THE DEMOCRATIC SCHOOL

Science Subject Overview
MYP Years IV-V

MYP-IV
Biology

S R #	Unit Name	Key concepts	Related concepts	Global context	Statement of Inquiry	MYP Objectives	Approaches to learning	Content	Summative Assessment Task
1.	**How is Life Organized ?**	Relations hips	Patterns, Function	Identities and relationships **Focus exploration** Moral reasoning and ethical judgment	Your identity is determined by the relationship between different levels analyzingzation in your body which, although differing in complexity, share patterns and functions with all life on Earth.	**Science Year 5 Objectives** **Criterion A: Knowing and understanding** 1. Apply scientific knowledge to solve 2. problems. 3. Apply scientific knowledge and understanding to solve problems. 4. Explain scientific knowledge; 5. Analyse and evaluate information to make scientifically supported judgments. • **Criterion C: Processing and evaluating** 1. Present data in visual forms;	• **Critical-thinking skills** 1. Draw reasonable conclusions and generalizations 2. Analyze complex concepts and synthesize them to 3. create new 4. Understanding • **Creative-thinking skills** 1. Use visual diagrams to generate new ideas; 2. Make unexpected connections between ideas; 3. Apply existing knowledge to generate new	1. State the characteristics that make something alive or not. 2. Describe the characteristics that determine whether something is alive or not Interpret information about viruses to make scientifically supported judgments about 3. whether viruses are alive or not. 4. Explain the relationship between the structure of a cell and its function. 5. Draw and label diagrams of cells using a microscope. 6. Describe and explain the function of different organelles. 7. Describe the differences between cells, tissues, organs ,and organ systems Explain the implications of only using physical characteristics to classify organisms. 8. Explain why it is important to use the same method of	Learners will solve different problem questions and Essay Style Question **Criterion A:** Knowing and understanding Find out about the Harvard University group who are creating artificial cells. Use the following search terms: scientist, artificial life, Mycoplasma mycoides JCVI-syn. Explain the questions below with scientific reasoning: What ethical issues does their work raise?

						2. Interpret data and explain results using scientific reasoning. • **Criterion D: Reflecting on the impacts of science** 1. Explain the ways in which science is applied and used to address a specific problem.	**4.** ideas • **Organization skills** 5. Use technology effectively and productively	classification throughout the scientific community. 9. Explain Linnaeus‟ binomial classification system.	Do you think that it will be possible to create new species artificially? Would this be desirable? **Criteria D:** Reflecting on the Impacts of Science
2.	**What Chemical Processes Support Life?**	Systems	Energy, Transformation	Scientific and technical innovation **Focus Exploration:** Processes and solutions	The systems of life are supported by biochemical reactions and the transformations of energy that occur within cells. Innovations in science could lead to these reactions being utilized to meet growing energy and food needs.	**Criterion A: Knowing and understanding** 1. Describe and explain scientific knowledge. • **Criterion B: Inquiring and designing** 1. Formulate a testable hypothesis and explain it using scientific reasoning. • **Criterion C: Processing and evaluating** 2. Interpret observations and explain results using scientific reasoning. 3. Interpret data and explain results	• **Critical-thinking skills** 1. Draw reasonable conclusions 2. Gather and organize relevant information 3. Interpret data; Gather and organize relevant information to formulate an 4. argument • **Organization skills** 1. Plan a long-term assignment • **Communication skills** 2. Make effective summary notes; Organize and depict	1. Respiration 2. State the word equations for anaerobic respiration in yeast, plants and humans 3. Outline the differences between respiration and combustion 4. Explain how substances required for photosynthesis enter the leaf State the word and chemical equations for photosynthesis 5. Explain each part of the starch test using scientific reasoning 6. Outline the experiments that can be carried 7. out to indicate that light, carbon dioxide and chlorophyll are needed for photosynthesis	Plan an experiment to change one variable to investigate its effect on plant growth. Explain the question to be tested in the investigation.Which species of plant will you use? Formulate and explain a testable hypothesis using correct scientific reasoning. Evaluate the validity of the hypothesis based on the outcome

