



# ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL

FACULTAD DE CIENCIAS NATURALES Y MATEMÁTICAS

DEPARTAMENTO DE CIENCIAS QUÍMICAS Y AMBIENTALES



## SECOND EVALUATION OF ENVIRONMENTAL IMPACT OF PROJECTS (65 PTS)

II SEMESTER 2013-2014

ENERO 2014

NOMBRE: .....

PARALELO:.....

**NOTA:** Este examen está diseñado para ser resuelto de manera individual, puede usar una calculadora ordinaria para sus cálculos aritméticos, un lápiz o esferográfico. Solo puede comunicarse con la persona responsable de la recepción del examen; y, cualquier instrumento de comunicación que hubiera traído, deberá apagarlo y ponerlo en la parte anterior del aula, junto con algún otro material que se encuentre acompañándolo. No consultará libros, notas, ni algún apunte adicional a las que se entreguen en esta evaluación. *Desarrolle los temas de manera ordenada. Firme como constancia de haber leído lo anterior.*

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Firma

### 1. Write the letter according to the concept of each term (1 e/o pts)

	Term	Concept	
A	Physical models	relative knowledge or ignorance common to every EIA process which is also critical for the impact prediction	
B	Environmental index	Document that describes in detail the actions required to prevent, mitigate, control and compensate the possible negative environmental impacts	
C	Environmental Indicator	A method for impact prediction	
D	Doubt	WQI	
E	Magnitude	Ecuadorian Legal Framework	
F	Environmental risk	directly from the visit	
G	Environmental Management Plan	A way to compensate Impacts	
H	Primary source of information	Potential danger that affects the environment, derived from the probability of occurrence and severity of the damage caused by accidents	
I	TULAS	It depends on the quantitative valuation and the selected indicator of the environmental element to be analyzed	
J	Restore	Simple measurement that indicate potential changes in the original environment of the evaluated site	

### 2. Mention and explain 3 criteria taken into consideration for the selection of the Methodology to predict impact (3 pts)

### 3. What criterias are used for the Leopold Matrix calculation. Explain each one of them. What is the result of this calculation and write the formula of the calculation (5 pts)

### 4. Read the following cases and then answer the questions in each case

#### CASE 1 (15 pts)

A chemical industry has been working in an industrial area for about 15 yrs. In the last 3 years its production has increased and double. In the surroundings of this industrial area is located an urban area, which in the last year has been complaining about the quality of the air in that place. For this reason they ask the Municipality to perform the environmental studies, therefore, the fabric will temporally close or continue working according to the results obtained. You are part of the environmental team and you have to indicate the Municipality what is the level of the air quality in the area and the effect it has to the health. You perform the measurements of the environmental parameters of the air, with the following results:

SO<sub>2</sub> = 1.10 ppm    NO<sub>2</sub> = 1.8 ppm    CO<sub>2</sub> = 3.65 ppm    O<sub>3</sub> = 0.75 ppm    Particulate matter (>10um) = 41 ug/m<sub>3</sub>

- Choose the correct formula (a, b or c) (1 pts)
- Calculate the value of the air quality index. Write your calculations (5 pts)
- According to the table given below what is the level of the air quality and what is the impact to health (2 pts)
- Which are the sensitive groups? And **why** are they called sensitive groups? (3 pts)
- Mention two reasons of why environmental indexes are useful (2 pt)
- Mention the two reasons from the ones explained in class of why environmental indicators are important (2pts)

AQI	Level of the quality of the air	Impact to health
0-50	Good	Good
51-100	Moderate	Moderate
101-150	Alert	Not Good for sensitive groups
151-200	Aware	Bad
201-300	Emergency	Very bad
301-500	Significant harmful	Dangerous

**Possible formulas to be used for calculating the air quality index (CHOOSE the correct one):**

- $AQI_{cont} = AQI_{high}/AQI_{low} + BP_{high}/BP_{low}$
- $AQI_{cont} = BP_{high} + BA_{low}$
- $AQI_{cont} = ((AQI_{high} - AQI_{low}) / (BP_{high} - BP_{low})) * (C_{cont} - BP_{low}) + AQI_{low}$

