

Lesson Plan **HEUREKA COLOURFUL CHEMISTRY**

The “Emil Racovita” Secondary School in Galatzi, Romania has carried out a laboratory chemistry activity on acid-base indicators.

Aura Cozmaciuc, the chemistry teacher, and her 16 and 17 year-old students have used the Heureka colourful activity (link) available both on the Xplora portal and on the Xplora Knoppix DVD.

The main aim of the activity was to familiarise students with the acid-base indicators and to let them understand the importance of these indicators in featuring the environment.

Lesson type: laboratory workshop

Operational objectives:

- to define acid-base indicators;
- to classify acid-base indicators;
- to perform some experiments and to indicate the environment reaction using acid-base indicators.
- to understand the importance of those substances

Learning approaches used:

- conversation;
- experiments;
- independent observation;
- explaining;
- controlled or independent discovery;
- brainstorming.

Didactical tools:

- chemical substances,
- laboratory utensils,
- working record,
- Heureka colourful chemistry lesson, from the XPLORA Knoppix DVD and from Xplora portal

Lesson set up:

a) Organizational moment: 2 minutes

- writing down the absent students in the class register
- creating the right atmosphere for didactical activities

b) Knowledge evaluation: 10 minutes

- verifying the homework given to students
- verifying the comprehension of the previous lessons “Acids and bases”, through some questions:

- What are acids?
- Which are their main characteristics?
- How do they color acid-bases indicators learned in previous classes, such as litmus and fenolftalein?
- The same questions will be asked for base indicators.
- Which is the name of the reaction between acids and bases? Which substances are obtained following this reaction?
- Gives examples of substances used at home that have acid or basic characters.
- Yogurt, orange and lemon juice taste sour. Which characteristics do you think they have?

c) Learning new knowledge: 30 minutes

This phase starts with the announcement of the new lesson “**Acid-base indicators**” which will be written on the blackboard.

What is an indicator?

It is a substance with organic molecule, which changes colour depending on the pH. In a pH field will coexist species of both acid and basic characters in comparable concentrations. On this field, the colour will be given by the mix between acid and basic species. In order not to influence the pH of the studied substance, the indicator quantity to be used, has to be very small. Download the [full lesson plan](#) (pdf, en)

The main acid-base indicators:

Indicator	Changing colour	Turning field
Picric acid	Incolour-yellow	0,1-0,8
Methyl yellow	Red-yellow	2,9-4
Orangemethyl	Red-yellow	3,1-4,4
Litmus	Red-blue	4,5-8,3
Brometimol blue	Yellow-blue	6-7,6

Fenolftalein	Incolour-red	8,3-10
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Acid-base indicators are both used for determining the pH of a solution (indicator pH paper, which is imbued with an indicator mix), and for titrate acid-base reactions to make evident the pH at the moment of equivalency.

Moving on to practical activity, the teacher is telling students that they need to carry out some experiments, following the order in the enclosed paper, to observe carefully the colour modifications, to point out the environment character, to find out conclusions and to fill in the missing spaces in the same paper.

The experiments will be carried out on groups of three students, and the filling in of the papers will be done individually.

STUDENTS PAPER

(1) Comparison between some acids concentration

- Introduce in the first test tube 1-2 ml of $\text{CH}_3\text{-COOH}$ over it put 1-2 drops of litmus solution. In acid environment the litmus is coloured
- Repeat the operation above using the H_3PO_4 solution and then the H_2SO_4 solution.
Compare the colour intensity from the 3 test-tubes:
 - the most intense colouration is obtained in the test tube.....
 - the most weak colouration is obtained in the test tube.....



(2) Comparison between some bases concentration

- Introduce in the first test tube 1 ml of AlCl_3 solution. Put over it 3-4 drops of NaOH solution, to prepare $\text{Al}(\text{OH})_3$. Put 1-2 drops of fenolftalein. In basic environment fenolftalein is coloured in.....
- Introduce in the second test tube 1ml $\text{Mg}(\text{OH})_2$ solution. Put over it 1-2 drops of fenolftalein. Repeat the previous experiment, using the NaOH solution. The most intense colouration is obtained in the test tube which contains, and the weakest one in test tube