

Text Set & Analysis Assignment – Cover Page**Brief description or overview of the topic/concept that will be taught (a sentence or two is fine)**

The primary topic is the role of ammonia in life and the wider ecosystem as a tie-in and “throwback” during a unit on ecology and systems. We’ll be connecting recent learnings in ecological systems interactions down to basic cells/microorganisms, all the way up to industrial manufacturing, pollution, and climate change.

Goal: Students should be able to describe connections between interconnected ecological systems through the lens of ammonia in cellular metabolism, microbial ecosystems, food production, industrial production, and environmental pollution.

Brief description of the instructional context (e.g., grade level, course, type of school, etc.)

9th grade Biology students at an average CPS high school. This is in the middle of an ecology unit where they’ve already passed the initial lessons and are moving toward more complex understanding.

As one of the final units of the year, students should also be familiar with some genetics/evolution, cells and their operations, basic biochemistry, and natural selection/taxonomy.

As a part of UDL, I’m allowing for broad connections between ecological systems depending on each student’s lived experiences.

Category	Name of your text satisfying this category
Nonfiction print texts (e.g., books, magazine, newspaper articles, textbook chapter)	Minnesota’s aspirations for a ‘green ammonia’ industry could soon pay off
Excerpt from popular media (e.g., clip from a news broadcast, article from a newspaper, infographic from a website)	Youtube short on “Rocky’s” biology from “Project Hail Mary” , focusing on ammonia in an alien atmosphere
“Primary source” document (e.g., a letter, a sketch, a diary entry, a historical newspaper article, a photograph or painting of a historical person, a chart or graph depicting findings from a scientific study, an equation from a mathematical argument, transcript of an interview, video/audio of an interview)	(Graph of global ammonia production between 1947 and 2019) Openstax: Chapter 46 Ecosystems Section 46.2: Energy Flow Through Ecosystems
A multimodal text (includes not <i>just</i> print text—could include visuals, audio, animation, moving images, etc.)	(Graph of global ammonia production between 1947 and 2019)
A visual representation of data (e.g., a graph, a chart, a map, a timeline, etc.)	(Image of Energy and Nitrogen Cycle from NASA [scroll 1/3 down the page])

Text Set & Analysis Assignment

Name: Nicolas Maher	Topic/Concept: Ecological systems
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Directions: What is involved in reading a text? What does a reader *know* and *need to know* to make sense of a text?
 Task: Think about the “types of knowledge” a student would need to make sense of EACH text in your text set. The overlapping categories below provide a way to think about the challenges and opportunities a given text provides.

Text A

Name of text: Energy and Matter Cycles (image)
Additional Information (author, reference, website information, etc.): Image from MyNASADData
Text Type: Visual Representation
Rationale for choice of text: A primer and review of older concepts covered before, while also connecting the day’s topic (ammonia) to ecological systems

Knowledge of the Topic	Knowledge of Texts	Engagement/ Motivation/ Connections	Disciplinary Discourse Practices
Students would have some understanding of the nitrogen cycle, albeit with different visual representations and strength of meaning.	This is a more complex and detailed version of a traditional nitrogen cycle diagram, including more features than the average middle or intro diagram.	This version of the image lets them apply environmental justice lenses to the use of ammonia industrially, and reconsider how the nitrogen cycle interacts with complex ecologies.	This can exemplify how life at its most basic, microscopic level is impacted by human industry and agriculture on a global scale. Ecosystems are influenced by human activity not only a local, but on a regional and global scale.

Additional Notes:

Text B

Name: Nicolas Maher	Topic/Concept: Ecological systems
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Name of text: Project Hail Mary ammonia Clips compilation
Additional Information (author, reference, website information, etc.): Project Hail Mary (2026) has not been released, but the parameters of this inclusion will be true.
Text Type: Popular media
Rationale for choice of text: It's relevant, popular, and it has Ryan Gosling. It's meant to recapture their attention and also contrast our lesson with life on another planet. We're left asking a question, why might Grace (the character) be facing so much ammonia when encountering alien life?

Knowledge of the Topic	Knowledge of Texts	Engagement/Motivation/Connections	Disciplinary Discourse Practices
The smell, effects, and vague familiarity with Ammonia is essential to sensory understanding. They'd need to be vaguely familiar with the concept of space ships, aliens, space travel, the book Project Hail Mary, or other sci-fi.	This is meant to be a contrasted piece of 'text', so it's inherently different from all earth-bound biology, which can be confusing. Also, If they are unfamiliar with sci-fi or disinterested, it can be boring or foreign.	A love of sci-fi, a popular curiosity about aliens, or interest in the source material are all positive assets here. It's a new movie that can connect directly to a piece of popular media. It's making cross-cutting real connections, even if it's fantasy.	As far as all science can tell, Nitrogen is essential to all life (spoiler ahead: There is a plot point about Grace's character trying to prove that life can exist without water and he is proven wrong multiple times. Instead, even in the most extreme and alien forms of life, the fundamental needs of life are the same [at least in this book]). The main point here is the relative scale of "toxicity" when it comes to life's compounds like oxygen and ammonia.

