#### CLIL Module Plan

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School	Liceo Scientifico	iceo Scientifico "Da Vinci" Trento					
School Grade	O Primary		O Middle			• High	
School Year	01	O 2	03		<b>•</b> 4		0 5
Subject	Chimica	Topic	'	ABC: Acid-Base-pH Calc			
CLIL Language	● English			O Deutsch			

# Personal and social-cultural preconditions of all people involved

The scientific high school "Leonardo da Vinci" is one of the historical "Liceo" of the Province of Trento. Nowadays the "Leonardo da Vinci" high school proposes two curricula, foreseen by the reform of the high school, the ordinary scientific curriculum and the applied sciences scientific curriculum. A typical 3th grade class consists of 25 students. There are students of foreign origin, but normally perfectly integrated into the class; there are no or few SEN students. The classroom is rather small and the available space is therefore limited. The position of the desks s is the classic one (in pairs). The narrow space is a factor to consider when planning activities that require movement or different allocation of the desks. A PC, an interactive whiteboard (IWB) and a blackboard are availablein the class. Although the students are particularly bright, their average behavior is polite and participating. The class is generally close-knit and collaborative. The class presents on average linguistic competence level B1+. The motivation and enthusiasm are high. The teacher, who will carry out the CLIL module, teaches Science and Environmental education and she/he is the main teacher. She/he has a C1 English level certification. She/he is planning Science-CLIL modules in collaboration with some colleagues of her/his disciplinary Department.

#### Students' prior knowledge, skills, competencies

#### Subject

- Chemistry nomenclature ●
   Definition of mole and
   stoichiometry calculation about
   mole, molecular weight. ●
   Definition of atom, molecule, ions
   and compound Lewis' structure
- ◆ The Law of Mass action ◆Principles of logarithmic calculation
- Behaviour's rule in chemistry lab
- Basic lab procedure: use of burette, ability of dilute, measure of liquid volume

#### Language

Present, past, future, modal verbs, conditional forms; Reporting verbs; Scientific basic vocabulary related to lab equipment and chmistry procedure (see "glossary"); To be able to listen and understand the main concepts/meaning of a new video/speech. To be able to read and understand the main concepts/meaning of a new text. To be able to express an opinion. To take notes while listening. To simply answer open questions

**Timetable fit** 

Module

Length 10

#### Description of teaching and learning strategies

All this unit is prepared using a slide presentation and so there is a file called "ABC: Acid-Base-pH Calc.ppt" with pictures, texts and useful slides to use . There is also a folder with all the handouts to print. At the beginning of the unit we are going to start with an introductory lab using household materials and a natural indicator. The next step involves the description of acid-base theories ( Arrhenius, Brøensted and Lewis) and some examples on balanced ionic equations. Then in lab we are going to use acid or base dilution and pHindicator. Afterwards we are going to come back to the class for studying the meaning of Kw and pH. We will use a video clip and students are going to practice some exercises about pH. Last step regards the titration methodology in the lab and the drawing of a titration-plot. At the end students are invited to reflect about an environmental issue (acidification of oceans). Using some videos from youtube, students can be guided how to work in the lab. Students have also to make some homework like using wordcloud to write some sentences or to review some topics or exercises. In general, the learning and teaching objectives aim at highlighting disciplinary-specific cognitive processes, considering at the same time transversal and communicative outcomes. The lessons have been designed to encourage the development of creative thoughts and ideas; transversal skills as critical thinking and problem solving; the comprehension and production (in both verbal and written form) of the language of intercommunication and the micro-language related to the specific topic.

