**Alpha HS Chemistry & Biology – Writers’ Guide**

Guidance for developing the Student’s Book for the Chemistry and Biology curriculum.

**TOC**

[**Physical Structure** 4](#_Toc179494504)

[**General Approach to Content Writing** 4](#_Toc179494505)

[**Writing style** 4](#_Toc179494506)

[**Distribution of Components in SB – TG – Digital** 6](#_Toc179494507)

[**SB - Unit Opener Components** 10](#_Toc179494508)

[**Unit Title** 10](#_Toc179494509)

[**Essential Questions** 10](#_Toc179494510)

[**Big Idea** 10](#_Toc179494511)

[**Phenomenon-Based Learning (Storyline)** 10](#_Toc179494512)

[**Last Time, This Time, Next Time** 10](#_Toc179494513)

[**Unit STEM Task** 10](#_Toc179494514)

[**Unit Overview** 10](#_Toc179494515)

[**SB - Chapter Opener** 11](#_Toc179494516)

[**Chapter Title** 11](#_Toc179494517)

[**Essential Questions** 11](#_Toc179494518)

[**Big Idea** 11](#_Toc179494519)

[**Phenomenon-Based Learning** 11](#_Toc179494520)

[**Chapter STEM Task** 11](#_Toc179494521)

[**Chapter Overview** 11](#_Toc179494522)

[**SB – Lesson** 12](#_Toc179494523)

[**Lesson Title** 12](#_Toc179494524)

[**Essential Questions** 12](#_Toc179494525)

[**Big Idea** 12](#_Toc179494526)

[**Phenomenon-Based Learning** 12](#_Toc179494527)

[**Vocabulary** 12](#_Toc179494528)

[**SMART Lesson Objectives** 12](#_Toc179494529)

[**Ignite (Engage)** 12](#_Toc179494530)

[**Direct Instruction (pre-Explore section)** 13](#_Toc179494531)

[**Progress Check** 13](#_Toc179494532)

[**Pathfinder (Explore)** 13](#_Toc179494533)

[**Lightbulb (Explain)** 13](#_Toc179494534)

[**Progress Check** 14](#_Toc179494535)

[**Power Up (Elaborate)** 14](#_Toc179494536)

[**Progress Check (Evaluate)** 14](#_Toc179494537)

[**Beyond the Lesson (Extend)** 14](#_Toc179494538)

[**SB – Chapter Wrap Up** 15](#_Toc179494539)

[**Summary** 15](#_Toc179494540)

[**Revisit Phenomenon** 15](#_Toc179494541)

[**Extended STEM activity (optional)** 15](#_Toc179494542)

[**Bring It Together** 15](#_Toc179494543)

[**Chapter Reflective Journal** 15](#_Toc179494544)

[**Formative Assessment** 15](#_Toc179494545)

[**SB –Unit Wrap Up** 16](#_Toc179494546)

[**Summary of the Unit** 16](#_Toc179494547)

[**Mini-Index of Terms** 16](#_Toc179494548)

[**Key images** 16](#_Toc179494549)

[**PSA** 16](#_Toc179494550)

[**Digital - Unit Opener Components** 17](#_Toc179494551)

[**Unit Readiness Assessment (Digital + Answer key in TG)** 17](#_Toc179494552)

[**LOs** 17](#_Toc179494553)

[**Math & Literacy Connections (Digital + reference in SB)** 17](#_Toc179494554)

[**Social Science and Science & Society Literacy Connections (Digital + reference in SB)** 17](#_Toc179494555)

[**Study Strategies** 17](#_Toc179494556)

[**Once Upon a Time in History (Digital + reference in SB)** 17](#_Toc179494557)

[**Digital - Chapter Opener** 18](#_Toc179494558)

[**Chapter Overview** 18](#_Toc179494559)

[**Digital – Lesson** 19](#_Toc179494560)

[**Pathfinder (Explore)** 19](#_Toc179494561)

[**Progress Check (Evaluate)** 19](#_Toc179494562)

