MYP Biology

Based on NGSS, MYP expectations, and Colorado State Standards (2020)

1. **Sci Community**
    1. **(Safety/Lab Design/Data/Getting to know kids/routines/downloading programs/setting up notebook)**
    2. **2 weeks or incorporate into the first unit.**

2. **Matter and Energy:**
    1. **Biochem/Cycling of Materials/Conservation of Matter and Energy**
    2. ***Standards***
        1. ***3. Organisms use matter and energy to live and grow***
        2. ***4. Organisms interact with the living and nonliving components of the environment to obtain matter and energy.***
        3. ***5 Matter and energy necessary for life are conserved as they move through ecosystems.***
    3. **3 Weeks**

3. **Ecology:**
    1. **Field Lab/Pred Prey Simulation/Cemetery Lab/Garbage Lab/Environmental Issues Project/Wolf Debate Project/Land Use Simulation**
    2. **Standards:**
        1. ***3. Organisms use matter and energy to live and grow***
        2. ***4. Organisms interact with the living and nonliving components of the environment to obtain matter and energy.***
        3. ***5. Matter and energy necessary for life are conserved as they move through ecosystems.***
        4. ***6. A complex set of interactions determine how ecosystems respond to disturbances.***
        5. ***7. Organisms interact in groups to benefit the species***
        6. ***11. Genetic variation among organisms affects survival and reproduction.***
        7. ***12. The environment influences survival and reproduction of organisms over multiple generations.***
        8. ***13. Humans have complex interactions with ecosystems and have the ability to influence biodiversity on the planet***
    3. **6 Weeks**

4. **Cells:**
    1. **Scopes, Cell Size, Cell Transport, Cell Division,**
    2. **Standards:**
        1. ***2. Growth and division of cells in complex organisms occurs by mitosis, which differentiates specific cell types.***
        2. ***3. Organisms use matter and energy to live and grow.***
    3. **2 Weeks**

5. **Mendelian Genetics:**
    1. **Probability Basics/Mono/Di/Co/Blood/Disorders/Meiosis Basics**
    2. **Standards:**
        1. ***1. DNA codes for the complex hierarchical organization of systems that enable life's functions.***
        2. ***8. The characteristics of one generation are dependent upon the genetic information inherited from previous generations.***
        3. ***9. Variation between individuals results from genetic and environmental factors.***
        4. ***10. Evidence of common ancestry and diversity between species can be determined by examining variations including genetic, anatomical and physiological differences.***
        5. ***11. Genetic variation among organisms affects survival and reproduction.***
    3. **4 Weeks**

6. **Review Semester:**
    1. **1 Week**

7. **Winter Break**

8. **Molecular Genetics**
    1. **Structure/Function/Scale, Build DNA, Protein Synthesis/DNA Tech/Ethical**

    2. **Standards:**
        1. *1. DNA codes for the complex hierarchical organization of systems that enable life's functions.*

2. *8. The characteristics of one generation are dependent upon the genetic information inherited from previous generations.*
3. *9. Variation between individuals results from genetic and environmental factors.*
4. *10. Evidence of common ancestry and diversity between species can be determined by examining variations including genetic, anatomical and physiological differences.*
5. *11. Genetic variation among organisms affects survival and reproduction.*

3. **4 Weeks**

9. **<u>Evolution/Taxonomy</u>**
    1. **<u>Gallery Walk/Zoom/Checks/Darwin Awards/M&M Lab/Cladograms/Kindgom/Linneas Basics, at end pathogens(virus/bacteria)</u>**
    2. **Standards:**
        1. **1. DNA codes for the complex hierarchical organization of systems that enable life's functions.**
        2. **2. Growth and division of cells in complex organisms occurs by mitosis, which differentiates specific cell types.**
        3. **6. A complex set of interactions determine how ecosystems respond to disturbances.**
        4. **7. Organisms interact in groups to benefit the species.**
        5. **8. The characteristics of one generation are dependent upon the genetic information inherited from previous generations.**
        6. **9. Variation between individuals results from genetic and environmental factors.**
        7. **10. Evidence of common ancestry and diversity between species can be determined by examining variations including genetic, anatomical and physiological differences.**
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        9. **13. Humans have complex interactions with ecosystems and have the ability to influence biodiversity on the planet.**
    3. **4 Weeks**

10. **<u>Body Systems (Cardio-Pulm/Nerv/Immune/GI)</u>**
    1. **<u>Go from pathogens previous unit to Immune System, then heart/lungs, Nervous system, Brain Basics/Neuron/reaction/Drugs, and finish with dissections.</u>**

2. **Standards:**
    1. ***2. Growth and division of cells in complex organisms occurs by mitosis, which differentiates specific cell types.***
    2. ***3. Organisms use matter and energy to live and grow.***
    3. ***4. Organisms interact with the living and nonliving components of the environment to obtain matter and energy.***
    4. ***9. Variation between individuals results from genetic and environmental factors.***
    5. ***11. Genetic variation among organisms affects survival and reproduction.***
3. ***4 Weeks***

11. **Cell Energy (Cell Respiration/Photosynthesis)**
    1. **Root Beer Lab/Photosynthesis Lab**
    2. **Standards**
        1. ***3. Organisms use matter and energy to live and grow.***
    3. **2 Weeks**

12. **Botany:**
    1. **Flower Dissection/Basic Leaf/Root Structures/Greenhouse/Seed Germination/Carnivorous Plants**
    2. **Standards:**
        1. **1. DNA codes for the complex hierarchical organization of systems that enable life's functions.**
        2. ***2. Growth and division of cells in complex organisms occurs by mitosis, which differentiates specific cell types.***
        3. ***4. Organisms interact with the living and nonliving components of the environment to obtain matter and energy.***
        4. ***8. The characteristics of one generation are dependent upon the genetic information inherited from previous generations.***
        5. ***9. The variation between individuals results from genetic and environmental factors.***
    3. ***3 Weeks***

13. ***Review for Finals:***
    1. ***1 Week***

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Website
https://sites.google.com/a/baldmanapes.com/poudrebiology/

Supplies - (Order and Organize Early) - Owl Pellets, duckweed,

Needs - A “data analysis” example guide - “How to” explain data and graphs. Have example pictures and sentences used to describe common data patterns.

First Quarter: How do organisms get the energy they need?
UNIT 1: Basic physical science nutrient cycles, conservation of matter
CO standards
3. Organisms use matter and energy to live and grow
4. Organisms interact with the living and nonliving components of the environment to obtain matter and energy.
5. Matter and energy necessary for life are conserved as they move through ecosystems.
6. A complex set of interactions determine how ecosystems respond to disturbances.

Content	Practice (Activity)	Crosscutting Concept
Parts of a system - Set up a “class model”	Know the different parts of the Earth: biosphere, atmosphere, hydrosphere, and geosphere. Label this on the “Brian’s Field” Picture	
Conservation of Matter - student connection - food and energy needs	Option A: Food Burning Experiment (burn outside) - Flaming Hot Cheetos - Mass before and after to compare to the law of conservation of mass - Everything is made of atoms - Can we show how the “invisible” atoms moves in these systems? Option B: Student design experiment (Criterion B) Yeast and sugar. Resource - Youtube Draw what is happening in this process for what you cannot see - possibly have a microscope available to observe “budding yeast”	Science Laws/Theories - most that applied in the past and today, will apply in the future (some could change with new knowledge or ways of measuring) Organisms can use matter for energy and make new products in the process. How do students do this with food?
Cycles Diagrams -	Use Brian’s Field as a base picture.	Damon’s idea - give print

interspersed with the following labs - spinach disks and duckweed.	Layer each nutrient cycle on top with transparency plastic sheets. Each sheet shows a different cycle.	out
Water Cycle	"Water cycle in Ft Collins" poster with vocabulary - of a "Brian's Field" picture Water in a plastic bag - draw and explain	Water shortages in California/Colorado
Nitrogen Cycle	Nitrogen/Phosphorous duckweed lab dissolved oxygen lab	Eutrophication Video Example
Phosphorus Cycle	Nitrogen/Phosphorous duckweed lab	Eutrophication
Carbon Cycle	Photosynthesis lab SPINACH DISC Diagram of a "Brian's Field" picture	Climate change
Photosynthesis	Claim, evidence, reasoning, source of information discussion on climate change	

MYP MATH SKILL - Scientific notation and powers of 10
CRITERION A assessment
CRITERION C assessment

UNIT 2: Ecology: abiotic and biotic, succession, population dynamics, human impacts (options: pollution, climate change, habitat loss).
CO Standards
3. Organisms use matter and energy to live and grow.
4. Organisms interact with the living and nonliving components of the environment to obtain matter and energy.
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6. A complex set of interactions determine how ecosystems respond to disturbances.
7. Organisms interact in groups to benefit the species.
11. Genetic variation among organisms affects survival and reproduction.
12. The environment influences survival and reproduction of organisms over multiple generations.
13. Humans have complex interactions with ecosystems and have the ability to influence biodiversity on the planet.

Content	Practice (Activity)	Crosscutting Concept

Local Biodiversity/Ecology		Habitat destruction/preservation
Predator/Prey Lab	A. Computer lab option B. Student simulation??	Wolf reintroduction Yellowstone: claim evidence reasoning Possible support material - Living with wolves Keystone species
predator/prey interactions (moved to unit 2 - ecology)	Owl Pellet - quantitative analysis of predator to prey Create an energy pyramid	Coral Bleaching
Population and Biodiversity	Graph of snowshoe hare and lynx Compare - Lawn vs. Field Lab	Graphing activity
Competition Activity	competition lab (2 to 3 week lab)	Seed bombs
Trophic Ecology - conservation of energy	Eating Lower lab - Incorporate Energy and Population Pyramids - Explain the reason for their shape. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.	
Food chain/Food webs	Field Lab - create a food web of Brian's Field	Colony Collapse Disorder: claims, evidence, reasoning Elk Management in Colorado Fox populations and chickens
Succession and disturbance	Observe Brian's Field OR Fires in Colorado	Managing public lands Gardening? Dams
Population dynamics: symbiosis, migration, swarming,,,,	Cemetary lab - graphing data (online access possible)	Option 2 - Use goggle Earth to show housing growth in Fort Collins or Wellington with the time clock - could graph area of land change over time - see Greg for basics

Genetic Variation and Survival	Video Day (extra) - NOVA - Wild Ways (need to order - asked the library on 9/1) - connects human disturbance and solutions - promote genetic variation	Solutions to combat human disturbances - like habitat fragmentation

MYP MATH SKILL: Plot graphs, interpret graphs, interpret data, scatter plot

CRITERION A assessment
CRITERION D assessment

Second Quarter: How do Organisms Grow and Develop?
UNIT 3: Cell processes: basic cell division, cell respiration, basic transport
CO Standard
2. Growth and division of cells in complex organisms occurs by mitosis, which differentiates specific cell types.
3. Organisms use matter and energy to live and grow.
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5. Matter and energy necessary for life are conserved as they move through ecosystems.

Content	Practice (Activity)	Crosscutting Concept
Cell review	Microscopes - Cheek Cells	
Mitosis and cell cycle	Make a model of mitosis Becoming Video Microscopes - Onion Root Tips and White Fish Slides Make a stop motion video of cell respiration Structure and function	Cancer vs normal growth
Cell respiration	Cell respiration activity with carbon dioxide OR oxygen sensors Student design lab - modify from this experiment. Need O2 probes (ideas like, Height vs O2 intake, home location vs O2 intake, exercise estimate/day vs O2 intake) Aquatic plant and bromthymol blue Link back to Carbon Cycle	Eutrophication Climate change Cooking, fermentation
osmosis/diffusion	Diffusion - Starch in a bag - beaker	Air and Water Pollution

	with iodine (Writing hypotheses) Osmosis lab - graph and find isotonic changes for an gummy bear, egg, carrot, or potato (use ruler, scale, or string to measure changes) Osmosis 1 day lab option - video guide	
Surface area to volume ratio	Phenolphthalein agar lab Model video - Or Demo setup	Compartmentalization of life
Cells and your Choices Shorten time for progression into unit 4	Topic Selection - How does the things you put into your body impact your cells? - Smoking, vaping, energy drinks, processed foods, Student Guide (need to modify)	Health and choices

MYP MATH SKILL significance of gradients (osmosis lab)
CRITERION A assessment
CRITERION B assessment
DOES NOT INCLUDE FULL DETAIL of cell respiration, cell membrane, organelles, or "rote memorization of mitosis"

UNIT 4: Body systems: nervous system, circulatory system, respiratory system, muscular system, digestive (light overview of each system). Drugs. Homeostasis.
CO Standard
2. Growth and division of cells in complex organisms occurs by mitosis, which differentiates specific cell types.
3. Organisms use matter and energy to live and grow. *(Use a model based on evidence to illustrate the relationships between systems or between components of systems.)*

Content	Practice (Activity)	Crosscutting Concept
Circulatory System/Respiratory System	Heart rate lab Engineering: Model a body system - Hand (muscular/skeletal), Circulatory (muscular/circ) - a one way flow valve? Lungs (resp/musc)	Feedback to systems CPR Training Pulse Point (20 minutes)
Digestive system	Frog Dissection	

Nervous system	Movie - Inside Out (DVD in the Library) - Comparison - link to a reading - How does the teenage brain develop? Video Guide (feel free to copy and edit)	Electricity and circuits related to immune system
Homeostasis		diabetes
Biological basis of gender	Reading news article on gender development (SRY gene and epigenetics) RADIOLAB GONADS!	Huevodoces in Dominican Republic RadioLab Episode

MYP MATH SKILL: use direct and inverse proportions (heart rate lab), plot graphs, use calculations involving means
CRITERION A assessment
CRITERION A FINAL
DOES NOT INCLUDE extreme detail of organ systems

Third Quarter: How do Organisms Change Over Time?
UNIT 5: Evolution/taxonomy organization, natural selection, mendelian inheritance, genetic variation, common ancestry, mutations
CO Standards
1. DNA codes for the complex hierarchical organization of systems that enable life's functions.
2. Growth and division of cells in complex organisms occurs by mitosis, which differentiates specific cell types.
6. A complex set of interactions determine how ecosystems respond to disturbances.
7. ***Organisms interact in groups to benefit the species.***
8. The characteristics of one generation are dependent upon the genetic information inherited from previous generations.
9. Variation between individuals results from genetic and environmental factors.
10. Evidence of common ancestry and diversity between species can be determined by examining variations including genetic, anatomical and physiological differences.
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Content	Practice (Activity)	Crosscutting Concept

Biodiversity		
Natural Selection (Stabilizing, directional, disruptive)	LOOK FOR A COMPUTER MODEL ON ANTIBIOTIC RESISTANCE Explain how bacteria and "pests" evolve	Antibiotic resistance Pesticide resistance
Evidence of evolution	Skulls from CSU Research Evidence for Evolution - Video and recorded notes. Microscopes to look at pond organisms??	Darwin (After watching - I think this video might promote too many misconceptions among freshmen - NOVA - Judgement Day: Intelligent Design on Trial - Flagella Motor)
Chasing the red queen/Coevolution	STICKLEBACK LAB HHMI with Mendelian crosses Found another computer model option for this concept - quicker overall. Computer Model - Bug Hunt	
Mutations - insertion, deletion, substitution	Making Stuff Smarter - Shark Skin?	Biomimicry
Ernst Mayr - Five facts and three inferences of evolution	Animate meiosis with crossing over and nondisjuncture	Gender inheritance
Bottle-necking/founder effect	Look for a computer model	Cinderella
Environmentally influenced traits, polygenic traits, epigenetics	M and m lab	

MYP MATH SKILL graphic interpretation, draw lines of best fit
CRITERION A assessment
CRITERION B assessment
DOES NOT INCLUDE details of protein synthesis,

UNIT 6: Disease - immune system, disease transmission, vaccination, bacteria and viruses

CO Standard
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Content	Practice (Activity)	Crosscutting Concept
Immune System	Glo germ lab	Health care
pathogens	Disease transmission lab (NaOH)	Vaccinations (standard 6)
Epidemics	stuff	HIV epidemic - social response, stigma, PREP
STDs	Evaluate arguments on vaccinations from carefully selected videos - using claim, evidence, reasoning and sources	
Mutation, zoonosis		

MYP MATH SKILL - reciprocal relationships
CRITERION A assessment
CRITERION D assessment - bacterial and pesticide resistance

Fourth Quarter: How do Organisms
UNIT 7: Interactions, adaptations
Lab exploration: Galapagos Finches, Pocket Mouse lab, Wolves and Elk populations in Yellowstone, Isle Royale data exploration
CO Standard
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4. Organisms interact with the living and nonliving components of the environment to obtain matter and energy.

6. A complex set of interactions determine how ecosystems respond to disturbances.
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11. Genetic variation among organisms affects survival and reproduction.

Content	Practice (Activity)	Crosscutting Concept
~~predator/prey interactions (moved to unit 2 - ecology)~~	~~Owl Pellet - quantitive analysis of predator to prey~~	~~Coral Bleaching~~
Trophic cascade	Trophic pyramid analysis-interdependent relationships and carrying capacity	Invasive species
Genetic Inheritance/Mendelian Genetics	Blue People?? Background - personal connections - What is in your DNA (possibly)? Could be difficult for adopted students. Not sure how strongly this connects - Virtual Experiment Stickleback Evolution - might need to introduce the Genetic Inheritance concept first.	Students can answer the question: How are the characteristics of one generation related to the previous generation? Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
Interactions/adaptations (move to Unit 7 - Adaptations)	Squirrellng away lab (adaptation) Or Adaptation lab with colored chips/goggles	
Island biogeography	Computer model - fire models and gis Computer model - excel model of invasive species	Invasive species Design solutions for them
Carrying capacity and limiting factors	Design a pollinator garden to fight colony collapse disorder	
competition	Data Collection & Analysis	

