + 16y^2 =$

Exercise 3. Together with your teammates you find a way to convey to your colleagues what you have learned.

**Information technology**
**Laboratory fiche**

Theme: **Internet**
Class XIIth

**1.** Search the web for information about the mammal called **a bear**.

**a.** Identify the name of the country with the largest population of brown bears in the European Union (about 40% of the total existing in the European Union) and write it in a Word file. Save the file with the name "***Bear***".

**b.** Save in your personal directory (folder), as a web page, only HTML (HTML only), with the default name, the web page from which you took the information from point **a**.

**c.** Copy to the "***Bear***" file a paragraph about the panda bear, an image of such a mammal, as well as the addresses of the web pages from which you copied each of the mentioned content elements.

**2.** Search the web for information about the Romanian Athenaeum.

**a.** Write in a Word file the number of episodes in the history of the Romanian people represented on the fresco in the concert hall. Save the file with the name "***Athenaeum***".

**b.** Save in your personal directory (folder), as a web page, only HTML (HTML only), with the default name, the web page from which you took the information from point **a**.

**c.** Copy in the "***Athenaeum***" file a paragraph about the Romanian Athenaeum, an image of the interior of the Romanian Athenaeum, as well as the addresses of the web pages from which you copied each of the mentioned content elements.

## Information technology
## Laboratory fiche

**Class Xth**

Make an electronic presentation with the theme "Planets of the Solar System". On each slide, a planet is described by adding planet-specific text and images.

Add animation effects as suggestively as possible to inserted objects. Animation effects must start on their own, without user intervention.

Apply transition effects to each slide that start automatically after 3 seconds.

Save the presentation with the name "Solar System" in your personal folder.

## Laboratory fiche

**Class Xth**

Make a documentary in PowerPoint in which to present some of your favorite animals (at least 5 animals) by adding text and images specific to each animal.

Add animation effects as suggestively as possible to inserted objects. Animation effects must start on their own, without user intervention.

Apply transition effects to each slide that start automatically after 3 seconds.

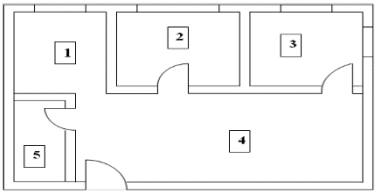
Save the file with the name "Documentary" in your personal folder.

## Electrical equipment

Theme: ***Categories of low voltage electrical installations - electrical lighting installations***

**Laboratory fiche**

The next picture represents the plan of a two room apartment.




1. To place the incandescent lamps, the necessary switches
2. To draw the electrical circuit of light in mounting on the plaster
3. To fill in the technological sheet for the light installations of the apartment (living room - 6 incandescent lamps, 1-lamp bedrooms in the ceiling and 1 on the wall / each, kitchen / bathroom - for each of them an incandescent lamp

For the following types of installations: Library/ Office, Kitchen, Dining Room, Bedroom 1, Bedroom 1 Bathroom, Bedroom 2 Bathroom, Bedroom 2, list: waterelectrical rates used, quantity, SDVs used, defects that may occur during the technological process, fixes.
List the stages of the technological process.

*Observations*:
According to the presented method, the students learned at home by watching video clips/presentations and/or by reading information from sources indicated by the teacher or identified by their own documentation.
In class, the concepts will be clarified, there will be debates, the worksheet will be filled in.
Students will work in a group, help each other and interevaluate each other

## Laboratory sheets

**Theme 1: Determination of the density of solids by measuring volume and mass**

***Principle of the method***

The method is applied to solid bodies of a regular shape which make it possible to determine the volume by measuring the dimensions and to determine the mass by weighing.

***Materials and utensils***

1. analytical balance
2. graduated ruler
3. bodies with regular form

***Procedure***

1. measure the dimensions of the body with regular shape
2. the mass of the body is determined by weighing at the analytical balance
3. calculate the density of the substance (material) of which the body is made up.

***Recording of results***

| Group of pupils | Body dimensions (cm) | | | Body volume V ($cm^3$) | Body mass m (g) | Density ρ ($g/cm^3$) | Average density $\rho_m$($g/cm^3$) |
|---|---|---|---|---|---|---|---|
| | L (cm) | l (cm) | h (cm) | | | | |
| Grupa 1 | | | | | | | |
| Grupa 2 | | | | | | | |
| Grupa 3 | | | | | | | |

***Calculation of results***

The following calculation formulae is used to determine **the density of a solid**.

V = L x l x h

$$\rho = \frac{m}{V}$$

**Theme 2: Determination of the density of liquid substances with the aid of densimeters**

***Principle of the method***

The measurement principle is based on the observation that the depth of immersion of the densimeter varies inversely with the density of the liquid.