[**Digital – Chapter Wrap Up** 20](#_Toc179494563)

[**3D Assessment (Digital)** 20](#_Toc179494564)

[**Digital – Unit Wrap Up** 21](#_Toc179494565)

[**Push Forward** 21](#_Toc179494566)

[**Careers in Chemistry/Biology** 21](#_Toc179494567)

[**3D End-of-Unit Assessment** 21](#_Toc179494568)

[**TG – Unit Opener** 22](#_Toc179494569)

[**Unit Overview** 22](#_Toc179494570)

[**TG – Lesson** 23](#_Toc179494571)

[**Ignite (Engage)** 23](#_Toc179494572)

[**Pathfinder (Explore)** 23](#_Toc179494573)

**[Lightbulb (Explain)](#_Toc179494574)** [23](#_Toc179494574)

[**Power Up (Elaborate)** 23](#_Toc179494575)

[**Progress Check (Evaluate)** 23](#_Toc179494576)

[**Beyond the Lesson (Extend)** 23](#_Toc179494577)

[**TG – Chapter Wrap-Up** 24](#_Toc179494578)

[**TG – Unit Wrap Up** 25](#_Toc179494579)

[**Assessment Solution Key** 25](#_Toc179494580)

[**Images/ Art Spec** 26](#_Toc179494581)

[**Chemistry Specific Guidelines:** 27](#_Toc179494582)

[**Chemical Compound Names** 27](#_Toc179494583)

[**Equations** 27](#_Toc179494584)

[**Fractions** 27](#_Toc179494585)

[**Guide for Writing Multiple Choice Items** 28](#_Toc179494586)

[**Language** 28](#_Toc179494587)

[**Item Content** 28](#_Toc179494588)

[**For multiple-choice questions** 29](#_Toc179494589)

[**Answer choices/Distractors** 29](#_Toc179494590)

[**How to choose and write a unit phenomenon?** 30](#_Toc179494591)

# **Physical Structure**

|  |  |  |  |
| --- | --- | --- | --- |
| **Chemistry** | **Units** | **Chapters** | **Number of Lessons** |
| **Volume 1** | 1 - 4 | 1 - 12 | 41 |
| **Volume 2** | 5 - 9 | 13 - 21 | 41 |
| **Total** | 9 | 21 | 82 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Biology** | **Units** | **Chapters** | **Number of Lessons** |
| **Volume 1** | 1 - 3 | 1 - 10 | 37 |
| **Volume 2** | 4 - 6 | 11 - 20 | 37 |
| **Volume 3** | 7 - 10 | 21 - 27 | 34 |
| **Total** | 10 | 27 | 108 |

# **General Approach to Content Writing**

* Close attention to:
  + [Alpha Sensitivity guide](https://qbslearning.sharepoint.com/sites/Alphaproject2/Shared%20Documents/Forms/AllItems.aspx?id=%2Fsites%2FAlphaproject2%2FShared%20Documents%2FAlpha%2D%20Bio%2F01%5FInputs%20from%20client%2F01%5FGuidelines%2FAlpha%20Sensitivities%20Guide%20%2D%20Jan%202022%2Epdf&viewid=5ecd04c3%2D8766%2D4184%2Db368%2D6f12d972fc38&parent=%2Fsites%2FAlphaproject2%2FShared%20Documents%2FAlpha%2D%20Bio%2F01%5FInputs%20from%20client%2F01%5FGuidelines) both for writing content and selecting images
  + [Alpha Editorial Style Guide](https://qbslearning.sharepoint.com/sites/Alphaproject2/Shared%20Documents/Forms/AllItems.aspx?id=%2Fsites%2FAlphaproject2%2FShared%20Documents%2FAlpha%2D%20Bio%2F01%5FInputs%20from%20client%2F01%5FGuidelines%2F01%2E%20Alpha%20Style%20Guide%20%2D%20updated%20March%202024%20%281%29%2Epdf&viewid=5ecd04c3%2D8766%2D4184%2Db368%2D6f12d972fc38&parent=%2Fsites%2FAlphaproject2%2FShared%20Documents%2FAlpha%2D%20Bio%2F01%5FInputs%20from%20client%2F01%5FGuidelines)
  + [Math Style Guide](https://erpcloud365-my.sharepoint.com/personal/suzan_riad_alphapublishing_com/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fsuzan%5Friad%5Falphapublishing%5Fcom%2FDocuments%2FDesktop%2FPortfolio%2D%20Alpha%2D%202021%2FA%2D%20Projects%2FQBS%2DSocial%20Studies%2D%206%2D9%2F01%20External%20Folder%5F%2FMath%20%28Temporary%29%2FMath%20from%20Style%20Guide%2Epdf&parent=%2Fpersonal%2Fsuzan%5Friad%5Falphapublishing%5Fcom%2FDocuments%2FDesktop%2FPortfolio%2D%20Alpha%2D%202021%2FA%2D%20Projects%2FQBS%2DSocial%20Studies%2D%206%2D9%2F01%20External%20Folder%5F%2FMath%20%28Temporary%29&ga=1) when writing equations
* Original content free of plagiarism (plagiarism reports submitted to Alpha).
* Lexile level 1100 L. Run readability checks using MetaMetrics Lexile Analyzer throughout the manuscript prior to transmitting <https://hub.lexile.com/analyzer>.
  + Run through the analyzer a sample text from the middle of each lesson.
  + If above level content and skills vocabulary terms have been introduced in a prior lesson, remove them prior to running readability checks. If the terms have not been introduced in a prior lesson, keep them in the sample text to analyze.
  + Remove all proper nouns from text to be analyzed.
  + Submit Lexile scores report with manuscripts, in a separate document.
* Content should progress at a reasonably challenging level
* Content should remain accessible for all learners.
* Sources used and provided in manuscript should be reputable (.org, .gov, .edu, or academically referenced and reputable .com).
* Embed retrieval practice throughout the learning process to facilitate enduring understanding, conceptual learning, and application of science concepts.

# **Writing style**

* Reference the unit/chapter/lesson big ideas frequently to better build the storyline.
* Develop students’ scientific mindset and identity by frequently exemplifying with familiar events and connections to real-world problems or applications relevant to students. For example, learning that
  + “*Scientists consider all possible sources of error before launching an experiment*”

will not foster enduring learning as much as

* + “*When you plan for a trip, you most likely consider what to do if things go wrong. Just like you, when planning an experiment scientists consider all possible sources of error before launching an experiment”.*
* Include real-life examples that apply the Chemistry/Biology concepts being studied
* Encourage students to explore how the lesson content impacts society, technology, or environmental issues.
* Active learning can take the form of hands-on or minds-on; for example, students can reflect on ideas and draw their own conclusions (rather than being spoon fed information).
  + Prompt students to examine, infer, apply, evaluate, create work products, gather evidence to support arguments, and test hypotheses to successfully prepare them to answer the essential questions.
  + Prompt students to express themselves verbally and in writing using learned vocabulary.
  + Avoid longs reading sections (a page) without students doing something (for example, students reflect or answer a question)
* Expose students to reading in science
* Vocabulary: introduce and use scientific key words.
* Lessons should follow an inquiry approach (5E) and encourage students to ask questions, explore, and engage deeply with content, fostering a sense of curiosity and intrinsic motivation.
* Do not use a single subheading under a heading. If subheadings are used, then there should be at lease 2 subheadings under a heading. An alternative to a single subheading is to bold the first sentence or phrase in a section.
* At least 2 collaborative experiential learning opportunities will be included in each unit. These learning experiences may include field trips, labs, simulations, investigations, research, and similar hands-on activities.
  + Hands-on experiences would include observing phenomena and recording data.
  + Hands-on experiences could be preceded by students’ planning of the activities.
  + Hands-on experiences will necessarily be followed by students’ analysis of findings, discussion, and draw conclusions (minds-on).
  + Write instructions for group work where students can collaborate to analyze data, discuss hypotheses, and refine their conclusions.
  + Encourage students to share findings, work together to solve problems, and refine ideas by challenging each other's ideas.

