

Subject: Biology**Curriculum: MoE of Jordan****Grade: 10**

	Topic / concept	Objectives	Strategies	Math skills used/ needed	Application or integration 1- in the same subject; 2- in other subjects
B01	Viruses	<p>1.justify the statement, "Viruses are not living organisms,"</p> <p>2. Explain how the Structure of viruses controls its life cycle</p> <p>3. Explain how viruses are transmitted and why vaccines do not protect against all viral diseases (i.e. HIV, cold and flu viruses).</p>	<p>1. Students view a PowerPoint presentation</p> <p>2. Asking a series of planned questions</p> <p>3. Students share their thoughts and their ideas and then proceed with the slide that has the following characteristics (homeostasis, reproduction, cellular organization, metabolism, and genetic information).</p> <p>4. Each student chooses a viral disease from the container and tells what he/ she knows about the disease. Other students will be encouraged to share additional information not mentioned.</p>	<p>1. using the small measurement units</p> <p>2.using statistics for viruses diseases</p>	<p>1. printed slips with names of viral diseases</p> <p>2. we can protect ourselves from many diseases</p> <p>3. We can integrate this topic with art subject, by modeling, drawing. .With English language by using a scientific vocabulary</p>

B02	EVOLUTION OF ORGANISMS	<ol style="list-style-type: none"> 1. Explain how the life on Earth began. 2. Explain The process of evolution 3. Discuss variation can be caused by both genes and the environment. 4. Explain the theories of evolution, and give their opinions about it, by using evidences. 	<ol style="list-style-type: none"> 1. asking an essential question about diversity of living organisms 2. Students model natural selection by using tools 3. studying fossils, and comparing them with living organisms 4. Giving a worksheet, .Students have to fill in this worksheet while we teach. Students then use this worksheet as a central place to study from to prepare for a test or quiz. 	<ol style="list-style-type: none"> 1. recording data 2. statistics 3. graphing 	<ol style="list-style-type: none"> 1. Students analyze the characteristics of fossils, to show change over time. 2. find recourses of energy, integrated with chemistry,
B03	Fungi	<ol style="list-style-type: none"> 1. Learn about the characteristics of fungi. 2 . Identify and explain interactions among organisms (e.g., mutually beneficial, harmful relationships). 3. Explain and analyze the relationship between structure and function at the molecular, cellular and organ-system level . 4. explain how can you protect yourself from fungus diseases 	<ol style="list-style-type: none"> 1. Show pictures or movies about fungi such as the Fungi Of athlete's foot, champignons, and beer.” Discussion and questions” 2. use microscope to see the spores and symbiotic fungi 3. compare the harmful fungi with the beneficial fungi 	<ol style="list-style-type: none"> 1. Magnification 2. Measurements 	<ol style="list-style-type: none"> 1. Making bread using yeast, integrated with chemistry and economics. 2. Avoid fungal diseases that are very difficult to treat, integrated with human biology.
B04	Theory of natural selection	<ol style="list-style-type: none"> 1. Students will be able to explain how natural selection works. 2. Students should 	<ol style="list-style-type: none"> 1 . show the students for extinct animals and plants 2 . asking a series of 	<ol style="list-style-type: none"> 1. recording data 	<ol style="list-style-type: none"> 1 .grow a number of bacteria in a good conditions and some of them in a bad conditions

		<p>know how natural selection determines the differential survival of groups of organisms.</p> <p>3. Students know variation within a species</p> <p>4. Some members of the species will survive under a changed environmental conditions</p>	<p>questions them</p> <p>3. students share their thoughts and their ideas and then to conclude the natural selection</p> <p>4. students participate in an activity that demonstrates how natural selection works by mimicking adaptations of Darwin's finishes</p>	<p>2. graphing</p>	<p>and compare the growth rate</p> <p>3. We can integrate this topic with art subject, by modeling, drawing.</p> <p>With geography by using different regions populations</p>
B05	Taxonomy	<p>1. Define and explain the purpose of a taxonomy</p> <p>2. Identify the hierarchical classifications of biological taxonomy</p> <p>3. Name taxonomy scientists and elaborate on their role in classification of living things.</p> <p>4. To know the classification divisions: species, genus, family, order, class, phylum, kingdom, and domain.</p>	<p>1. asking an essential question about diversity of living organisms</p> <p>2. show many living organisms and find the scientific names</p> <p>3. Give a worksheet which Students will complete and answer while during the class.</p>	<p>1. recording data</p> <p>2. statistics</p> <p>3. division</p>	<p>1. Ask students to create their own problem and theory as an assessment of their ability to apply taxonomy information in their area</p> <p>2. Integrated with math.</p>

B07	Algae	<ol style="list-style-type: none"> 1. Learn about the characteristics of algae. 2. Identify and explain what chrysophyta , pyrrophyta , euglenophyta , chlorophyta , algae are. List their main features, and where they grow. 3. Explain how the chlmydomonas alga reproduces. 	<ol style="list-style-type: none"> 1. Ask an essential question “Are There Algae in Your House?” to start a discussion. 2. Show Samples of Brown, red, and green algae. 2. use microscopes to see the unicellular algae, like euglena, chlamydomonas. 3. Study the life cycle of chlamydomonas. 	1. magnification measurement	<ol style="list-style-type: none"> 1. Investigate the foods you eat to determine what algae derivatives they contain, “Look through your own kitchen and find a few food products that contain algae derivatives. Show these items to your class” integrated with chemistry , Find What chemical reaction changed the taste.
B08	Division pterophyta “Ferns”	<ol style="list-style-type: none"> 1. Identify and explain what the main features of ferns are. 2. Identify the proper environment for ferns to live 3. Explain how the ferns reproduce. “ The life cycle of fern” Learn the alternation of generations, haploid and 	<ol style="list-style-type: none"> 1. Show an images and movies of the ferns 2. use the microscope to see the spores 3. Discussion ferns the students know and use. 4. Study the life cycle of fern. And compare between haploid and diploid generations. 	1. Magnification	<ol style="list-style-type: none"> 1. Explore around the school to know where you can find some ferns to collect some. 3. Integrated with Arabic language, and art.

		diploid.			
B09	Gymnosperms	<p>1. Identify the main characteristics of Gymnosperms.</p> <p>2. Describe the life cycle of Gymnosperms and determine each stage, with drawing it</p> <p>3. Explore the Gymnosperms big role in solving some environmental problems.</p> <p>4. Research in a variation of Gymnosperms in local area.</p> <p>5. Explain the importance of Gymnosperms on the environment, and economics.</p>	<p>1. Show a PowerPoint presentation, or use images of Gymnosperms to introduce the lesson.</p> <p>2. Ask a series of planned questions.</p> <p>3. Allow students to share their thoughts and their ideas.</p> <p>4. Students collect some pieces from pine plant and study the features.</p> <p>5. Students will research printed encyclopedia, Internet resources, and their science textbook to gather information to answer questions and draw an assigned portion of the Life Cycle of the pine "Gymnosperms."</p>	<p>1.Measurement</p> <p>2. Use statistics for the region of Gymnosperms distribution.</p>	<p>1. Use the local area map and mark the biomes where gymnosperms are most abundant. Explain it would be the northern biomes_ in Jordan - and gymnosperms are evergreens (stay green all year).</p> <p>2. Integrated with, art, economics, and computer.</p>