Additional Notes: (SPOILERS) For more context on what the clips would look like, I'd start with the initial encounter with "Rocky", an alien whose body is based on organo-metallic constructs from a planet encased in dark clouds of ammonia and other heavy gasses. The fundamental aspects of Rocky's cells are similar to extremophiles on earth: a heavy resistance to metal ions, high temperature, and high pressure. When Grace encounters Rocky, he is hit with an overwhelming blast of ammonia once their ships interface with one another. This has implications for how the two have to interact, since this much ammonia is heavily toxic to Grace. It turns out that Rocky's home atmosphere is 29 times more dense than Earth and is almost entirely ammonia, making no light penetrate to its surface. On the flip side, oxygen is highly corrosive and toxic to Rocky (since even on earth, Oxygen corrodes metals!) so one of the essential points to get across is that "toxicity" is a relative concept, and ammonia is essential to all life *within certain bounds*. So too is water, oxygen, and carbon essential, but at extreme ends, can still be extremely toxic.

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Text C

Name of text: Graph of global ammonia production between 1947 and 2019
Additional Information: Academic review article titled “Fuels of the Future for Renewable Energy” about Biofuels, Ammonia, and Hydrogen.
Text Type: Primary Source
Rationale for choice of text: This graph and its accompanying text tie ammonia back to earth and the interactions humans have with that specific compound. With the nitrogen cycle also in mind, the production of ammonia should paint how humans dramatically alter the flow of nitrogen.

Knowledge of the Topic	Knowledge of Texts	Engagement/ Motivation/ Connections	Disciplinary Discourse Practices
Understanding of graphs over time, the units being used on the axis, and the concept of scale relevant to the amounts being shown.	Scale can be hard to translate and relativity would be important to implement in some other way.	Large scales can be daunting or awe inspiring, and imply a grand scale of what may seem like a simple chemical. All life has nitrogen, and much of our food relies on human produced ammonia. I would start a wider discussion on food, fertilizers, organic food, and whatever else comes to mind with this.	Tying the human ecological impact of industrial production, especially chemicals, agriculture, and food. We’d connect the disparate concepts between the nitrogen cycle, pollution/ environmental damage, food, microbes, and ecosystems.

Additional Notes:

Text D

Name: Nicolas Maher	Topic/Concept: Ecological systems
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Name of text: Minnesota's aspirations for a 'green ammonia' industry could soon pay off
Additional Information (author, reference, website information, etc.): Minnesota local news
Text Type: Nonfiction print text
Rationale for choice of text: This is a very recent, ongoing human factor that is changing and can be innovated upon. There is positive change that can be advocated for and there is successful policy making already. We can underscore climate and environmental optimism with students and show that there are solutions that are both logical, environmental, and conscious of these complex systems: solutions that are either in infancy or yet to be discovered.

Knowledge of the Topic	Knowledge of Texts	Engagement/ Motivation/ Connections	Disciplinary Discourse Practices
Understanding what anhydrous ammonia is, what fertilizer is and what it's made of, the importance of fertilizer, how plants grow, and the importance of agriculture to any economy, but maybe specifically to the economy of Minnesota and the US.	Issues of scale and impact are not entirely clear. It may be the case that students will not be able to compare what is an impactful amount of fertilizer or even make sense of the values being discussed in the post. Will students believe the claims made in the article are even important or impactful?	These are tangible green solutions to real world polluters and green house gas emitters. As youth, they are more likely to bear the brunt of climate change shifts, and may want to advocate for environmental justice. Some may be tangentially related to Minnesota's industry, agriculture, or pollution in their community.	Reading deeper into claims of headlines is essential for critical research. Attention grabbing text bites can often be slightly misleading and digesting the full text of an article is essential for making use of new knowledge. Some of the deeper skills at play are critical analysis: challenging claims and evidence from a journalism source that may or may not be more interested in gathering views rather than engaging in rigorous science discourse.

Additional Notes:

Text E**Name of text:** Openstax: Chapter 46 Ecosystems Section 46.2: Energy Flow Through Ecosystems**Additional Information:** Openstax is an opensource website.**Text Type:** Primary Source

Rationale for choice of text: Students who need a more proactive and structured set of notes and knowledge to draw on should have this as a resource. We will define all the key vocabulary points in class and have a discussion relevant to our specific experiences and takeaways, but deeper dives on those terms will require more independent reading. Some intuition should be gathered from class discussion but this acts as a supplement.

Knowledge of the Topic	Knowledge of Texts	Engagement/Motivation/Connections	Disciplinary Discourse Practices
Prior chapters will be referenced and presumed to be read, but some students may rely on lecture/class instead of reading text sections.	Long walls of text and the singular format can be boring and challenging for those who struggle with long reading. It has vocabulary that can be unfamiliar even if students are well-versed in the content.	For students who engage deeply with text and are passionate about the topic, this can deepen their understanding. The optionality of this reading gives them agency in avoiding this, while also allowing a challenge for students who seek more for themselves.	Engaging with dense academic textbooks is an important part of attaining higher education and deeper knowledge of complex science concepts. It's not the only component, but it is consistently seen as a necessary one to become a disciplinary expert. Chunking, highlighting, skimming, and main-takeaways are just a handful of reading practices that can support meaningmaking with these types of texts. A key strategy here would be to rely on note taking of specific sections most interesting and most pertinent to the "goal" of your learning. Practicing good notetaking with the what and why of the concepts is used in science discipline at nearly every level.

Additional Notes:

