



## MCIEA Task: The Story of Life

**Course/subject/grade level:** HS Biology

**Context/prerequisite skills:** While written for an IB Biology course, this task can be modified to accommodate any biology class. Students should have a strong foundation in cellular biology as part of this task.

### Performance Assessment Quality Criteria

High-quality performance tasks should:

- Align to high-leverage learning goals (competencies, learning targets, standards, transferable skills, etc.)
- Be open ended and relevant to the real world
- Require application and transfer using higher-order thinking
- Be fair and culturally responsive
- Outline clear criteria for success in a rubric
- Result in original products, performances, or solutions

### Learning Goals

*What is being assessed in this task? This includes competencies, standards, learning targets, transferable skills, etc. Remember - application and transfer of high-leverage skills are a hallmark of performance assessments.*

#### **MA State Standards:** HS-LS1

- HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
- HS-LS1-5: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
- HS-LS2-3: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

#### **IB Competencies**

**Ai - Scientific knowledge:** how well student explains or shows what is currently known about: prokaryotic and eukaryotic cells (ie. describes form and function), cell theory, the functions of life, and the evolutionary theory of life.

**Aiii - Interpret information to make scientifically supported judgement:** how well a student is able to explain or show the scientific rationale behind the evolutionary sequence of the modern day form - ie. tie the form to the stepwise functional improvement (this means connecting what we have learned about SA/volume ratio, diffusion, osmosis, active and passive transport, membrane structure, etc to the functional improvement in form).

**Diii - Use scientific language effectively** - For this assignment - “effective” scientific language usage means that you consider your audience (9th grade HS students). Use advance scientific terminology only after you have explained it in layman’s terms. Your goal is to choose your words and pictures to efficiently and effectively communicate deep understanding. It’s a tough task, but probably the most useful day-to-day skill you will develop in biology.

To adapt this task for your classroom, click [here for an editable version](#).

Original task created by Ian Warner.

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**Art iii - Apply Artistic vision effectively** - Artistic vision can manifest itself in so many ways, written, drawn, and so on. Whatever medium you use for this project - does it attempt to engage its audience? Is it successful? Most importantly for academic purposes, is it memorable?

### Task Summary

*Describe the essence of the task. What authentic role is the student taking? Who is the audience? What is the problem they are trying to solve?*

Students will take on the role of artists submitting a piece of work and an artist statement that tells the story of life (grounded in concepts of evolution) for a contest for a natural history exhibition. In their art (or artist statement), students will show their knowledge of the evolution of life forms from organic molecules to more complex structures.

### Essential Questions

*What challenging and open-ended questions are students exploring in this task? How does this assessment engage students in tackling the essential question?*

What forces were responsible for the diversification of cellular structures?

### Quality Output

*What original product or solution will students produce as a result of this task? Describe what a quality output looks like, sounds like, feels like.*

Students will produce a story of life (the format is their choice, including comic book, poem, painting, etc.) that highlights evolutionary concepts including

- Creation of the first cell
- Binary fission
- Development of ability to eat other cells
- Eukaryotic adaptations
- Prokaryotic adaptations
- Photosynthesis

### Quality Process

*Without being overly prescriptive, what will students actually do as they complete this task? Describe the flexible quality process learners will engage in to produce the output.*

- Step 1:** Brainstorm artistic product (including an outline of process)
- Step 2:** Draft artistic product that highlights the story of life
- Step 3:** Ensure that artistic product and scientific concepts are aligned for final draft



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### Resources/Materials

*What do all students need to have access to in order to complete the task?*

[IB Biology Course Book](#), 2014 Edition: Oxford IB Diploma Programme  
Resource Database for Student Research - <https://bpslibraries.org/high-resources/>  
Boston Public Library Resource Center (need library ID to log in) - <http://www.bpl.org/electronic/>

### Possible Accommodations

*Understanding that accommodations will always need to be adapted for student's individual needs, what are some accommodations that may be provided for this task?*

- Students may work in groups
- Students may work with teachers to develop an individualized timeline
- Draft and feedback cycles
- Graphic organizers to assist in showing/understanding the story of life in linear fashion

## The Story of Life Student Instructions

The Museum of Natural History and Metropolitan Museum of Art have teamed up to launch a national contest to have artists produce original pieces that tell “The Story of Life.” Your submission will be evaluated on your mastery of the scientific concepts and terms, your concise ability to make this story easy to comprehend, and your artistic ability to make this story memorable (may include images, rhyme, metaphor, or whatever you do that shows your unique perspective).