						using scientific reasoning. • **Criterion D:** **1.** Reflecting on the impacts of science	3. information logically • **Self-management skills** 1. Plan a short-term assignment	8. Outline the role of limiting factors 9. Describe and explain an experiment that shows how light intensity affects rate of photosynthesis 10. Describe and explain an experiment that shows that plants carry out both photosynthesis and respiration Describe and explain the relationship between structure and function in 11. enzymes. 12. Outline an experiment that investigates the effect of enzyme concentration on rate of reaction 13. Outline an experiment that investigates the effect of the temperature on the rate of reaction 14. Explain the differences between respiration and combustion.	of the experiment. **Criteria B:** Planning and designing **Criteria C:** Processing and evaluating **Take Action:** **Food waste:** Think about ways in which you can reduce food waste. Write up your findings as a fully referenced report, and use scientific ideas **Criteria D:** Reflecting on the impact of science
3.	**How Do Organisms Sustain Themselves?**	Systems	Balance, Energy, Environment	Personal and cultural expression **Focus Exploration:** Lifestyle choices	Systems in living organisms transfer energy and nutrients from the environment to cells, where they are used to maintain the	• **Criterion A: Knowing and understanding** 1. Explain scientific knowledge. 2. Describe and explain scientific knowledge.	• **Critical-thinking skills** 2. Interpret data 3. Use models to explore complex systems 4. Draw reasonable	Outline an experiment that measures energy content in food Evaluate an experiment that measures energy content of food and explain improvements State the chemical composition of carbohydrates, lipids and proteins	**Test, Brochure** Learners will solve different problems and questions. **Criteria A:** Knowing and understanding

					balance of life. Diet can be affected by personal and cultural choices.	3. Apply scientific knowledge and understanding to solve problems. • **Criterion C: Processing and evaluating** 1. Collect Data 2. Interpret data and explain results using scientific reasoning. 3. Interpret data and explain results using scientific reasoning. • **Criterion D: Reflecting on the impacts of science** 1. Discuss and evaluate the implications of science to solve a specific problem.	conclusions and generalizations • **Creative-thinking skills** 1. Apply existing knowledge to generate new ideas, 2. make unexpected 3. connections between ideas 4. Use visual diagrams to generate new ideas; • **Communication skills** 1. Use a variety of media to communicate with a range of 2. audiences; Negotiate ideas with peers and teachers • **Transfer skills** 1. Make connections between subjects and disciplines • **Information literacy skills** 2. Access information to be	Outline food tests for starch, simple sugars, proteins and lipids. Explain the outcomes of food tests on unknown solutions Explain what is meant by the term „digestion“ Describe the processes that occur in each part of the digestive system Describe the digestion of carbohydrates, proteins and lipids Explain the role of bile in digestion Describe and explain how the breathing system is adapted for gas exchange Explain the process of ventilation and how it draws air into and out from the lungs Describe the passage of blood around the body Describe and explain the structure and function of the heart State what is meant by the terms „diffusion“, „osmosis“ and „active transport“ Outline how blood vessels are adapted to their function Outline how water travels from the soil to the leaves in plants	Plan an advertising campaign to ensure healthy eating within your school or community. culture. Decide within your class the best way of promoting your message. This could be a poster campaign, information on a website, leaflets and brochures. **Criteria D:** Reflecting on the impacts of Science

							informed and inform others • **Collaboration skills** Work collaboratively in teams		
4.	**What Issues do Larger Organisms face?**	Relationships	Environment, Form, Function	Orientation in space and time **Focus Exploration:** Constraints and adaptation	The size of organisms determines their distribution in space and time, and the form and function of specialized structures in larger organisms develop from their relationships with the environment.	• **Criterion A: Knowing and understanding** Apply scientific knowledge and understanding to solve problems. • **Criterion B: Inquiring and designing** Formulate a testable hypothesis • **Criterion C: Processing and evaluating** Present data; Interpret data and explain results using scientific reasoning. • **Criterion D: Reflecting on the impacts of science**	• **Critical-thinking skills** 3. Draw reasonable conclusions and generalizations Evaluate evidence • **Creative-thinking skills** 4. Make unexpected connections between ideas; 5. Generate new ideas	1. Describe how an organism is adapted to the environment and explain how these adaptations aid survival 2. Outline how surface area: volume ratio changes as organisms increase in size 3. Outline how physical and behavioural adaptations help organisms overcome problems of size 4. Describe and explain the factors that increase the rate of diffusion 5. Explain why surface area: volume ratio changes as organisms increase in size 6. Explain how physical and behavioural adaptations help organisms overcome problems of size	**Lab Report** Test the effect of size and surface area on the movement of molecules. For that formulate and explain a testable hypothesis using correct scientific reasoning, Carry out the experiment, interpret your data and explain your results using correct scientific reasoning. **Criteria B:** Planning and designing **Criteria C:** Processing and evaluating
5.	**What Factors**	Relationships	Consequences; Interaction	Fairness and development	Human health is a consequence of the relationships and interactions between	• **Criterion C: Processing and evaluating**	• **Communication skills**	1. Approaches to human welfare around the world	Create a campaign of scientifically researched and