B10	Inheritance of traits	<ol style="list-style-type: none"> 1. Elaborate on how Mendel discovered classical genetics using pea plants. 2. To define and explain: genotype, phenotype, dominant genes, and recessive traits. 3. Explain what is meant by true breeding. 4. Explain the inheritance of dominant traits. 	<ol style="list-style-type: none"> 1. Collecting information around Gregor Mendel's investigation. 2. Students work alone to answer questions on how Mendel discovered genetics. 3. Give a worksheet. Students have to conclude that alleles could be dominant or recessive. 	<ol style="list-style-type: none"> 1. Recording data 2. Statistics 3. Probability 	<ol style="list-style-type: none"> 1. Students can grow a pea plant in school garden or their own houses and record information. <p style="text-align: center;">Integrated with math. “probability”</p>
B11	Genetic material	<ol style="list-style-type: none"> 1. Define chromosomes. 2. Explain how the Structure of chromosomes controls all the inheritance traits 3. Describe the : double helix, nucleotides, template strands, nitrogen bases, 4. Explain how DNA replicates 	<ol style="list-style-type: none"> 1. Demonstrate cell structure image, and draw attention to the nucleus. 2. Ask a series of questions about the content of the nucleus. 3. Students use candy pieces and toothpicks to "build" DNA molecules and then simulate DNA replication. 4. Extract DNA from various foods that are found around you. 	<ol style="list-style-type: none"> 1. Use the very small measurement units 	<ol style="list-style-type: none"> 1. Students use their knowledge of how traits are inherited to determine the traits of Egg Bunnies. 2. Integrate this topic with art subject, by modeling, drawing. With chemistry by extracting the DNA.

B12	Genetic material	<p>1. Define chromosomes.</p> <p>2. Explain how the Structure of chromosomes controls all the inheritance traits</p> <p>3. Describe the : double helix, nucleotides, template strands, nitrogen bases,</p> <p>4 .Explain how DNA replicates</p>	<p>1. Demonstrate cell structure image, and draw attention to the nucleus.</p> <p>2. Ask a series of questions about the content of the nucleus.</p> <p>3. Students use candy pieces and toothpicks to "build" DNA molecules and then simulate DNA replication.</p> <p>4. Extract DNA from various foods that are found around you.</p>	<p>1. Use the very small measurement units</p>	<p>1. Students use their knowledge of how traits are inherited to determine the traits of Egg Bunnies.</p> <p>2. Integrate this topic with art subject, by modeling, drawing. With chemistry by extracting the DNA.</p>
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Subject: Biology Curriculum: MoE of Jordan

Grade: 11

Code	Topic / concept	Objectives	Strategies	Math skills used/ needed	Application or integration 1- in the same subject; 2- in other subjects
B13	Cellular Respiration	<p>1. Investigate and explain how living things obtain and use energy</p> <p>2. Analyze how parts of</p>	<p>1. show this PowerPoint game "Download the Jeopardy Game PowerPoint Presentation" The last slide contains the</p>	<p>1.counting</p> <p>2 graphing</p>	<p>1. Grow yeast in a test tube filled with water and sealed with a balloon and justify if the growth aerobic or anaerobic?</p>

		<p>living things are adapted to carry out special functions “mitochondria”</p> <p>3. Explain the process of food storage and food use in organisms.</p> <p>4. Explain the process of producing 38 ATP molecules from 1 glucose molecule.</p>	<p>questions; we use them as a competition.</p> <p>2. Practical experiments in the lab.</p> <p>3. Show figures and explain them.</p> <p>4. Write the equation of producing 38 ATP molecules from 1 glucose molecule</p>		<p>2. Make bread using yeast.</p> <p>2. Producing yogurt, alcohol.</p>
B14	Protein Synthesis	<p>Understand the structure of DNA and the process of DNA replication.</p> <p>Describe the process of protein synthesis</p> <p>Recognize the importance of proteins in the human body</p> <p>Understand how mutations affect protein synthesis and how they can cause genetic disorders</p>	<p>1 . Show an animation of How DNA Replicates.</p> <p>2 .Give students imaginary sections of DNA in a gene and ask them to translate it first into mRNA codons and then into amino acid sequences</p> <p>3 . Read about molecular genetics and discuss the significance of proteins in the human body.</p>	<p>1. Sequences</p> <p>2. Estimating,</p>	<p>1 .Presentation about Mutation diseases “ Syndromes”</p> <p>2. Genetic engineering.</p> <p>3. Integrated with chemistry.</p>
B15	Root System	<p>1. Identify root systems.</p> <p>2. Define root structure.</p>	<p>1. Students will collect root systems from outside.</p>	<p>1. Measuring</p> <p>2. Estimating,</p> <p>3. Counting,</p>	<p>1.use of various roots “ monocotyledons, dicotyledonous plant and</p>

		<p>3. Explain about the parts seen in a transverse section through a root.</p> <p>4. Discuss and explain uses of plants root such as: food, Fuel, and medicines.</p>	<p>2.Students will fill out an worksheet, identifying root systems and measuring their length and widths.</p> <p>3. Each student will draw their own root system.</p> <p>4. Student will see a root section under the microscope and identify all the features.</p>	4. Graphing	<p>integrate math concept such as: Estimating, counting, sorting, graphing etc.</p> <p>2.Be able to identify root parts.</p> <p>3. Uses of plants root, such as: For food, fuel; and medicines.</p>
B16	<p>Phylum Platyhelminthes</p> <p>“Flatworms”</p>	<p>1. Identify the types of flatworms.</p> <p>2. Define how Planaria flatworms live independently.</p> <p>3. Observe the anatomy of the flatworms and the movement of the flatworms.</p> <p>4. Explain the difference between Taena saginata and Taena solium .</p> <p>5. Explain the life cycle of Taena saginata.</p>	<p>1. Show images, or video for planaria and Taena saginata.</p> <p>2 . Ask a series of questions.</p> <p>3. Allow Students to share t ideas and fill in a work sheet about the life cycle of Taena saginata.</p> <p>4. I n the lab students should observe the anatomy and movement of a flatworm.</p>	<p>Magnifications</p> <p>measurement</p>	<p>1. Find Planaria flatworms in fresh <u>water</u> ponds especially during spring and study it in lab.</p> <p>2. Doing a study of: identification of human tapeworm infections is important for public health purposes. Integrated with economics</p>
B17	Class amphibian “Amphibians”	1. Identify the general appearance, reproduction, and the heart, of	1. Using some amphibians models .from the lab and	1. Graphing	1. Students will research in Benefits of Amphibians in nature.

