


Sistema de Administración de Calidad				
	Clave	Nombre		Revisión
	R-03-SAP	<b>Programa Sintético</b>		00-06/17
				1de1


<b>Área Curricular</b>	Basic		
<b>Campo Disciplinar</b>	Experimental Sciences		
<b>Unidad de Aprendizaje</b>	<b>Fundamentals of Genetics and Biotechnology</b>	<b>Semestre</b>	4
<b>Periodo Académico</b>	Enero – Junio 2020		
<b>Coordinador de Cuerpo colegiado:</b>	Dra. Cristina Aracely Ramírez de la Garza		

## FUNDAMENTALS:

The learning Unit (UA) of Fundamentals of Genetics and Biotechnology, belongs to the area of free choice among the field of experimental sciences in the curriculum of General Baccalaureate of medium high level UANL. It is instructed through face-school modality with a frequency of five hours per week of 50 minutes each, totaling 80 hours classroom and 48 extra-classroom equivalent to 4 credits per semester.

The program focuses on developing the skills outlined in the Common Curriculum Framework (MCC) of the Integrative Reform of Medium High Education (RIEMS) and the structuring axes of the educational model of the UANL, shafts running through education centered and competency-based learning. The first axis is oriented to achieve significant learning using cognitive strategies of logical and creative thinking, promoting autonomous student activity through more active and responsible behavior in building their own knowledge by participating. In the second axis, skills are developed by focusing more on the construction process of learning in teaching, it is important to create environments that promote and develop the knowledge, skills, attitudes and values required by society. Therefore the analytical program is based on both the educational model UANL, the graduate profile and the MCC RIEMS.

The intention is to develop in students the skills that will serve as support to establish the relationship between advances in genetics and its impact on society; lay the foundations for common hereditary mechanisms to all living beings to assess its significance, issue scientifically informed judgments and decisions related to health and care of the environment; also, allows you to explore careers whose training is linked to the progress of this science.


Sistema de Administración de Calidad				
	Clave	Nombre	Revisión	Hoja
	R-03-SAP	<b>Programa Sintético</b>	00-06/17	1de1

The UA has been developed for a one-semester school year to serve as a guide to teachers for their implementation in the classroom. Each stage indicates the extended generic, disciplinary skills and competency elements that are considered basic to be developed by students. Evidence of learning, performance criteria, facilitation activities, involvement activities, content and resources are linked elements to define the learning process, planned from the point of view that gives and considering the characteristics of the group of students.

Fundamentals of Genetics and Biotechnology, is divided into four stages that promote understanding of concepts, principles, biological processes and the development of cognitive skills that allow them to form a critical and analytical attitude in the social and ethical implications of advances in genetics.

Interphase cell division and cytokinesis are part of the first stage "Cell reproduction", the changes undergone by the cell through the cell cycle in its three major events are reviewed. Interphase cell prepares for cell division, which may occur through mitosis processes (somatic cells) or meiosis (gametes) in cytokinesis the cytoplasm divides to form independent cells. Mitosis in growth, development (cancer) and meiosis with genetic variability in the production of sex cells relate each other; aspects of bioethics, cancer and stem cells are also considered. In "Mendelian genetics" the work of Gregor Mendel is approached in the midnineteenth century, who laid the foundations of heredity and whose principles have transcended from the way human hereditary characteristics, they are transmitted to biotechnology and genetic engineering. The third stage, "DNA, RNA and protein synthesis" is important because the role, composition and description of the structure of DNA, and the universality of the genetic code and its relevance in replication and transcription genetic material, from gene to protein synthesis are reviewed. Finally, at the stage of "Biotechnology" is known and assesses the impact of genetic engineering, cloning and genetically modified organisms intended that the student forms a bioethical approach with scientific bases.

The program presented below is a tool to support the process of educational planning and for this purpose, teachers can adapt to their context the suggestions of activities that contribute to the development of skills.

Sistema de Administración de Calidad				
	Clave	Nombre	Revisión	Hoja
	R-03-SAP	<b>Programa Sintético</b>	00-06/17	1de1

## GENERIC COMPETENCES

3. Manage information and communication technologies as a tool for access to information and its transformation into knowledge, as well as for learning and collaborative work with cutting-edge techniques that allow its constructive participation in society.

4. Master your main language orally and in writing with correctness, relevance, opportunity and ethics by adapting your message to the situation or context, for the transmission of ideas and scientific findings. In everyday, academic contexts. Attribute - Use linguistic, mathematical or graphic representations as communication strategies

8. Uses traditional and cutting-edge research methods and techniques for development of his academic work, the exercise of his profession and the generation of knowledge. Attributes - Reflectively understands the phases that will lead to the achievement of its objective - Develops and designs hypotheses taking into account the principles, laws and concepts.

5. Employs logical, critical, creative and proactive thinking to analyze natural and social phenomena that allow it to make relevant decisions in its sphere of influence with social responsibility.

## ATTRIBUTES

- Select the sources of information according to responsible criteria.
- Build your point of view according to its importance and relevance.
- Integrates and structures new knowledge that allows decision making with social responsibility.

## BASIC SPECIFIC AND DISCIPLINARY COMPETENCES

Specific Competence of: Experimental Sciences-Biology

Values the mechanisms that ensure the continuity of life, based on the compounds that

Sistema de Administración de Calidad				
	Clave	Nombre	Revisión	Hoja
	R-03-SAP	<b>Programa Sintético</b>	00-06/17	1de1

contain the hereditary factors, the laws that regulate them and their importance for the development of biotechnology within an ethical context.



Clave	Nombre	Revisión	Hoja
R-03-SAP	<b>Programa Sintético</b>	00-06/17	1de1

## **CONTENTS:**

### **Stage 1. Cellular Reproduction**

Cell size limits  
 Cell division and reproduction  
 Cell cycle and its phases  
 Cell cycle regulation  
 Meiosis  
 Stem cells

### **Stage 2. Mendelian Genetics**

Concepts used in Genetics  
 Mendel, the first geneticist  
 Mendel's experiments  
 Mendel's Laws  
 Punnet square  
 Family trees  
 Non Mendelian Genetics  
 Genetic disorders

### **Stage 3. Hereditary Material: DNA, RNA and protein synthesis**

Chemical structure of DNA and RNA  
 How was the structure of DNA discovered? The works of Rosalind Franklin, Watson and Crick  
 Double Helix Model  
 DNA replication in Eukaryotes  
 Protein synthesis  
 Mutations

### **Stage 4. Biotechnology**

Biotechnology  
 Biotechnology through time  
 Genetic engineering  
 Applications of Genetic engeneering  
 Bioethics

## **EVALUATION OF PROCESS AND PRODUCTS:**

The following categories are taken into account:



Clave	Nombre	Revisión	Hoja
R-03-SAP	<b>Programa Sintético</b>	00-06/17	1de1

### Diagnostic Evaluation

No creditable value. Applied at the beginning of the semester in order to identify prior knowledge possessed by the student on the subject.

### FORMATIVE ASSESSMENT

The portfolio of evidence includes all the activities in the program and performed by the student themselves to realize their learning process throughout the semester. Following the selection of activities to be evaluated quantitatively presented.

#### Portfolio of evidence

##### Stage 1

- Evidence: 3D Model: Cell cycle, Mitosis and Meiosis

##### Stage 2

- Evidence: Video: Mendel's diary

##### Stage 3

- Evidence: 3D Model: hereditary material: DNA, RNA and protein synthesis

##### Stage 4


- Evidence: Report writing on Biotechnology (needed for the PIA debate)

Product integrative learning unit:

Debate on Biotechnology topics: cloning, GMO, Gene therapy and Bioethics

### Summative Evaluation

Instruments of evaluation and evidences	Weighting
First Partial Exam	10%
Mid-term exam	15%
Second partial exam	10%
Global exam	25%
<b>Subtotal</b>	<b>60%</b>
<b>Portfolio Evidence</b>	
Stage 1. Model of the eukaryotic cell	8%
Stage 2. Report of case studies	8%
Stage 3. Collage	8%
Stage 4. Poster	8%
Integrative Product of the LU: Electronic magazine	8%
<b>Subtotal</b>	<b>40%</b>
<b>Total</b>	<b>100%</b>