	Affect Human Health?			**Focus Exploration:** Health and well-being	biological processes in our bodies, our lifestyles and the conditions we live in.	i. Present collected and transformed data, and ii. Interpret data and explain results using scientific reasoning, • **Criterion D: Reflecting on the impacts of science**	1. Read critically and for comprehension 2. Make inferences and draw conclusions • **Media literacy skills** 1. Locate, organize, analyse, evaluate, synthesize and ethically use 2. information from a variety of sources and media • **Critical-thinking skills** Interpret data; Formulate factual, topical, conceptual and debatable questions Draw reasonable conclusions and generalizations; Use models to explore complex systems and issues; identify trends • **Transfer skills** Combine knowledge, understanding, and	2. Explain the factors in one's surroundings that contribute to human health 3. Explain the factors within one's own body that contribute to human health 4. Outline the relationship between different types of pathogens and their hosts 5. Explain the immune response and symptoms such as fever, sneezing and coughing, and vomiting 6. Explain the way science has been applied to address the issue of diseases, through the development of treatments such as antibiotics and vaccines 7. Discuss and evaluate the use of antibiotics and vaccines for the treatment and prevention of diseases 8. Analyse and evaluate information about antibiotics and vaccines to make scientifically supported judgments about their use in the treatment and prevention of disease 9. From conclusions about the spread of disease based on information presented in models and graphs	supported healthy-living strategies or Suggestions. **Criteria D:** Reflecting on the impact of science

							skills to create products or solutions • **Organization skills** Use appropriate strategies for organizing complex information • **Information literacy skills** Access information to be informed and inform others	10. Describe the different types of diseases, including communicable; heritable or genetic; autoimmune;lifestyle; mental health Interpret and explain graphs that 11. describe the trends in disease and life expectancy around the world 12. Analyse and evaluate trends in disease prevalence and life expectancy to form scientifically supported	
6.	**How do characteristics pass from one generation to another?**	Relationships	Evidence; Models; Patterns	Identities and relationship **Focus Exploration:** Human impact on the environment.	Your identity and relationships with other people are determined by genetic factors: scientific evidence has led to models that help to understand observed patterns of inheritance.	**Criterion A: Knowing and understanding** Apply scientific knowledge to solve problems. Analyse and evaluate information to make scientifically supported judgements. Describe and explain scientific information. • **Criterion C: Processing and evaluating** Accurately interpret data and explain results using scientific reasoning. Interpret	• **Organization skills** Use technology effectively and productively • **Critical-thinking skills** Interpreting data Analyse complex concepts and synthesize them to create new Understanding Use models to explore complex systems Revise understanding based on new information • **Creative-thinking skills**	1. Define the terms 'nucleus', 'chromosome', 'DNA', 'gene', 'allele' 2. Describe the structure of DNA and outline how its structure relates to its function 3. Describe the cause and effect of gene mutations 4. Analyse genetic diagrams to calculate the ratio of expected genotypic and phenotypic outcomes 5. Explain how outcomes of genetic crosses can be used to define parental genotypes 6. Describe the difference between asexual and sexual	Learners will have a grand test in which they will attempt different problems and questions. **Criteria A:** Knowing and understanding

						information and explain results using scientific reasoning. • **Criterion D: Reflecting on the impacts of science**	Use brainstorming and visual diagrams to generate new ideas and inquiries • **Information literacy skills** Access information to be informed Evaluate information sources based on their appropriateness to tasks	7. reproduction Describe the process of mitosis 8. Outline different life cycles for both vertebrates and invertebrates 9. Explain the differences between asexual and sexual reproduction 10. Outline how genes code for proteins Explain how mutations lead to a change in phenotype 11. Explain how different life cycles adapt organisms to different environments	