		<p>Amphibians.</p> <p>2. Identify the taxonomy of Amphibians.</p> <p>3. Find the features of salamander .” Amphibian with tail”</p> <p>4. Find the features of frogs. “Amphibian without tail”.</p> <p>5. Explain the reproduction in frogs.</p>	<p>show them to the student.</p> <p>2.Ask student a few Questions.</p> <p>3. Some student should find a live frog from the pond and show it to others.</p> <p>4. Study the anatomy of the frog.</p> <p>5. Studying the life cycle of a frog.</p>		
B18	Enzyme	<p>1.Define enzyme</p> <p>2.Observe the enzyme activity</p> <p>3.Explain how changing the physical conditions affects enzyme activity</p> <p>4.Discuss the Relationship between oxidation and reduction using NADP</p> <p>5. Explain the differences between oxidation and reduction</p>	<p>1. Asking the student a few questions about the role of enzymes, and what factors affects enzyme activity.</p> <p>2. Demonstration - add hydrogen peroxide to separate beakers containing potato cubes and liver extract. Have students list their observations and formulate an explanation. As a group discuss enzymes and how they react.</p> <p>3. Answering the lab questions.</p>	<p>1.Graphing</p> <p>2.Measurement</p>	<p>1. Lab experiments.</p> <p>Integrated with chemistry , “chemical reactions”</p> <p>With physics. “changing the physical conditions”</p>

			4. Demonstration -the changing of physical conditions how affects enzyme activity .		
B19	Photosyn-thesis	<p>1 .explain the three phases of photosynthesis.</p> <p>2. Demonstrate how light, H₂O, and CO₂, are used to make sugar.</p> <p>3. Explain how chlorophyll captures energy from sunlight and convert to chemical energy. “light reactions “</p> <p>4. Explain the dark reactions. “ Calvin cycle”</p>	<p>1. Students draw a structure of chloroplast with thylakoids</p> <p>2. Draw a the flow of electron transport chain.</p> <p>3. Use internet to see the stages of Calvin cycle. Or images. and discuss the reaction , the number of ATPs used , the number of NADPH used.</p> <p>4. Students work as a groups on work sheet.</p>	<p>1. using the small measurement units</p>	<p>. Testing the amount of sugar in several fruits and relates it with photosynthesis rate.</p> <p>2.Integrated with chemistry , physics ,” electron transport”.</p> <p>3. with art “drawing “</p>
B20	Cell cycle phases And DNA structure& Replication	<p>1. Identify stages of the cell cycle.</p> <p>2. describe steps of the cell cycle</p> <p>3. Explain the DNA structure</p> <p>4. Explain how DNA repairs DNA replication errors.</p> <p>5. Identify mutations.</p>	<p>1. Show video about animal and plant cell cycle. Compare the phases.</p> <p>2. Under the microscope, observe the different phases of the cell cycle of onion root tips and white fish blastula cells.</p> <p>3. Students use candy pieces and toothpicks to "build" DNA molecules and then simulate DNA</p>	<p>1.Counting</p> <p>2. Estimating</p>	<p>1. Students will understand that living things share common materials and structures which perform basic life functions.</p> <p>2. Integrated with social studies . And with health. “ effects of mutations “</p>

			<p>replication.</p> <p>4. Students demonstrate errors correcting that happened during DNA replication using candies.</p> <p>5. If the students do not correct errors. Then they know what mutations are.</p>		
B21	Population Ecology	<p>1. Define biodiversity groups.</p> <p>2. Explain why all members of an ecosystem are important.</p> <p>3. Explain the properties of biodiversity groups.</p> <p>4. Explain why the members of an ecosystem change with time.</p>	<p>1. Show photos of endangered species using Internet “ or in a book “ and discuss the reasons why these animals are threatened and why they should be protected;</p> <p>2. Use seeds and a paper, divided into squares, to represent the number of the groups.</p> <p>3. Make a list of the reasons why the population growth changes.</p> <p>4. Write essays in which they explain what they feel are the most compelling reasons for preserving biodiversity and also describe the arguments they think would be most likely to convince the</p>	<p>1.Counting</p> <p>2.Graphing</p>	<p>1. Use math to calculate the diversity of a selected habitat in the students’ area.</p> <p>2. Integrated with Geography.</p>

			general public that biodiversity should be preserved.		
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Subject: Biology Curriculum: MoE of Jordan

Grade: 12

Code	Topic / concept	Objectives	Strategies	Math skills used/ needed	Application or integration 1- in the same subject; 2- in other subjects
B22	IMMUNITY	<p>1. Identify the types of immunity, and primary functions of the human body’s immune system?</p> <p>2. Identify the types of cells that are important in the immune system.</p> <p>3. Investigate the different mechanisms used by white blood cells as they protect the body from foreign invaders.</p> <p>4. Explain what is happening on a cellular level, as the body is invaded and counters with an attack of virus.</p>	<p>1 Ask an Essential Question: “How does the body become sick with a communicable disease?”</p> <p>2. Use reference materials (textbook, magazines, Internet sources with diagrams of viruses, bacteria, antibodies, white blood cells, immune system) to help in answering series of planned questions.</p> <p>3. Create a chart that</p>	<p>1 . Recording data 2 . Graphing</p>	<p>1. Constructing a Model of a Virus and a model for an antigen-antibody reaction.</p> <p>2 .Each fall signals back to school, and unfortunately for many, back to bed with the flu , Research and analyze the data of Influenza</p>

			<p>defines these terms (helper T cells, killer T cells, memory T and B cells, nonspecific immunity, its.</p> <p>4. Inform students that they will be given one of five “case studies” and asked to write a script describing the scenario. They will use this chart as a reference for the activity.</p>		
B23	Transport of Water and Minerals in Plants	<p>1. Explain the mechanism of water and minerals absorption in flowering plant</p> <p>2. Explain the mechanism of sugar movement in the plant.</p> <p>3. Explain the forces of adhesion and cohesion.</p> <p>4. Describe the structure and function of stomata.</p>	<p>1. Show pictures and figures of water pathway through a root, and stem.</p> <p>2. Discuss the function of each pathway.</p> <p>3. Find evidences of transport in the vascular bundles such as using photometer.</p> <p>4. Carry out an experiment showing the transpiration produces the force which draws water up the stem.</p>	<p>1. Measurement</p> <p>2. Graphing</p>	<p>1. Carry out an experiment using pot plant.</p> <p>2. Find the relationship between number of stomata in several kinds of the plant leaves, and the height, and age.</p> <p>3. Integrated with math.</p>
B24	Mendel's law of segregation	<p>1. Explain how different versions of genes give similar characteristics.</p> <p>2. Identify that each</p>	<p>1. Show a video of Mendel’s Pea Plant Experiment.</p> <p>2. Ask few questions about dominant and recessive</p>	1. Probability	<p>1. Students will predict the genotypes of the parents and grandparents and construct a Pedigree chart showing the traits for the grandparents, parents and</p>

		<p>characteristic has two alleles, each one is inherited from one of the parents .</p> <p>3. Explain, that when the two alleles inherited from the parents are different, then the dominant trait will be shown on the offspring.</p> <p>4. Explain that each gamete will contain one allele .</p>	<p>traits.</p> <p>3. Students should create Pedigree charts, involves eye color, hair color, earlobes.</p> <p>4. Students will List and discuss the parts of Mendel’s Law of Segregation.</p> <p>5. Students fill in a worksheet.</p>		<p>children.</p> <p>2. Integrated with math.</p>
B25	Co dominance and Multiple Alleles	<p>1. Define co dominance.</p> <p>2. Apply genetic principles to solve inheritance problems including multiple alleles, and co dominance.</p> <p>3. Explain the blood groups, “antigens, and antibodies“.</p>	<p>1. Discuss the definitions of co dominance, giving examples (Black, white, speckled chickens; blood types A, B, AB, and O).</p> <p>2. ask Students to design a poster with a fictitious animal or plant illustrating co dominance. Show example and what it must include.</p> <p>3. Discuss how co dominance and incomplete dominance differ from each other.</p>	probability	<p>1. Research in blood groups in students’ families “the parents , grandparents, and children’s “</p> <p>2. Integrated with economics. Health “blood transfuse.”</p>