MYP MATH SKILL: use direct and indirect proportions

DOES NOT INCLUDE detailed chemical signalling
CRITERION A assessment
CRITERION C assessment

UNIT 8: botany/biotechnology- tropism, stomata, plant responses. Organisms interact with living and nonliving
CO Standard
1. DNA codes for the complex hierarchical organization of systems that enable life's functions.
2. Growth and division of cells in complex organisms occurs by mitosis, which differentiates specific cell types.
4. Organisms interact with the living and nonliving components of the environment to obtain matter and energy.
8. The characteristics of one generation are dependent upon the genetic information inherited from previous generations.
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Content	Practice (Activity)	Crosscutting Concept
Seed starting - greenhouse skills	Seed starting - horticulture - beans, rye grass, lettuce, marigolds, zucchini,	Colony collapse disorder
Plant growth/development	Work in greenhouse, draw out germinating plant anatomy	GMO's and overuse of herbicides
Flowers and plant reproduction	GIS spread of patented genes based on wind and insect pollination	GMO's and patented genes
Extinction of species Monarch watch - graph their data	Restoration of Brian's Field -identify - removal of invasives -replant native wildflowers	Management perspectives (intervene or don't intervene)
Photosynthesis	Oxygen probes, plastic bags, and started plants lab Link back to Carbon Cycle	Carbon sequestration
Carbon Capture	Measure the starting and ending mass: soil, seed, plant (when dry) -develop concept that plants gain	Deforestation and palm oil plantations

	mass primarily from carbon dioxide Data Collection & Analysis	
Plants and Soils	Erosion, Soil degradation, Solutions for improving soil quality	Growing food - challenges, victory gardens (recent article?)

MYP MATH SKILL: means
CRITERION A assessment
DOES NOT INCLUDE detailed chemical signalling

Biology Sequence 2019-2020

Quarter 1:

Ecology

- Biogeochemical cycles Project/Lecture
- Ecology Lecture
- Food Web
- Cheeto Lab (energy conservation)
- Elodea Lab
- Predator-Prey Relationships
- Ecological Footprint
- Plant Competition Lab
- Environmental Issue Project
- Ecology Test

Cells

- Cells reading guide
- Lecture on Cell Parts/Membrane/Transport
- Cell Analogy- Onion and Cheek Cells
- Microscope Lab
- Cell Part/Membrane Quiz
- Cell Transport Gummy Bear Lab- instead of egg lab
- Cell Transport Quiz

Quarter 2:

Biochemistry

- Biochemistry reading guide
- Biochemistry Lecture
- Basic biochemistry practice
- Food Labels
- Macromolecule Notes
- Biochemistry Quiz
- Food Testing Lab
- Digestive System Lecture
- Digestive Disorder Presentation
- Enzyme Lecture
- Lactase Lab
- Catalase Lab- guided design lab with demos
- Enzyme Quiz

Photosynthesis and Botany

- Photosynthesis Pogil
- Photosynthesis Lecture
- Spinach Leaf Disk Lab (might not do again, tough one to get consistent data)
- Botany Notes
- Flower Dissection

Quarter 3:

Cellular Respiration

- Cellular Respiration Notes
- Fermentation Lab
- Root Beer Lab

- Review on CR and PS
- Quiz on PS and CR

Mitosis

- Mitosis Notes
- Mitosis Onion Root/Zebrafish online lab
- Mitosis Microscope Lab
- Surface Area to Volume Assignment with Cell Division
- Mitosis Review
- Mitosis Quiz

Meiosis and Mendelian Genetics

- Meiosis Notes
- Meiosis WebQuest
- Meiosis Review
- Mendelian Notes
- Practice punnet squares- monohybrid
- Codominance, sex-linked punnet squares
- Pedigrees
- Dragon Genetics or some sort of application of phenotype, genotype, dominant, recessive
- Blood Typing Lab
- Mendelian Quiz

Quarter 4:

Molecular Genetics

- Molecular Genetics Reading Guide
- Intro to DNA Lecture

- Intro to DNA Replication
- DNA structure and replication practice- webquest
- Intro to Transcription and Translation Lecture
- Transcription and Translation Practice- Form Sentences
- Transcription and Translation Practice- Form Sentences with mutations
- DNA gel electrophoresis Lab (Online and in person)

Evolution

- Evolution lecture- theory, evidence
- Evolution Station Lab
- Speciation Activity
- Human Skull Lab (CSU)
- Evolution Quiz

Human Body Systems

- Varies- usually lecture, lab, and/or application project
- Bacteria Lab?
- Frog Dissection (when GI system is covered)
- Cardiovascular System (HR)
- Respiratory System with Lung Capacity Lab