#### Overall Module Plan

Unit: 1

ABC Acid-Base-pH Calc

Unit length: 10

Lesson 1

Lab with red cabbage

Lesson 2

ACIDS and BASES: Arrhenius theory and Broensted theory

Lesson 3

ACIDS and BASES theory: Conjugate acids and bases

Lesson 4

ACIDS and BASES: Lewis theory

Lesson 5

dilutions and acid-base scale

Lesson 6

What is Kw What is pH What is pKw Exercises on pH

Lesson 7

lab on tritation

Lesson 8

9 expand your knowledge: ocean acidification

Lesson 9

**ASSESSMENT** 

 Unit number
 1
 Lesson number
 1
 Title
 Lab with red cabbage

Activity	Timing	Learning Outcomes	Activity Procedure	Language	Interaction	Materials	Assessment
1	50'	To compare the precision and validity of an indicator. To distinguish between an acid and a base by using an indicator. To discuss the properties of common household chemicals based on their pH. How to compare the acidity and alkalinity of a solution using pH value Now they should know the pH values of some common substances	t's role: Watch the video clip: link Lab activity S's role: Watch the video clip To bring from home household material to use into the lab To work in chemistry lab with Handout 1 To complete lab sheet on handout1	Key vocabulary Acidic/ basic (alkaline) properties. Taste sour/ bitter, feel slippery. PH scale, acid-base indicator, common household liquids.  Communicative structures ake a look at the procedure Feel free to ask questions, to intervene, to ask for explanations	■ Whole class ■ Group work □ Pair work □ Individual work	• 1 handout reb cabbage.doc.docx chemistry lab handout 1 household material (50 ml: detergents, salt, rain water soda water, soap, aspirin, shampoo, wine, beer, milk, Coca-Cola, ammonia, vinegar, lemon juice) file: Acids and bases video: link	none

Unit number 1 Lesson number 2 Title ACIDS and BASES : Arrhenius theory and Broensted theory

Activity	Timing	Learning Outcomes	Activity Procedure	Language	Interaction	Materials	Assessment
1	25	To describe the Arrhenius model for acids and bases. To determine whether a given chemical substance is an Arrhenius acid or an Arrhenius base (or neither). Be able to complete and balance simple acid-base reactions.	T'S ROLE: to complete the first part of handout 2 collect handout 2 to correct the second part S'S ROLE: To listen to teacher explanation and to listen to the solution of the example. Then they work in pairs on second part of handout 2. (fill in the gaps)	Key vocabulary dissociate/dissolve/ionize; neutral compounds; hydrogen chloride; Arrhenius acid; Arrhenius base; neutralize.  Communicative structures Comm. structures: meaning of? Which is the	□ Whole class □ Group work □ Pair work □ Individual work	<ul> <li>ABC_ Acid-Base-pH         Calc.pptx</li> <li>2 handout_         Arrhenius         definition A _ B         students.docx</li> <li>3.1 handout         Broensted         definition of A _         B student.docx</li> <li>3 Broensted         definition of A _         B teacher.docx</li> <li>2 Arrhenius</li> </ul>	FORMATIVE
		reactions.		main point of this sentence? Did you understand? The right pronunciation isTry again.		definition A _ B teacher.docx  2 handout: Arrhenius definition A & B students	

2 25' Know the theories T'S ROLE: complete Skills ☐ Whole • 3.1 handout **FORMATIVE** of acids and the first part class Broensted L S bases, especially handout 3.1 collect R W ☐ Group definition of A the Broensted handout 3 to correct work B student.docx **Key vocabulary** Theory. To the second part S'S □ Pair work • 3.2 handout Brønsted-Lowry, model; describe the ROLE: To listen to wordcloud.docx ☐ Individual acids are hydrogen-ion Bronsted-Lowry teacher explanation • 3 Broensted work donors or proton donors. model for acids and to listen to the definition of A Brønsted bases are and bases. To be solution of the B teacher.docx hydrogen-ion acceptors able to identify example. Complete 3.1 handout: The or proton acceptors; pairs and name acids the second part of Brønsted Definition of nonbonding valence and bases. To be handout 3.1 as of Acids and Bases electrons. homework able to complete 3.2 handoutand balance homework handout homework Communicative simple acid-base 3.2 write some wordcloud structures reactions. sentences What's the meaning of? Which is the main point of this sentence? Did you understand...? The right pronunciation is....Try again

Unit number 1 Lesson number 3 Title ACIDS and BASES theory: Conjugate acids and bases

Activity	Timing	Learning Outcomes	Activity Procedure	Language	Interaction	Materials	Assessment
1	50'	To describe the relationship between "H+ (aq)" and "H3O+ (aq)". To describe an "amphoteric" substance. To identify the chemical species that function as the Bronsted acid, the Bronsted base, the conjugate acid and the conjugate base from the molecular equation for an acid-base reaction. To identify conjugate acid-base pairs.	T'S ROLE: check homework from handout 3.1 and 3.2 work with the whole class and complete handout 4 S'S ROLE: check homework To listen to teacher explanation and to listen to the solution of the example and complete handout 4	Skills  L S R W  Key vocabulary  Communicative structures	■ Whole class □ Group work ■ Pair work ■ Individual work	• ABC_ Acid- Base-pH Calc.pptx • 4 handout Acid-Base Pairs - STUDENT.docx • 4 Conjugate Acid-Base Pairs - TEACHER.docx wordcloud handout 3.2 4 handout Acid- Base Pairs - STUDENT AND TEACHER	NONE

Unit number 1 Lesson number 4 Title ACIDS and BASES: Lewis theory

Activity	Timing	Learning Outcomes	Activity Procedure	Language	Interaction	Materials	Assessment
1	50'	To write Lewis structures in particular, for acids and bases. To illustrate electron reorganization in an acid-base reaction by using Lewis structures and "arrow-pushing". To know and recognize the concept of nucleophilic and electrophilic.	T'S ROLE: check running dictation and explain some contents S'S ROLE: running dictation	Key vocabulary as in the previous activities; conjugate acid-base pairs; stem meaning "joined together"; neutral molecules, positive ions, or negative ions.	□ Whole class □ Group work □ Pair work □ Individual work	• ABC_ Acid- Base-pH Calc.pptx file ABC_ Acid- Base-pH Calc.pptx slide 6 5 handout lewis running dictation	

structures	
Have a look on the	
clouddo you	
recognize any	
sentence? Could you	
build a meaningful	
sentence? Do you want	
to try? Do you	
remember this	
word/concept? Recall	
	Have a look on the clouddo you recognize any sentence? Could you build a meaningful sentence? Do you want to try? Do you

Unit number 1 Lesson number	5	Title	dilutions and acid-base scale
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Outcomes Procedure		Activity	Timing	Learning Outcomes	Activity Procedure	Language	Interaction	Materials	Assessment	
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1	100'	Students should recognize the relationship between pH value and the hydrogen ion concentration. They should understand why solution with pH less than 7 is acidic while that with pH above 7 is basic.	T'S ROLE: during warm-up activity ask to answer to the multiple choice in the slide 9 lab activity with handout 6 discuss the lab-sheet with the class S'S ROLE: work in chemistry lab with Handout 6 complete lab sheet	Key vocabulary dilutions and acid-base scale; increasing alkalinity/acidity;Set up a serial dilution; indicators behave asinteraction with universal indicator; distilled water, pipette; test-tubes; tube rack; indicator paper.  Communicative structures If questions/conditional forms; Compare the color of Take a look at the procedure Feel free to ask questions, to intervene, to ask for explanations	■ Whole class ■ Group work □ Pair work □ Individual work	6 handout acid-base dilution scale.docx     4 Conjugate Acid-Base Pairs - TEACHER.docx      chemistry lab file ABC_ Acid-Base-pH Calc.pptxslide 9 handout 6	NONE
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Unit number 1 Lesson number 6 Title What is Kw What is pH What is pKw Exercises on pH

Activity	Timing	Learning Outcomes	<b>Activity Procedure</b>	Language	Interaction	Materials	Assessment
1	50'	To write the equilibrium reaction for the dissociation of pure water to produce H3O+ and OH - ions. To write the equilibrium constant expression for the dissociation of pure water (Kw). To describe a "p function" and to calculate the value of pH. To find To describe pH and pOH. To calculate the pKw and its relation with pH and pOH To calculate pH, pOH, [H3O+]tot and/or [OH-]tot for a solution .	T'S ROLE: After the video give further explanation and revise the content by using slides from 13 to 18 assign handout 7.6 as homework S'S ROLE: take notes during the video and during the teacher explanation work with exercices from handout 7.5 homework: finish handout 7.5 and 7.6	Key vocabulary as in the previous activities; H+ concentration iswhat is the pH? Ion Product Constant of Water, kW.  Communicative structures If questions/conditional forms; Modal verbs; Passive forms; future tense; Listen to the video Try to catch the meaning; let's have a look at the exercisesdo you want to try?	□ Whole class □ Group work ■ Pair work ■ Individual work	• ABC_ Acid- Base-pH Calc.pptx • 7.5-7.6 handout table on pH.docx link file ABC_ Acid-Base-pH Calc.pptx slide 13-18 handout 7.5-7.6	NONE

Unit number1Lesson number7Titlelab on tritation

Activity	Timing	Learning Outcomes	Activity Procedure	Language	Interaction	Materials	Assessment
1	100'	The difference ways for measuring the pH of a solution The neutralization titration with the use of acid-base indicators for the determination of endpoint. To sketch the general shapes of acid-base titration curves . To identify the equivalence point and calculate the volume of titrant required to reach the equivalence point during tritation of a strong acid with a strong base.	T'S ROLE: check handout 7.6 lab activity with handout 8 discuss the labsheet with the class or assign the conclusion of lab-sheet as homework S'S ROLE: check homework from handout 7.6 work in chemistry lab with Handout 8 complete lab sheet	Key vocabulary titration, unknown/known concentration; solution; stop-cock valve, control the delivery of the titrant, burette, graduation. pHmeter, pH electrodes, calibration standards, Phenolphthalein, stir plate, endpoint, equivalence point.	■ Whole class ■ Group work □ Pair work □ Individual work	<ul> <li>ABC_ Acid-Base-pH Calc.pptx</li> <li>7.5-7.6 handout table on pH.docx</li> <li>8 titration phmeter.docx</li> <li>ABC_ Acid-Base-pH Calc.pptx chemistry lab handout 7.5-7.6 handout 8</li> </ul>	NONE

Communicative	
structures	
If questions/conditional	
forms; Take a look at	
the procedure Feel	
free to ask questions, to	
intervene, to ask for	
explanationsfollow	
the instructions	
precisely; be careful;	
what is the color of the	
solution	
above/belowe?Do you	
prefer monitoring a	
titration with a pH	
probe or an indicator?	
Explain your choice	

Unit number 1 Lesson number 8 Title 9 expand your knowledge: ocean acidification

Activity	Timing	Learning Outcomes	Activity Procedure	Language	Interaction	Materials	Assessment
1	50'	Describe human activities that increase carbon in the atmosphere Describe the relationship between dissolved carbon dioxide and ocean pH. Explain how ocean acidification affects marine life.	T'S ROLE: To use video collect answers sheet S'S ROLE: To listen to the clip and answer to the FAQ on a piece of paper	Skills	□ Whole class	• ABC_ Acid- Base-pH Calc.pptx ABC_ Acid- Base-pH Calc.pptx video: link	FORMATIVE
				L S R W	☐ Group		
				Key vocabulary ocean acidification, fisheries, human activities, impacts, greenhouse gases, climate change, driving force	work Pair work Individual work		
				Communicative structures Listen to the video Try to catch the meaning; let's have a look at the main conceptswhat do you thing about? feel free to express your opinion onwhich impacts do you consider most?			

Unit number 1 Lesson number 9 Title ASSESSMENT

Activity	Timing	Learning Outcomes	Activity Procedure	Language	Interaction	Materials	Assessment
1	50'			Skills  L S R W  Key vocabulary	☐ Whole class ☐ Group work ☐ Pair work ☐ Individual	<ul> <li>ASSESSMENT-solutions.docx</li> <li>ASSESSMENT-students.docx</li> <li>Griglie di valutazione Acid and bases.doc.docx</li> <li>ASSESSMENT-students ASSESSMENT-students.docx Griglie di valutazione</li> </ul>	SUMMATIVE
				Communicative structures	work	Acid and bases.doc.docx	