B26	Gene Interaction “ Epistatic gene “	<ol style="list-style-type: none"> 1. Describe the epistatic gene and hypostatic gene. 2. Analyze the difference between epistatic gene and the complete dominance. 3. Explain how the epistatic gene can be dominant or recessive. 4. Explain the effects of epistatic gene on the color of summer pumpkin. 	<ol style="list-style-type: none"> 1. Show images for what Bateson and Punnett performed an experiment that demonstrated genetic interactions. They analyzed the three comb types of chicken known to exist at that time: 2. Discuss an interaction between genes in which one gene masks or suppresses the expression of the other. “Epitasis”, 3. Students use books or internet to make a list of anther examples, like Kernel Color in Wheat, Flower color in sweet pea. 4. Students should work on worksheet. 	probability	<ol style="list-style-type: none"> 1. Research in gene causing albinism would hide the gene controlling color of a person's hair. In another example, a gene coding for a widow's peak would be hidden by a gene causing baldness.
B27	Chromosomal Mutations	<ol style="list-style-type: none"> 1. Describe chromosomal mutations. 2. Define all types of chromosomal mutation results from the changing in the chromosome structure, or from changing in the number of chromosomes, including sex chromosomes. 3. Explain the benefits of 	<ol style="list-style-type: none"> 1. Use slides to show students the major types of chromosomal mutations. 2. Put students in groups of two to do a handout in which they explore how inversion, translocation, addition, and deletions in DNA result in changes in chromosomes structure. 	<ol style="list-style-type: none"> 1.addition 2.deletions 	<ol style="list-style-type: none"> 1. Students have an opportunity to research different genetic disorders resulting from chromosomal malfunctions. “ Down syndrome , Edward syndrome, and Klinefelter syndrome, ...etc.” Research can be mutagens that are specific to student area and tell how the

		<p>chromosomal mutation in plants.</p> <p>4. Distinguish between the no disjunction chromosomes mutation during the first stage or of second stage of meioses</p>	<p>3. Discuss with the students how the different mutations affect the resulting protein products</p> <p>4. Draw images for no disjunction chromosomes during first stage and second stage of meioses.</p>		<p>mutagens affect the environment.</p>
B28	<p>Human genome Map</p> <p>Gene Therapy</p>	<p>1. Identify the human genome.</p> <p>2. Explain the four levels of drawing a human genome, “Cytogenetic map, Genetic map, Physical map, and DNA sequencing.”</p> <p>3. Define the gene therapy.</p> <p>4. Explain the gene therapy for stem cells, and for sex cells.</p>	<p>1. Discuss the definition of human genes and their function and importance</p> <p>2. Ask students to consider why scientists would want to map genes.</p> <p>3. Have them use the Internet, a dictionary or other sources</p> <p>4. Brainstorm advantages and disadvantages of gene therapy</p> <p>5. Student work on a worksheet of drawing a genetic map.</p>	Estimation	<p>Student research in how alleles can be inherited that have a deleterious effect upon an offspring, so they</p> <p>Explore feelings and beliefs within a framework that is non-threatening to themselves or others if it can be treated by gene therapy. It also allows them the opportunity to use ethical decision-making models.</p>
B29	Hearing receptor	<p>1. Identify the tree main parts of the human ear.</p> <p>2. Discribe the structure of the inner ear</p> <p>3. Recognize that</p>	<p>1. Ask students what their first words were, and Ask them why so many of them report having the same first words.</p> <p>2. Begin focusing the discussion on the ear as the</p>	1- Micro-measurements	<p>1. Integrated with physics (sound waves)</p> <p>2. Research in problems of hearing.</p>

		<p>understanding spoken language requires a process that moves from sound to cochlea (the hair cells) to the brain.</p> <p>4. Recognize that the brain is the central to communication of any form.</p>	<p>body organ that interacts with brain and environment.</p> <p>3. Display a transparent paper for inner ear, students should explain the procedure of hearing.</p> <p>4. Students should work on worksheet.</p>		
B30	Heart beat coordination	<p>1. Identify the structure of the human heart.</p> <p>2. Determine normal pulse rate.</p> <p>3 Determine how the sinoatrial node and the atrioventricular node work to keep the heart beating.</p> <p>4. Explain how the heart can beat without brain controlling.</p>	<p>1. Brainstorm with the students facts they already know from their investigations concerning the heart.</p> <p>2. As a team, compare your heart rates with each others from the Vital Signs Spreadsheet; share your insights to others.</p> <p>3. Show the students a heart diagram; ask them to discuss the function of each feature.</p> <p>4. Students fill in worksheet.</p>	Collect, organize, interpret data, including making predictions, involving the heart rate at rest and after exercise.	Students use a variety of technological and information resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge about heart problems that are common in Jordan.

Subject : Biology
Grades: Nine and Ten

Curriculum :IG

					for living things.(physics)
B33	<p><u>Photosynthesis</u></p> <p>Effect of external factors on the rate of photosynthesis</p> <p>Limiting factors</p>	<p>1. Identify the effect of the following external factors on the rate of photosynthesis: temperature, light intensity and carbon dioxide concentration</p> <p>2. Explain how the previous factors are considered limiting factors.</p>	Design experiments to show the effect of each limiting factor on the rate of photosynthesis while maintaining the other factors controlled or constant	<p>Drawing graphs</p> <p>Showing the dependent and the independent variables</p>	<p>1 the structure of enzymes and their mode of action at different temperatures. (chemistry and physics)</p> <p>2.the importance of mineral salts found in soil and their effect on plant growth (biology)</p>
B34	<p><u>Transport in plants</u></p> <p>Uptake of water and mineral salts and how are they transported from roots to leaves up</p>	<p>1. Identify the uptake means of water and mineral salts from soil</p> <p>2. Explain the passage of water and dissolved salts through the root cells</p> <p>3. Explain how water and dissolved salts</p>	<p>1.Experiments that demonstrate the characteristics of water</p> <p>2.Experiments which prove leaves are responsible for evaporating water from plants</p> <p>3. Experiments that</p>		<p>1.characteristics of water such as cohesion and adhesion forces (chemistry and physics)</p> <p>2. structure of water vessels in plant</p> <p>3. structure of leaf that helps in creating a pulling force for water</p>

	high	<p>move up high through plant vessels</p> <p>4. Identify the forces that causes the pulling of water up high towards the leaves.</p>	shows the water passage inside water vessels inside the plant		(physics)
B35	<p><u>Digestion , absorption and use of food</u></p> <p>Absorption of digested food</p>	<p>1. Identify the areas in the digestive system where absorption takes place</p> <p>2. Identify the types of food that are absorbed</p> <p>3. Explain how the absorption of digested food takes place</p>	Drawings, models and animated diagrams		<p>1. structure of chemicals found in food such as carbohydrates, lipids and proteins(chemistry)</p> <p>2. diffusion and active transport (physics)</p> <p>3. types and structure of blood vessels (biology)</p>
B36	<p><u>The blood circulatory system</u></p> <p>Lymphatic system</p>	<p>1. Identify the parts of the lymphatic system</p> <p>2. Identify the function of the lymphatic system</p> <p>3. Explain the role of lymphatic system in transporting substances to blood circulation</p> <p>4. Explain the relation</p>	Drawings, models and animated diagrams		<p>1. Structure and types of blood vessels</p> <p>2. diffusion and osmosis</p> <p>3. function and structure of lymphocyte and phagocytes (Biology)</p>