# **Distribution of Components in SB – TG – Digital**

|  |  |  |  |
| --- | --- | --- | --- |
| **Component** | **SB** | **TG** | **Digital** |
| Pre / Post (Diagnostic Assessment) |  |  | **X**  (for teacher only; downloadable as PDF/Word)  1 per area  5 overarching questions that including Math skills where appropriate |
| **Unit Opener (Title)** | | | |
| Grade Readiness Assessment |  |  | **X**  (for teacher only; downloadable as PDF/Word) 5 overarching questions that including Math skills where appropriate |
| EQ | 2 max. / st. language |  |  |
| Big Idea | X |  |  |
| Unit Phenomenon | X |  | Video? |
| LT, TT, NT | X |  |  |
| Unit STEM Task | X |  |  |
| Unit Overview | Chapter and PEs  (list or table) | Chapters and lessons (list or table)  Progression, an account of how the chapters fit in the learning sequence |  |
| Study Strategies |  |  | X |
| LOs |  |  | X  (includes all unit LOs) |
| Math and Literacy Connections |  |  | X |
| SS & Society Connections |  |  | X |
| Once Upon a Time |  |  | X |
| **Chapter Opener (Title)** | | | |
| EQ | 2 max. / st. language |  |  |
| Big Idea | A subordinate of the Unit Big Idea |  |  |
| Phenomenon | A subordinate of the Unit phenomenon |  |  |
| Chapter STEM Task | X |  |  |
| Chapter Overview | List of lessons |  | An account of how this chapter fits in the learning sequence. Provides the main ideas from prior units or chapters that lead to the current content. It ends with a short sentence of what will come next. |
| **Lesson (Title)** | | | |
| Essential Question | 2 max. / st. language |  |  |
| Big Idea | A subordinate of the Chapter Big Idea |  |  |
| Phenomenon | A subordinate of the Chapter phenomenon |  |  |
| Vocabulary | X |  |  |
| LOs | 3 to 4 SMART LOs |  |  |
| Ignite | X | Differentiation strategies for students who lag academically or have hearing, vision, or mobility impairments |  |
| Direct instruction | X |  |  |
| Progress check | Up to 3q’s |  |  |
| Pathfinder | Simple HO activities or research | Differentiation and English Language support through scaffolded tasks and language accommodations.  Main lab activity should have a guided instruction version to address students who lag behind academically. | Lab activities |
| Lightbulb | X | Differentiation to ensure all students can access the content, with additional language support for ELLs. |  |
| Progress check | Up to 3q’s |  |  |
| Power Up | X | Differentiation and English Language Support are embedded to cater to various learning levels and language needs. |  |
| Progress Check | Lesson quiz.  4 to 8 questions to cover all main concepts in the lesson. |  | Practice problem, task, or question set:   * A minimum of 10 questions, where there are at least 3 problems or questions per concept (at various DOK levels)   In the set, at least 5 problems, tasks, or questions should be SEP related and 5 should be CCC related. |
| Beyond the lesson | X |  |  |
| **Chapter Wrap-Up** | | | |
| Summary of Chapter’s main ideas | X |  |  |
| Revisiting the phenomenon | X |  |  |
| Extended STEM activity (optional) | If needed to support the main Chapter STEM Activity. It can be an experiment, further tasks, or research. |  |  |
| Bring It Together! | X |  |  |
| Chapter Reflective Journal | X |  |  |
| Chapter Formative Assessment |  |  | 5 questions; 3 of which must be require long answers. |
| **Unit Wrap-Up** | | | |
| Summary of the unit | X |  |  |
| Mini-Index of Terms | X |  |  |
| Key images | X |  |  |
| Push Forward |  |  | X |
| End of Unit Assessment |  |  | X |

# **SB - Unit Opener Components**

## **Unit Title**

Given in the S&S

## **Essential Questions**

Up to 2 overarching questions worded in students’ language (to spark curiosity) that address key concepts within the whole unit. These questions will be broken down at the chapter and lesson levels. Do not teach in these questions.