MYP-V
Biology

S R #	Unit Name	Key concepts	Related concepts	Global context	Statement of Inquiry	MYP Objectives	Approaches to learning	Content	Summative Assessment Task
1.	**How have different forms of life arisen?**	Change	Interaction; Environment	Globalization and sustainability **Focus exploration**	Species change over time through interactions with their environment: the evolution of humans has impacted global biodiversity in ways that may not be sustainable.	**Science Year 5 Objectives** • **Criterion A: Knowing and understanding** Describe and explain scientific Information Analyse and evaluate information to make scientifically supported judgments Apply scientific knowledge and understanding to solve problems in unfamiliar situations • **Criterion B: Inquiring and designing** Formulate a testable hypothesis • **Criterion C: Processing and evaluating**	• **Critical-thinking skills** 1. Evaluate evidence and arguments 2. Draw reasonable conclusions • **Creative-thinking skills** 3. Make guesses, ask 'what if' questions and generate testable 4. Hypotheses 5. Apply existing knowledge to generate new ideas 6. Use brainstorming and visual diagrams to generate new ideas 7. and inquiries	Find out: • How life on Earth has evolved over millions of years; and the evidence for evolution and how new species are formed. • Explore the mechanisms of natural selection and speciation.	**Unit Test** Learners will solve different problems and questions. **Criteria A:** Knowing and understanding **Take action by campaigning to protect an endangered animal at risk of extinction.** Explore how the evolution of one species (humans) has impacted the rest of biodiversity on Earth, and whether these effects are

						Accurately interpret data and explain results using scientific reasoning. • **Criterion D: Reflecting on the impacts of science** Discuss and evaluate the implications of science to solve a specific problem.	• **Information literacy skills** 1. Access information to be informed and inform others **a. Media literacy skills** 2. Seek a range of perspectives from varied sources		sustainable or not. In your class, choose an animal you want to protect, and then work out a strategy for how you can best help in this species'survival. You may want to: • work with a conservation charity, such as WWF, to help protect the animals • have an event within your community to raise money to fund conservation work • produce posters or leaflets to raise awareness of the plight

									faced by your animal • write to the governments who are responsible for the protection of the animal to encourage them to take the right actions. **Criteria D:** Reflecting on the impacts of Science
2.	**How are organisms adapted to survive?**	Change	Environment, Interaction	Orientation in space and time **Focus Exploration:** Evolution	Organisms are more likely to survive when they are adapted to interact with their surroundings and respond to changes in their environment.	• **Criterion A: Knowing and understanding** • **Criterion B: Inquiring and analysing** • **Criterion C: Processing and evaluating**	• **Communication skills** Use a variety of organizers for academic writing tasks • **Organization skills** Use appropriate strategies for organizing complex information • **Information literacy skills** Make connections between various	1. Find out how humans and other organisms are adapted to respond to changes in our and their surroundings. 2. Explore the interconnectedness between organisms' adaptations and their survival in the place and time they are living. 3. How different organisms interact in their environment and respond to the changing conditions in their surroundings.	**Design Lab & Lab Report:** Design an investigation into your chosen organism's response to the stimuli. **Criteria B:** Planning and designing. **Criteria C:** Processing and evaluating

							sources of information Access information to be informed and inform others • **Transfer skills** Apply skills and knowledge in unfamiliar situations; Combine knowledge, understanding and skills to create products or solutions • **Creative-thinking skills** Apply existing knowledge to generate new ideas Use brainstorming and visual diagrams to generate new ideas and inquiries • **Critical-thinking skills**	4. Take action by designing vegetable gardens that are well-suited for growing in different cities, different neighborhoods of the same city, or in your school or the neighborhood at different times of the year.	
3.	**How do species interact?**	Systems	Balance; Function	Globalization and sustainability **Focus Exploration:** Diversity and	Ecosystems can be in balance when the species sharing their habitat have interconnected and sustainable functions and roles.	• **Criterion A: Knowing and understanding** • **Criterion C: Processing and evaluating**	• **Reflective skills** Consider ethical, cultural and environmental implications • **Information literacy skills**	• Find out what happens to an ecosystem when the natural conditions are modified. • Explore the ways different species interact in ecosystems around the world; the interactions of species that make up the local ecosystem.	Unit Test Learners will solve the problems and the questions about this unit.

				interconnection		• **Criterion D: Reflecting on the impacts of science**	Access information to be informed and to inform others • **Creative-thinking skills** Apply existing knowledge to generate new ideas Practise visible thinking strategies and techniques • **Organization skills** Use appropriate strategies for organizing complex information • **Communication skills** Make inferences and draw conclusions	• Take action by identifying, advocating for, and making a small change in our daily habits that will have a positive impact on a local ecosystem.	**Criteria A:** Knowing and understanding
4.	**How do the choices people make affect the environment?**	Change	Environment, Balance	Globalization and sustainability **Focus Exploration:** Natural resources and public goods	As a result of the choices that humans make, the environment has undergone and will continue to undergo change. Humans have the ability to understand the consequences of their actions and to act to restore balance in ecosystems and work towards a sustainable	• **Criterion A: Knowing and understanding** Apply scientific knowledge to solve problems. Explain scientific knowledge. Analyse and evaluate information to make scientifically supported judgements. • **Criterion B: Inquiring and designing**	• **Creative-thinking skills** Make unexpected connections between objects or ideas Apply existing information to generate new ideas Practice flexible thinking • **Critical-thinking skills** Interpreting data	• Identify how the Neolithic period marked the start of population growth • Outline what is meant by exponential growth • Sketch a graph displaying population data and analyse any trends • Identify the periods in the last 12,000 years where the human population reached 1-2 billion, 2-3 billion etc.	Essay - Consequences of our actions: Investigate the effect that human disturbance has had on natural ecosystems. For this develop a hypothesis;

					future.	• **Criterion C: Processing and evaluating** Present and interpret data and explain results using scientific reasoning. • **Criterion D: Reflecting on the impacts of science** Explain the ways in which science is applied and used to address a specific issue.	Evaluate arguments • **Transfer skills** Compare conceptual understanding across multiple subject groups • **Information literacy skills** Access information to be informed and inform others; Collect and analyse data • **Collaboration skills** Listen actively to other perspectives and ideas; Negotiate effectively • **Organization skills** Plan an assignment	• Discuss how human threats are harming biodiversity and leading to endangered species • State how much of the Earth's surface is utilised for agriculture • List different types of pollution as well as the sources of them • Suggest some of the effects of pollution on human health • Determine the link between fossil fuels and acid rain affecting trees • Explain the process of eutrophication • Solve the issues of pollution by suggesting realistic strategies • Explain how pollutants can lead to biomagnification • List the greenhouse gases	Explain how to manipulate the variables, Design a logical, complete and safe method; Organize, transform and present your data numerically or visually as a graph. Accurately interpret your data and explain your results using correct scientific reasoning. Evaluate the validity of your hypothesis based on the outcome of the investigation. **Criterion B:** Inquiring and designing

									Criterion C: Processing and evaluating **Criteria D:** Reflecting on the impacts of science
5.	**How does biotechnology create new options in industry and health?**	Change	Development; Transformation	Fairness and development **Focus Exploration:** Power and privilege	The development and use of biotechnology to change and transform genes helps create new options, choices and opportunities in industry and health: whether these developments are fair for all remains to be seen.	• **Criterion A: Knowing and understanding** Apply scientific knowledge to solve problems Analyse and evaluate information to make scientifically supported judgements Describe and explain scientific knowledge • **Criterion D: Reflecting on the impacts of science** Explain the ways in which science is applied and used to address a specific issue.	• **Information literacy skills** Access information to be informed • **Critical-thinking skills** Draw reasonable conclusions and generalizations Revise understanding based on new information Consider ideas from multiple perspectives • **Creative-thinking skills** Apply existing knowledge to generate new ideas • **Communication skills** Negotiate ideas and knowledge with peers and teachers • **Collaboration skills**	• Define the term clone • Describe selective breeding • Explain the techniques used to modify genes • Analyse how humans can manipulate genes to create new cells, tissues and organs • Consider the use of cloning to benefit agriculture • Analyse how people's beliefs and values influence the development of biotechnological techniques • What are the possible consequences of developing and applying more biotechnology • Discuss the extent to which people should be allowed to clone organisms.	Test and essay Learners will attempt the problems and questions. **Criteria A:** Knowing and understanding Write an article about the issue you have chosen and the medical treatments it has made Possible. You could write the article for: • a magazine • a newspaper • a website. Your article will give a balanced opinion of the

							Listen actively to other perspectives and ideas		biotechnology you have chosen, although you could give your own opinions at the end. **Criteria D:** Reflecting on the impacts of Science