		<p>between the blood pressure</p> <p>In capillaries and the importance of the lymphatic vessels</p>			
B37	<p><u>Human reproduction</u></p> <p>Menstrual cycle</p>	<p>1. Define the menstruation</p> <p>2. Identify the hormones involved in the menstrual cycle</p> <p>3. Explain the effect of hormones on the female body</p>	<p>Drawings, models and animated diagrams</p>	<p>Drawing graphs showing the concentration of hormones versus the time of the month</p>	<p>1. Definition of hormones</p> <p>2. Structure of female reproductive system</p> <p>3. Family planning and contraceptives (population)</p>
B38	<p><u>Excretory System</u></p> <p><u>Homeostasis</u></p> <p>Osmoregulation</p>	<p>1. define homeostasis</p> <p>2. explain the importance of homeostasis for human body health</p> <p>3 state the substances that should be regulated in human body</p> <p>4. State the organs that is responsible for regulation of body internal</p>	<p>Drawing , models and animated diagrams.</p> <p>Animation to show how substances pass through the cell membrane</p>		<p>1. definition of endocrine gland (biology)</p> <p>2. coordination system, nervous system</p> <p>3, chemical structure of hormone (chemistry)</p>

		environment 5. Explain the effect of the ADH , when and where does this hormone secretes			
B39	<u>Genetics</u> DNA CHROMOSOME GENE	<ol style="list-style-type: none"> 1. Describe the structure of the DNA and its function 2. Describe the structure of the chromosome and its relation to the DNA 3. State that each chromosome is made of several gene 	<p>DNA model</p> <p>Drawing of cell to locate the DNA and chromosomes</p> <p>Animation of the how the DNA works and functions</p>		<ol style="list-style-type: none"> 1. structure and the chemical formula of nucleotides (chemistry) 2. structure of amino acids and proteins (chemistry) 3.chemical bonding in DNA (chemistry)

Subject: Biology A L

Curriculum:

Edexcel GCE

Grade/Grades 11 & 12

Code	Topic / concept	Objectives	Strategies	Math skills used/ needed	Application or integration 1- in the same subject; 2- in other subjects
B40	Transport around the body/ surface area to volume ratio (SA/V)	<p>- Explain the need of transport systems as body size increase.</p> <p>- To conclude which animal according to size can survive using outer surface for exchange.</p> <p>- Explain the need for specialized organs for exchange as volume of</p>	<p>Show pictures of small and big animals to judge which can survive depending on surface area alone for exchange.</p> <p>Explain the role of a transport system in providing nutrients and taking wastes.</p> <p>Use calculations to show the SA/volume ratio, to be able to draw a conclusion that as body volume increases the outer surface alone will not be enough to supply the cells with their needs.</p> <p>Explaining that diffusion is effective only for short distances. Using the thickness of capillary walls and the alveolus wall as an example.</p>	<p>-Use simple calculation.</p> <p>to calculate the area and volume of two different sized cubical objects = choosing cube shape for simplicity of calculation.</p> <p>- Calculate the SA/V ratio to compare between both bodies which its surface area is enough for exchange.</p>	<p>1. Integrated with mass flow, transport and circulatory system, other means of exchange across membranes.</p> <p>2. Medicine pharmacy and stability of internal environment.</p> <p>- Life style.</p> <p>- Develop practical skills of how science works.</p> <p>- Body health and risk.</p>

		animals increase	<p>Using charts to make students aware that the network of capillaries in the blood circulation makes cells so closed to supply.</p> <p>Using the adaptations of some organs where the surface area become so large to serve exchange materials like the lung surface due to alveoli and the small intestine due to villi .</p>		
B41	Cardiovascular diseases (CVDs) /atherosclerosis, angina, atheroma, plaque, ...etc.	To make students differentiate each case in the CVDs and recognize how each is developed?.	<p>Define each case of CVDs</p> <p>Explain how each is developed and the factors that lead to them.</p> <p>Using charts for blood vessels and their wall structures.</p> <p>Using video or DVD to show how these cases developed and how they occur.</p>	Analyze graphs , bar charts and pie charts for the CVDs according to life styles in different countries	<p>1.- Heart and body health</p> <p>- types of blood cells especially platelets.</p> <p>- clotting factors.</p> <p>- Nutrition and diet</p> <p>- Effect of age, life style, smoking,</p>

			<p>Student in group work Discuss cases happened with people known by them and discussing their symptoms and treatments.</p> <p>Explain the lipoproteins, cholesterol and other factors and their effect on CVDs</p> <p>Using catheterization video to illustrate these cases and explain how it is developed.</p> <p>Discuss how people use scientific knowledge about the effect of diet including obesity and BMI to reduce CVDs</p>		<p>drinking, exercise, obesity and BMI ...etc</p> <p>- Develop practical skills of how science work</p> <p>2.- Linked to medicine, lab analysis treatment, life style and risks, economics , ethics, genetics</p>
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	<p>DNA rewinding / /transcription/ replication models (conservative and semi conservative)</p>	<p>-To be recognize why DNA is the molecule of inheritance.</p> <p>- To differentiate between the two cases of DNA rewinding.</p> <p>-To differentiate between replication models.</p> <p>- To develop understanding of the process of protein synthesis</p>	<p>Explain the DNA structure and double helix</p> <p>Discuss the properties that make DNA the substance of inheritance.</p> <p>Show charts for Watson and Crick model.</p> <p>Use models of DNA that allow students to build up the DNA.</p> <p>Explain the importance of DNA unwinding and when it happens.</p> <p>Explain the difference between transcription and replication. When and why each occurs.</p>	<p>- Calculate the percentage of any nitrogen base in the DNA molecule if the number of one base given .</p>	<p>1. - Integrated with cell division, growth, repair, mutations, speciation and variation.</p> <p>- Protein synthesis and the importance of genetic code for controlling body structure and functions.</p> <p>2. - Practical skills of how science work.</p> <p>- Medicine, genetic disorders and mutation.</p> <p>- Diagnoses of genetic disorders for embryos.</p> <p>Genetic screening</p> <p>- Genetic engineering</p>
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			<p>Make students aware of the need for cell division, replication , protein synthesis.</p> <p>Make students use data to transcribe and translate the genetic code to a polypeptide chain.</p> <p>Use the periodic table to use data to know what an isotope is.</p> <p>Show the models of how DNA replicate (conservative and semi conservative).</p>		<p>- How to live with a genetic disorder, pharmacy to provide the medicines to reduce the symptoms.</p> <p>- Genetic counseling</p> <p>-Ethical issued , abortion,...etc</p>
B42	Embryo development and cell differentiation/ cloning, stem cells, Totipotency and pluripotency	<p>- To develop understanding of the meaning of each term</p> <p>- To differentiate between them.</p> <p>- To determine the</p>	<p>Define the meaning of each term.</p> <p>Explain how each of these can be used and when.</p> <p>Explain the process of fertilization and stages</p>	- Using graphs and data to analyze the needs for organs in different countries.	<p>1.- Integrated with mitosis. properties of embryo cells</p> <p>-How genes are transcribed.</p> <p>2. - Medical application , benefits of stem cell therapy</p> <p>- Therapy of Parkinson, diabetes, damaged nerves</p>