Sistema de Administración de Calidad				
	Clave	Nombre	Revisión	Hoja
	R-03-SAP	Programa Sintético	00-06/17	1de1

### \*\*\* Conditioning rule\*\*\*

Partial Exam – affects Stage 1

Internal Global exam – affects Stage 3

70-100 exam score	then	100% stage
60-69 exam score	then	90% stage
50-59 exam score	then	85% stage
< 50 exam score	then	80% stage

### \*\*\* Nexus\*\*\*

The use of Nexus account is mandatory; each undelivered activity will be penalized with 1 final point less respecting the due date established in class by the teacher.

## BIBLIOGRAPHY:

### Basic

Rodríguez,C. (2019). Fundamentos de Genética y Biotecnología. México: Ediciones de Laurel.

### Complementary

Audesirk, T., Gerlad Audesirk, Bruce Byers. (2014). Biología, la vida en la Tierra con fisiología. México D. F.

Pearson.Lewis, Julian. (2015). Introducción a la Biología Celular. México, D. F. Editorial Médica Panamericana.

Miller, Kenneth y Joseph, Levine. (2010). Biología. México, D.F.

PearsonOndarza Vidaurreta, Raul N. (2013). Bioética y Biotecnología.México. Trillas.

### Electronica

hhmi Biointeractive. (2017). Información registrada. [En línea]. Disponible en: <http://www.hhmi.org/biointeractive>[consultada el 20 de marzo de 2017].

yourgenome. (2017). Información registrada. [En línea]. Disponible en: <http://www.yourgenome.org/copyright>[consultada el 08 de abril de 2017].

yourgenome.org. [yourgenome].(2015, enero 07).From DNA to protein –3D [Archivo de video]. Recuperado de: <https://www.youtube.com/watch?v=gG7uCskUOrA>. [Acceso 25 abril 2017].

Yourgenome.org. [yourgenome]. (2015, junio26).DNA Replication –3D [Archivo de video]. Recuperado de: <https://www.youtube.com/watch?v=TNKWgcFPHqw>. [Acceso 01 mayo

Sistema de Administración de Calidad				
	Clave	Nombre	Revisión	Hoja
	R-03-SAP	Programa Sintético	00-06/17	1de1

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## Sugerida y de apoyo

### Stage 1. Cellular Reproduction

Cell cycle <https://www.youtube.com/watch?v=xsrH050wnIA>

Cell cycle <https://www.youtube.com/watch?v=QVCjdNxJreE>

Mitosis and Meiosis <https://www.youtube.com/watch?v=zrKdz93WIVk>

Mitosis and Meiosis <https://www.youtube.com/watch?v=goyfzIZuUWw>

### Stage 2. Mendelian Genetics

Mendel <https://www.youtube.com/watch?v=Mehz7tCxiSE>

Punnet squares [https://www.youtube.com/watch?v=3f\\_eisNPpnc](https://www.youtube.com/watch?v=3f_eisNPpnc)

### Stage 3. Hereditary Material: DNA, RNA and protein synthesis

DNA replication <https://www.youtube.com/watch?v=Qqe4thU-os8>

DNA replication <https://www.youtube.com/watch?v=TNKWgcFPHqw>

Transcription and translation <https://www.youtube.com/watch?v=2BwWavExcFI>

### Stage 4. Biotechnology

Cloning [https://www.youtube.com/watch?v=q0B9Bn1WW\\_4](https://www.youtube.com/watch?v=q0B9Bn1WW_4)

Cloning <https://www.youtube.com/watch?v=FjBgLIE7514>

GMO <https://www.youtube.com/watch?v=7TmcXYp8xu4>

GMO [https://www.youtube.com/watch?v=mz4\\_TwdaYel](https://www.youtube.com/watch?v=mz4_TwdaYel)