***Materials and utensils***

- ✓ sample to be analyzed
- ✓ densimeter
- ✓ glass cylinder

The densimeters are made of glass and consist of a float and a sledding chamber for maintaining verticality, which can be filled with mercury, in a determined quantity

***Procedure***

- ✓ the test sample is embedded in a glass cylinder
- ✓ insert the densimeter, well cleaned and dried, so as not to touch the walls of the cylinder
- ✓ read the densimeter looking at the tangent at the surface of the liquid

**Obs**. The densimeter is held by the tip of the rod and inserted slowly so that leaving it out of hand does not sink more than it has to float, because watering increases its weight and the measurement result is less accurate

***Recording of results***

| Grupa de elevi | Densitatea $\rho$ (g/cm$^3$) | Densitatea medie $\rho_m$(g/cm$^3$) |
|---|---|---|
| Grupa 1 | | |
| Grupa 2 | | |
| Grupa 3 | | |

## Theme 3: Determinarea densităţii substanţelor lichide cu ajutorul picnometrelor

***Principle of the method***

The method is based on the determination of the mass of an exact measured volume of the liquid to be analysed.

***Materials and utensils***

- ✓ sample to be analyzed
- ✓ Pycnometer
- ✓ analytical balance
- ✓ berzelius glass
- ✓ Erlenmeyer glass
- ✓ distal water

Pycnometers are glass vessels with a certain capacity (2-250cm$^3$) calibrated and of different shapes, used for the determination by weighing of the density of liquid substances. The working temperature and capacity of the pycnometer are engraved on its outer wall. The neck of the pyndometers is sanded inside and closes tightly with a ground-fruited stopper, through the middle of which a capillary orifice is practiced.

Of all the known procedures for determining the density of liquids, the pycnometer method is the most accurate.

***Procedure***

1. weigh the empty pycnometer together with its stopper at the analytical balance to the nearest 0,0002 g and note **$m_1$- the mass of the empty, clean and dry pycnometer in grams.**

2. fill the pycnometer with distilled water, remove the excess water output through the stopper by means of a filter paper and weigh to the analytical balance and note **$m_2$ - the mass of the pycnometer with distilled water at 20 °C in grams**.
3. fill the pycnometer with the liquid to be investigated, carefully place the stopper, wipe it by means of a filter paper and weigh it to the analytical balance and note **$m_3$ - the mass of the product pycnometer at 20 °C in grams.**

***Recording of results***

| Group of pupils | Mass of the empty pycnometer $m_1$ (g) | Mass of the water pycnometer $m_2$ (g) | Mass of the liquid pycnometer $m_3$ (g) | Density relative ρ ($g/cm^3$) | Relative density average $\rho_m$($g/cm^3$) |
|---|---|---|---|---|---|
| Grupa 1 | | | | | |
| Grupa 2 | | | | | |
| Grupa 3 | | | | | |

***Calculation of results***

In order to determine **the relative density of** any liquid, the following calculation formula is used.

$$d^{20}{}_{20} = \frac{m_3 - m_1}{m_2 - m_1}$$

where: $m_1$ – the mass of the empty, clean and dry pycnometer in grams.
$m_2$ – the mass of the pycnometer with distilled water, at 20 °C, in grams.
$m_3$ – the mass of the product pycnometer at 20 °C, in grams.

**Physics**

Lesson theme: **Measuringthe density of solids**
Class **IXth**

**Laboratory sheet No. 1**

1. Determine the density of the tan with the help of hydrostatic balance.

   Fill in the table:

| Practical determinations [g] | ρ Bronze [ g/cm$^3$] |
|---|---|
| $m_1$ =<br>$m_2$= | |
| $m_1 - m_2$= | $\rho_{bronze}$ = ..... [ g/cm$^3$] |

2. Indicate 3 labor protection rules that you have observed in carrying out your practical work.

**Laboratory sheet No. 2**

1. Determine the density of cast iron using the hydrostatic balance.

   Fill in the table:

| Practical determinations [g] | ρ Cast iron [ g/cm$^3$] |
|---|---|
| $m_1$ =<br>$m_2$= | |
| $m_1 - m_2$= | $\rho_{cast\ iron}$ = ..... [ g/cm$^3$] |

2. Indicate 3 labor protection rules that you have observed in carrying out your practical work.

**Laboratory sheet No. 3**

1. Determine the density of aluminum using hydrostatic balance.

   Fill in the table:

| Determinări practice [g] | ρ Aluminum [ g/cm$^3$] |
|---|---|
| $m_1$ =<br>$m_2$= | |
| $m_1$ - $m_2$= | ρ $_{aluminiu}$ =.....[ g/cm$^3$] |

2. Indicate 3 rules of labor protection that you have observed in carrying out the practical work.

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