		<p>source of each</p> <p>- To be able to know when each is applied.</p>	<p>of embryo formation.</p> <p>Show some experiments in literature to be aware of the sources and how applied.</p> <p>Use charts and models for embryo stages.</p> <p>Discuss the process of cloning and embryo splitting.</p> <p>Show video or DVD or internet for cloning.</p> <p>Group discussion about the difficulties of organ transplants.</p> <p>Research about totipotent and pluripotent cells , stem cells , transplants.</p>		<p>- Spare parts and organ transplant.</p> <p>- Agricultural applications for plant cloning.</p> <p>-Linked with techniques of how science work.</p> <p>- Ethics and point view of the community</p>
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B43	Practical work / Evaluating scientific studies, validity, reliability, accuracy, precision, biased, evaluation,	<p>To analyze the methodology and techniques of practical work</p> <p>To develop an understanding of the terms and the value of each for practical works.</p> <p>Students learn how to plan for an experiment.</p>	<p>Define each term</p> <p>Discuss the value and importance of each term</p> <p>Discuss the effect of each at the consistency of the scientific work.</p> <p>Demonstrate scientific experiment to let students know where each is available or lacked</p> <p>Group discussion for some scientific experiments to try recognize each term, and its importance</p>	<p>- To learn how they obtain data and how to tabulate, draw and analyze data</p> <p>- How to calculate the average when more than one set of data obtained.</p> <p>- Calculate the reciprocal time .</p> <p>- Calculate any missing value from the data given.</p> <p>-Obtain data from graphs</p>	<p>1. -Linked with all practical works.</p> <p>2.-Practical work in any field.</p> <p>- Pharmacy, drug and medicine development and approvals.</p>
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B44	Organic molecules in living things/ protein structures (primary, secondary, tertiary and quaternary)	<p>To know protein structure, recognize the amino acids as structural units.</p> <p>To determine the main plan of all amino acid structure.</p> <p>To develop an understanding of condensation and hydrolysis reactions.</p>	<p>Explain the amino acid chemical structure and configuration.</p> <p>Describe the amine group and hydroxyl group.</p> <p>Explain the common parts of all amino acids and illustrate R- residue as the main different group of all amino acids</p> <p>Illustrate by drawing how condensation and hydrolysis processes occur in the polypeptide chain (to build and break the peptide bond)</p> <p>Explain how the chain of amino acids(polypeptide) remain chain like or folded.</p> <p>Illustrate the shapes of the four structures by drawing their general</p>	No mathematical skills	<p>1- Linked this with other molecules polymerization and hydrolysis, as carbohydrates, lipids and nucleic acids.</p> <p>- Linked to protein synthesis at the ribosome.</p> <p>- Enzyme structure and specific shape, the active site and linked with key-lock theory and to induced fit theory, denaturation of enzymes.</p> <p>2. - Linked to medicine and fever.</p> <p>- Pharmacy in using masking medicines for active site.</p>
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		<p>To develop an understanding of the types of bonding within the polypeptide molecule and how they are formed, and their importance in holding the molecule structure.</p> <p>To differentiate between fibrous protein and globular proteins and their role in the body.</p>	<p>shape.</p> <p>Illustrate the 4 protein structures by using a wire or thread and showing that when protein becomes folded it requires special bonds for controlling and regulating its basic shape.</p> <p>Explain the types of bonds found in each structure in order to hold molecule in a specific shape</p> <p>Group work to conclude what will happen if these bonds (clips) holding the folded wire is removed.</p> <p>Discuss the difference between fibrous and globular protein with examples from our body.</p>		<p>- Linked to the role of Golgi body in protein modification and adding prosthetic groups. lipoproteins and haemoglobin , glycoproteins</p> <p>- Linked to how science work , application and diagnosis as using different techniques of chromatography.</p> <p>-Linked to some hormones (protein nature) and how they affect target cells.</p> <p>-Food and diet...etc</p>
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B45	Plant productivity/ photosynthesis reaction	<p>To realize the importance of plants in many ways especially as food and oxygen producers.</p> <p>To develop understanding of the structures and sites where the reaction of photosynthesis takes place.</p> <p>To determine the plant requirements for doing the reaction.</p> <p>Realize that solar energy is the main energy enters the ecosystem and it is the source of all energies except nuclear.</p> <p>To develop understanding of steps of photosynthesis and their products.</p>	<p>Explain the importance of plants in the ecosystem.</p> <p>Group discussion for student reports about deforestation as human impact.</p> <p>Lab work to study plant leaves as the sites of photosynthesis, their variation, and adaptation according to climate.</p> <p>Lab work to study leaf structure, using microscope slides, study of how leaf is protected.</p> <p>Discuss plant needs for living.</p> <p>Explain the types of plastids and studying in detail the structure of chloroplast. Studying other plant pigments.</p> <p>Lab work to extract the</p>	<p>- Read and obtain data from bar charts or graphs.</p> <p>- Calculate number of molecules of ATP , NADP or any others needed to make any number of 3C, or glucose molecules obtained .</p>	<p>1. -Linked to food and diet</p> <p>- Plant productivity</p> <p>- Enzyme action.</p> <p>- C4 and CAMP plants.</p> <p>- Food chain, food webs, energy flow , feeding relationships between organisms.</p> <p>-Ecology and ecosystem</p> <p>- Human impact on environment. deforestation and global warming, green house effect.</p>
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			<p>chlorophyll.</p> <p>Explain the light spectrum using chart of wavelength and their colors.</p> <p>Discuss the photo systems found in chloroplasts and how they are interdependent.</p> <p>Illustrate generally the light dependent and light independent reactions, their reactants and products.</p> <p>Illustrate in details both reactions, their steps.</p> <p>Discuss the importance of producing 3C skeleton to synthesize other organic compounds.</p>		<p>2. - Medicine and health</p> <p>- Pharmacy and extraction of drugs.</p> <p>- Economy and industry based on plant materials</p> <p>- Life style.</p> <p>-How science work and practical skills</p> <p>- Humidity and rain fall</p>
B46	DNA profiling / forensic investigation.	<p>To develop understanding to DNA structure.</p> <p>To classify nitrogen</p>	<p>Explain with the mean of drawings and illustrations the structure of DNA.</p>	<p>Simple calculation for the ratio of nitrogen bases in a DNA according</p>	<p>1. - Linked to heredity as body structure and function control</p>

		<p>based according to their structure and develop understanding of base pairing and H-bonds of double helix.</p> <p>Be able to know how DNA be extracted and cut up.</p> <p>Develop understanding of DNA isolation techniques.</p> <p>Develop understanding and applying DNA profiling in forensic investigations.</p> <p>Describe how DNA profiling is used for identification and determining genetic relationships between organisms.</p>	<p>Explain the base pairing rule.</p> <p>Group discussion for student reports about techniques of DNA profiling, extraction, cut up and isolation.</p> <p>Explain forensic methods of investigation and relate them to the use of DNA technique.</p> <p>Discuss the forensic methodology by the use of DNA.</p> <p>Discuss some cases and investigations of some crimes in literature.</p> <p>Show and illustrate the slides of results of DNA method of investigation and how can lead to know the criminal person.</p>	<p>to base pairing.</p>	<p>- Criminal investigations , genetic relationships application, blood group testing, and other methods</p> <p>2- Protein synthesis</p> <p>- Variation and diversity</p> <p>- How science work and practical skills.</p> <p>- Ethical issues.</p>
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B47	Energy transfer /Aerobic Respiration	<p>To develop understanding of muscle structure and action, and their need for energy.</p> <p>To recognize the need of energy for all living systems</p> <p>Recognize the mitochondria and its structure.</p> <p>Develop an understanding of aerobic reaction stages and steps, reactants and products of each.</p>	<p>Explain by the use of charts and models the muscle structure and function</p> <p>Group discussion for the uses of energy in living systems.</p> <p>Explain by drawings and illustrations the cell structure and the mitochondria in particular, showing the sites where each stage of respiration takes place.</p> <p>Student research and discussion about organisms where the stage glycolysis takes place and their particular modification to steps carried forward.</p> <p>Group discussion to develop the understanding that</p>	<p>Simple calculation.</p> <p>-The amount of ATP, FAD, NAD molecules produced by any quantity of glucose at any step.</p>	<p>1. - Integrated to muscle tissues.</p> <p>-Food store and reserve in the body</p> <p>-Food and diet and balanced diet.</p> <p>- Activities of our body that need energy.</p> <p>2. - Health, exercise and life style.</p> <p>-How science work and practical skills</p>
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		<p>glucose is the main key molecule for respiration and the need of other stored molecules in the body to glucose in able to enter into respiration</p> <p>Explain the steps of glycolysis, krebs cycle, e-transport, their production of energy molecules.</p> <p>Describing through chemiosmosis the fate of reduced molecules NAD AND FAD .</p> <p>By the means of charts students conclude the relationships between photosynthesis and respiration, and how they occur in plant cells,</p> <p>Determine the difference between anabolic and catabolic reactions.</p> <p>Explain the meaning of</p>		<p>- Industry, considering respiration as a source of intermediates.</p>
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			<p>phosphorylation and oxidation reactions</p> <p>Carry out investigations for respiration, the factors affecting its rate.</p>		
B48	Neurones / Transmission of an impulse.	<p>To develop an understanding of body need for communication, coordination and control.</p> <p>Students are able to determine how body performs response.</p> <p>To differentiate between types of neurones and their role.</p> <p>Develop understanding of that nerve impulse will pass through fibers and synapse in order to reach target.</p>	<p>Describe by means of charts , drawings the body plan and organ variation and their need for control and regulation.</p> <p>Explain by means of video or DVD how body makes the coordination, (nervous, hormonal).</p> <p>Explain practically by means of a simple game the meaning and the need for response.</p> <p>By use of illustrations give and account for types of neurones, structure and function.</p> <p>Illustrate and show structure of a synapse and its importance.</p>	No special calculations	<p>1. - Linked to all body organs.</p> <p>- Cell membrane and receptors.</p> <p>-Receptors and effectors.</p> <p>-Reflex action, conditional reflexes.</p> <p>- Behavior</p>

		<p>Refresh students' memory about the methods of transport across the cell membrane.</p> <p>To develop understanding of the mechanism of nerve impulse transmission through both fiber and synapse</p>	<p>Make revision to the ways of transport across the cell membrane.</p> <p>Explain stages of how nerve impulse is transmitted through the nerve fibers. Explaining the meaning of polarization, resting potential, action potential, depolarization, refractory period...etc.</p> <p>Explain how the action potential or nerve impulse passes to next neurone through the synapse, explaining the meaning of neurotransmitters and enzymes to break them in the cleft...etc.</p>		<p>-Related to hormonal coordination.</p> <p>- Food and diet</p> <p>2. – Linked to effect of drugs taking.</p> <p>- Medicine and treatment. Health and diseases</p> <p>-Life style</p> <p>- Ethical issues</p> <p>-How science work and practical skills</p>
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Subject: Biology

Curriculum : IB SL

Grades 11 and 12

Code	Topic / concept	Objectives	Strategies	Math skills used/ needed	Application or integration 1- in the same subject; 2- in other subjects
B49	Statistical Analysis	<p>1- To calculate mean, standard deviation of a set values.</p> <p>2- Deduce the significance of the difference between two sets of data using calculated values for (t) test and the appropriate tables.</p>	<p>1-Design an investigation to compare the distribution of a specific plant species in two areas in a local desert.</p> <p>2-Use of multimedia and websites to differentiate between correlation and casual relationship between two variables.</p>	<p>1.Calculate the <u>Mean, Mode, Median, and S.D</u> for the two areas for the plant species.</p> <p>2.Calculate the value of (t) test to find out if the difference between the two sets of data is significant and due to an ecological factor (t-test table)</p>	<p>1- Ecological investigations</p> <p>2- Biochemical investigations</p> <p>3- Statistical investigations for all fields of study.</p>
B50	Comparing Different Cells	1. To compare between prokaryotic and	1. Conduct a lab. Session to observe some	1. to use the skills of cross	1. Use of bacteria in producing lactose free milk.

		eukaryotic cells. 2. To compare between animal and plant cells.	bacterial cells such as (yogurt solution, pickle water) using the light microscope at X400, and some plant cells (tomato, onions) as well as animal cells (check cells).	multiplication using the formula for magnification as below: <u>Magnification</u> \equiv <u>size of drawing</u> size of specimen	
B51	Membranes	1. To identify the functions of a cell membrane 2. To compare between diffusion and osmosis.	1. Conduct an experiment to illustrate diffusion by adding crystals of KMnO_4 into a glass of water, as for osmosis use visking tubing to place sucrose solution inside it and immerse it in distilled water.	1. To calculate the rate of diffusion by dividing time needed over distance as below: Rate = $\frac{\text{Time}}{\text{Distance}}$	1. Immunity and getting rid of invaders inside the body.
B52	Cell Division (Mitosis)	1. To describe the events that occur in the four phases of mitosis (prophase, metaphase,	1. To cut and paste printed chromosomes from a Karyotype (found online) for a normal	N/A	1. Use of Karyotype in the Genetic field.

		anaphase and Telophase)	male and female, and a Down Syndrome male and female.		
B53	Organic Chemistry	<p>1. To compare between condensation and hydrolysis.</p> <p>2. To identify different types of molecules, such as amino acids, glucose, fatty acids, maltose and glycerol.</p>	1. Perform a chemical test for the presence of sugar, fat, and protein in different organic substances (olives, milk, meat)	<p>1. Counting the number of atoms in each molecule to write the chemical formula as $C_6H_{12}O_6$, $C_{12}H_{22}O_{11}$, ..etc.</p>	1. Concept of metabolism in Biology is formed when hydrolysis condensation takes place
B54	DNA Structure	1. To draw and label a simple diagram of the molecular structure of DNA.	<p>1. Conduct an experiment in the laboratory using plant cells to prepare the DNA.</p> <p>2. Use of multimedia and websites to illustrate the different compositions of the DNA.</p>	1. Calculate the percentage of any base in a known quantity of DNA, using the base-pair concept.	<p>1. DNA technology.</p> <p>2. Biochemical investigation.</p>
B55	DNA replication	1. To explain the DNA replication and its significance in conserving the genetic	1. Label a DNA diagram that illustrates the process of replication.	N/A	1. Biochemical investigation

		code.	2. Use multimedia and websites to illustrate the process of DNA replication (online: you tube)		2. Conserving the genetic code and its importance in keeping characteristics through mitosis.
B56	Transcription	1. To outline the process of transcription and the enzymes needed for the process.	1. Label a diagram illustrating how a DNA forms a transcript of RNA during transcription. 2. Use of multimedia and websites to illustrate transcription (YouTube).	N/A	1. Biochemical investigations 2. The use of transcription in the process of protein synthesis, and relating it to characteristics.
B57	DNA Translation	1. To explain the process of polypeptide formation in the cytoplasm using the translation process. 2. To define the terms codon, genetic code and universal.	1. Create a model to illustrate the occurrence of translation inside the cytoplasm which builds a polypeptide. (Lego blocks can be used for this activity) 3. Use of multimedia and websites to illustrate the process of translation.	1. Basic multiplication or cross multiplication in the formula related to the following rule: Each codon (3 nucleotides) results in carrying 1 amino acid.	1. Biochemical investigation and the use of genetic code in Biochemistry.

B58	Cell Respiration	1. To define cell respiration and to compare between aerobic and anaerobic respiration.	1. Perform a lab experiment in yeast and in germinating seeds highlighting the difference between anaerobic and aerobic respiration.	1. Simple addition and cross multiplication skills to find out total energy produced, in Kilo Calories or Kilo Joules.	1. Microbial industry, which is the production of alcohol. 2. Food industry.
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Subject : Biology

Curriculum : IB HL

Grades 11 and 12

Code	Topic / concept	Objectives	Strategies	Math skills used/ needed	Application or integration 1- in the same subject; 2- in other subjects
B59	Statistical Analysis	1. To calculate mean, standard deviation of a set values. 2. Deduce the significance of the difference between	1-Conduct and ecological trip to the desert, (Azraq reserve or Wadi Shu'ib) to compare the distribution of a plant species in two areas using random sampling. 2-An experiment in the	1- Calculate the <u>Mean</u> , <u>Mode</u> , <u>Median</u> , and <u>S.D</u> for the two areas for the plant species.	<ul style="list-style-type: none"> ▪ Ecological investigations ▪ Biochemical investigations ▪ Statistical investigations for all fields of study.

		<p>two sets of data using calculated values for (t) test and the appropriate tables.</p> <p>3. Explain the Differences between correlation and casual relationship between two variables.</p>	<p>laboratory to compare effect of light on germination of seeds by measuring the increase in the length of the shoot/root on daily basis for (12) days and use the two sets of results.</p> <p>3- Use of multimedia and websites to differentiate between correlation and casual relationship between two variables.</p> <p>“Correlation is not a proof of cause”</p>	<p>2-Calculate the value of (t) test to find out if the difference between the two sets of data is significant and due to an ecological factor (t-test table)</p>	<p>▪ Design investigations</p>
B60	Cells	<p>1. To compare between prokaryotic and eukaryotic cells.</p> <p>2. To Identify structures from a diagram of the ultra structure of (E.coli).</p>	<p>1. Conduct a lab. Session to observe some bacterial cells such as (yogurt solution, pickle water) using the light microscope at X400, and some plant cells (tomato, onions) as well as animal cells (check</p>	<p>1. To calculate the linear magnification of drawings and actual size of specimens in images of known magnification using the formula</p>	<p>▪ Use of bacteria in industry (making alcohol, cheese, yogurt, pickle biotechnology)</p>

		3. To identify structures from a diagram of the micrograph of a liver cell	cells). 2. Use e' micrographs from multimedia and websites to label different structures such as cell wall, plasma membrane, ribosome, mitochondria, Golgi apparatus, RER, nucleus and mitochondria in prokaryotic and Eukaryotic cells.	magnification= <u>size of drawing</u> size of specimen	
B61	Membranes	1. To compare between diffusion and osmosis. 2. To explain the formation of transport vesicles during endocytosis and exocytosis.	1. Conduct an experiment to illustrate diffusion by adding crystals of $KMnO_4$ into a glass of water, as for osmosis use visking tubing to place sucrose solution inside it and immerse it in distilled water.	N/A	<ul style="list-style-type: none"> ▪ Biochemical investigations ▪ Immunity and getting rid of invaders inside the body. ▪ Secretion by secretory cells (e.g. production of saliva.)

			2. Use of multimedia to show how does a macrophage engulf bacteria or debris/ or how does a secretary cell work.		
B62	Cell Division (Mitosis)	<p>1. To describe the events that occur in the four phases of mitosis (prophase, metaphase, anaphase and Telophase)</p> <p>2. Explain how mitosis produces two genetically identical nuclei.</p>	<p>1. Use of ribbons (class activity) of the same color to illustrate the duplicated chromosome and different colors to illustrate different chromosomes and stick them to papers to show the four phases.</p> <p>2. The above class activity clarify the identical nuclei strategies.</p> <p>3. Use of multimedia and websites to show the four stages of mitosis in the animation style.</p>	N/A	1. Mitosis will be applied in growth of plants and animals.
B63		1. Outline the role of condensation and	1. Use the class activity to construct a	1. Counting the number of atoms	1. Concept of metabolism in Biology is formed when hydrolysis condensation

	Chemistry of Life)	hydrolysis in the relationships between monosaccharide, disaccharide and polysaccharide as well as fatty acids and glycerol and amino acids and polypeptides.	<p>monosaccharide using the (organic chemistry kit) where Carbon, Hydrogen, and Oxygen are bonded to form the glucose in a ring shape.</p> <p>2. Allow students to form a disaccharide and a polysaccharide.</p> <p>3. Let the students form a fatty acid, glycerol and amino acid.</p> <p>4. Add H₂O to the polymer to present hydrolysis and let them use the concept of polymerization by taking of H₂O.</p>	in each molecule to write the chemical formula as C ₆ H ₁₂ O ₆ , C ₁₂ H ₂₂ O ₁₁ ,...etc.	takes place 2. Link this to chemistry and to nutrient cycles in earth.
B64	DNA Structure	1. To draw and label a simple diagram of the molecular structure of DNA.	1. Use a model to illustrate the structure of a nucleotide, and the bonding of nucleotides to form the DNA, showing the double helix.	1. Calculate the percentage of any base in a known quantity of DNA, using the base-pair concept.	<p>a. DNA technology.</p> <p>2. Biochemical investigation.</p>

			<ol style="list-style-type: none"> 2. Conduct an experiment in the laboratory using plant cells to prepare the DNA. 3. Use of multimedia and websites to illustrate the different compositions of the DNA. 		
B65	DNA replication	1. To explain the DNA replication and its significance in conserving the genetic code.	<ol style="list-style-type: none"> 1. Use diagrams in books (Clegg) to illustrate the process of replication. 2. Use multimedia and websites to illustrate the process of DNA replication (online: you tube) 	N/A	<ul style="list-style-type: none"> ▪ Biochemical investigation ▪ Conserving the genetic code and its importance in keeping characteristics through mitosis.
B66	Transcription	1. To outline the process of transcription and the enzymes needed for the process.	<ol style="list-style-type: none"> 1. Use a model illustrating how a DNA forms a transcript of RNA during transcription. 2. Use of multimedia and websites to illustrate 	N/A	<ul style="list-style-type: none"> ▪ Biochemical investigations ▪ Assists students in understanding the process of protein synthesis, and relating it to characteristics.

			transcription (YouTube).		
B67	DNA Translation	<p>1. To explain the process of polypeptide formation in the cytoplasm using the translation process.</p> <p>2. To define the terms codon, genetic code and universal.</p>	<p>1. Create a model to illustrate the occurrence of translation inside the cytoplasm which builds a polypeptide.</p> <p>(Lego blocks can be used for this activity)</p> <p>3. Use of multimedia and websites to illustrate the process of translation.</p>	<p>1. Basic multiplication or cross multiplication in the formula related to the following rule:</p> <p>Each codon (3 nucleotides) results in carrying 1 amino acid.</p>	<ul style="list-style-type: none"> ▪ Biochemical investigation and the use of genetic code in Biochemistry.
B68	Cell Respiration	<p>1. To compare between aerobic and anaerobic respiration.</p> <p>2. To outline factors affecting the rate of respiration.</p>	<p>1. Perform a lab experiment in yeast and in germinating seeds highlighting the difference between anaerobic and aerobic respiration.</p> <p>2. Refer to books as resources for production of energy (ATP) in aerobic and anaerobic respiration</p>	<p>1. Simple addition and cross multiplication skills to find out total energy produced, in Kilo Calories or Kilo Joules.</p>	<ul style="list-style-type: none"> ▪ Microbial industry, which is the production of alcohol. ▪ Food industry.