**Rules of the Contest:** As you tell “The Story of Life,” be sure to include the following information (and explanations where necessary) in the art you produce:

**1. Display clear scientific understanding that includes the following concepts and processes:**

- a. Creation of the first organic molecules
- b. Creation of the first cell, how they came together, and how they were alive.
- c. Competition of the hydrothermal vent and the start of evolution (be sure to include binary fission).
- d. The development of more advanced prokaryotic shapes, abilities, and parts
- e. Eukaryotic Adaptations:
  - i. Golgi apparatus
  - ii. Lysosome
  - iii. Rough endoplasmic reticulum
  - iv. Nuclear envelope
  - v. Mitochondria (endosymbiotic theory)
  - vi. centrosome
- f. Prokaryotic Adaptations:
  - i. Response to predators
  - ii. Photosynthetic ability
- g. How will Photosynthetic Eukaryotic cells evolve?

- h. Chloroplast (endosymbiotic theory)
- 2. **Artistic representation of the story** (your art should highlight the above concepts). If the concept is not clear in your work of art, you should include a brief artist statement that explains how certain artistic elements are representative of scientific concepts.
- 3. Consider how you will incorporate the entire time span of evolution into your artwork (3 billion + years) and show that evolution **ONLY** occurs over multiple generations.

## The Story of Life Criteria for Assessment

**AI - Scientific knowledge:** how well student explains or shows what is currently known about: prokaryotic and eukaryotic cells (ie. describes form and function), cell theory, the functions of life, and the evolutionary theory of life.

**Aiii - Interpret information to make scientifically supported judgement:** how well a student is able to explain or show the scientific rationale behind the evolutionary sequence of the modern day form - ie. tie the form to the stepwise functional improvement (this means connecting what we have learned about SA/volume ratio, diffusion, osmosis, active and passive transport, membrane structure, etc to the functional improvement in form).

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Criterion A- Strand i- Explain Scientific Knowledge	
Achievement Level	Level Descriptor
0	The student does not reach a standard described by any of the descriptors below
1-2	State scientific knowledge
3-4	Outline scientific knowledge
5-6	Describe scientific knowledge
7-8	Explain scientific knowledge
Criterion A- Strand iii- Analyse and evaluate information to make scientifically supported judgments.	
Achievement Level	Level Descriptor
0	The student does not reach a standard described by any of the descriptors below
1-2	Interpret information to make judgments.
3-4	Interpret information to make scientifically supported judgments.
5-6	Analyse information to make scientifically supported judgments
7-8	Analyse and Evaluate information to make scientifically supported judgments
Criterion D- Strand iii- apply scientific language effectively	
Achievement Level	Level Descriptor
0	The student does not reach a standard described by any of the descriptors below
1-2	With limited success, apply scientific language to communicate understanding
3-4	Sometimes apply scientific language to communicate understanding
5-6	Usually apply scientific language to communicate understanding clearly and precisely
7-8	Consistently apply scientific language to communicate understanding clearly and precisely
Criterion Art- Strand iii- apply artistic vision effectively	
Achievement Level	Level Descriptor
0	The student does not reach a standard described by any of the descriptors below
1-2	With limited success, apply art vision to communicate understanding
3-4	Sometimes apply art vision to communicate understanding
5-6	Usually apply art vision to communicate understanding meaningfully.
7-8	Consistently apply art vision to communicate understanding unforgettably.