PM <sub>10</sub> ug/m <sub>3</sub>				SO <sub>2</sub> ppm				NO <sub>2</sub> ppm				CO <sub>2</sub> ppm				O <sub>3</sub> ppm			
BP	BP	AQI	AQI	BP	BP	AQI	AQI	BP	BP	AQI	AQI	BP	BP	AQI	AQI	BP	BP	AQI	AQI
low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high
0	54	0	50	NA	NA	101	150	0.5	1.0	95	130	0.5	1.5	115	200	0.3	1.0	100	180
55	154	51	100	0.65	1.24	201	300	1.1	2.5	180	301	1.6	3.5	201	310	1.1	2.5	200	350
155	254	101	150	1.25	2.04	301	500	2.6	4.0	350	550	3.6	4.5	315	450	2.6	3.0	380	580

$$AQI_{air} = \max (AQI_{MP2.5}, AQI_{NO2}, AQI_{SO2}, AQI_{NO2}.....)$$

## CASE 2 (20 pts)

In the city of Guayaquil there is a Ciudadela Las Gaviotas and there is a car vulcanizer next to it. The vulcanizer works 24h/7d. The people living in the Citadel ask the local authority to perform an environmental audit, since they complain about the noise. You are the leader of this audit. You have performed a series of noise measurements and interviews to the people during your visit and now you have to present the report to the authority.

**Table of noise measurements performed during the audit**

Parameter	Noise (dB)	
	06:00-20:00	20:00-06:00
Day 1	43	45
Day 2	44	49
Day 3	41	52
Day 4	41	48
Day 5	40	57

- What is an audit, mention three characteristics of the audit and who can perform the audit? (4)
- Which are the 2 types of audit discussed in class? Which one are you performing in this case? Explain your answer (4p)
- What will your report say according to the noise levels you found? Give your conclusions according to the results (3pts)
- Mention all the primary sources information you are using in this audit (2 pts)
- Mention 3 characteristics that an audit report must fulfill (3 pts)
- Indicate the type of zone (landuse) from the table that you have chosen as reference for your audit report (2 pts)
- What is the name of the Ecuadorian Legislation and landuse used to refer to the allowed limits in noise (2 pts)

### CASE 3 (12 pts)

In an area close to Manglaralto there are a group of important aquifers in the area. This zone is well known since the main activity carry on by the local people is agriculture. In order to protect their crops they use two main pesticides **RADIN 11** and **PESTDIE**. Lately, in the last two years they have noticed that quality of the water in the aquifer has decreased. For this reason they asked the local authority to perform the environmental measurements to determine the water quality in the aquifer. A series of samplings have to be performed in order to determine, the Water Quality Index and to know if the admissible levels have been fulfilled or not. According to the tables included and in the local legislation you should determine if the environmental parameters are exceeding the allowed levels or not and calculate the water quality index for underground water.

- What is the name of the underground quality index you will use (1 pt)
- Calculate the underground quality index according to the parameters given in table of information (7pts).
- Define how is the quality of the underground water according to table (2 pt)
- According to the results obtained from your analysis and measurements, conclude if the water of the acquifer can be used for irrigation or recreation. Why? (2 pts)

Variable	Characteristics of the aquifer	Calculation	Value	Quality of the underground water according to table
Conductivity	$4.5 \times 10^{-2}$ cm/s			
Surface soil (<2m)	Arcilla arenosa			
Terrain tilt	3 %			
Depth of the aquifer	4 m			
Recharge	90 mm			
Impact Zone Vadosa	Arena or Grava			
Aquifer environment	Arenisca masiva			
<b>Name of Underground water index</b>				

Parameters	Results of the analysis	Fulfill the admissible limits (Y/N)	
		Irrigation	Recreation
Organoclorados (totals)	0.1 mg/l		
Arsénico (total)	0.05 mg/l		
Mercurio (total)	0.045 Hg		
Litio	2.3 mg/l		
Molibdeno	0.01 mg/l		
<b>Admissible use of the water of the aquifer: irrigation or recreation</b>			

## CASE 1 - ANSWERS

<b>Formula selected</b>		
<b>AQI PM<sub>10</sub></b>	<b>AQI SO<sub>2</sub></b>	<b>AQI CO<sub>2</sub></b>
<b>AQI NO<sub>2</sub></b>	<b>AQI O<sub>3</sub></b>	
<b>Value considered for the calculation of the AQI<sub>air</sub></b>		
<b>Level of quality of the air &amp; Impact to health</b>	<b>Level</b>	<b>Impact to health</b>
<b>Sensitive groups</b>	<b>Sensitive Groups</b>	<b>Why are they called sensitive groups</b>
<b>Reasons to use environmental indexes</b>	<b>Reason 1</b>	<b>Reason 2</b>

## CASE 2 - ANSWERS

<b>Ecuadorian legislation</b>		
<b>Define audit 3 characteristic And who can perform it?</b>		
<b>Type of audits</b>		
<b>Which audit are you performing</b>		
<b>Conclusions of your audit report according to the noise levels found</b>		
<b>Characteristics of the audit report</b>		
<b>Type of primary source information used in the audit</b>		
<b>Type of zone (landuse) used as reference</b>		