## **Big Idea**

Given in the S&S. This Big Idea will be broken down into related parts in the Chapters and Lessons.

## **Phenomenon-Based Learning (Storyline)**

Only when a high-quality all-encompassing phenomenon that includes all concepts for all the chapters cannot be found, then chapters may have different phenomena (ideally related). In all other cases, there should be one Unit Phenomenon or Problem that builds the story line for the whole unit. Please see section [How to choose and write a Unit Phenomenon](#_How_to_choose) in this document.

## **Last Time, This Time, Next Time**

The purpose of this table is to build conceptual continuity. Hence, list only key ideas that are closely related to the current unit.

* Last Time: list of key ideas from previous units that are building blocks for the current unit (no need to list all ideas learned in previous units)
* This Time: key ideas from current unit; cover ideas from all chapters.
* Next Time: list of key ideas from next unit (only ideas related to the current one).

## **Unit STEM Task**

This is the multi-disciplinary Unit project. It is questions, problems, activities, cases, etc. that students would need to address and respond to at the end of the Unit. It derives from the Unit phenomenon and will be broken down into Chapter and Lesson STEM Tasks. The Elaborate Part of a Lesson is the most likely place to make the connection between the Lesson-Chapter-Unit STEM Tasks.

## **Unit Overview**

Chapter List + the NGSS PE covered

# **SB - Chapter Opener**

## **Chapter Title**

Given in S&S

## **Essential Questions**

Up to 2 overarching questions worded in students’ language to address key concepts within the chapter. These EQs are subordinates of the unit EQ’s. Do not teach in these questions.

## **Big Idea**

A subordinate of the Unit Big Idea that addresses the main concepts in the chapter’s lessons.

## **Phenomenon-Based Learning**

It builds from the unit phenomenon and presents some additional aspects or perspective.

## **Chapter STEM Task**

It is questions, problems, activities, cases, etc. that students would need to address and respond to at the end of the Unit. It derives from the Unit phenomenon and will be broken down into Lesson STEM Tasks. The Elaborate Part of a Lesson is the most likely place to make the connection between the Lesson-Chapter-Unit STEM Tasks.

## **Chapter Overview**

List of lessons

# **SB – Lesson**

## **Lesson Title**

Given by S&S

## **Essential Questions**

Adjust the wording of the EQ’s given by the S&S so that they clearly drive the lesson.

* Up to 3 inquiry-based open-ended questions that sparks curiosity (e.g., “Why is water a liquid if it is such as small and light molecule?”).
* Directly related to the chapter’s phenomenon.
* Encourage critical thinking and further exploration.

## **Big Idea**

A subordinate of the Chapter Big Idea that addresses the main concepts in the lesson.

## **Phenomenon-Based Learning**

Continue building the storyline but now focus on a very specific aspect/question/issue that will be investigated in the lesson through questions and tasks included either in the Ignite (light task), Explore, and/or Elaborate sections of the lesson.

## **Vocabulary**

**List main terms and definitions**

## **SMART Lesson Objectives**

Modify the S&S LOs given to make 3 or 4 SMART LOs Specific, Measurable, Achievable, Relevant, and Time-based per lesson. 1st person wording, for example: “*I will balance simple chemical equations such as complete combustion reaction with 100% accuracy by applying the law of conservation of mass.*”

These SMART LOs should:

* target both content knowledge and skills
* written with increased levels of complexity to reach higher levels of Bloom’s Taxonomy if content progression allows for this structure of LOs.
* clearly state what students should know and be able to do by the end of the lesson. For this, LOs should use measurable verbs (avoid unmeasurable verbs like “understand”, “learn”, “know”, etc.). Resources for actionable and measurable verbs aligned to Bloom’s taxonomy: <https://www.utica.edu/academic/Assessment/new/Blooms%20Taxonomy%20-%20Best.pdf>

Further ideas for LO’s aligned to Bloom’s taxonomy and DOK can be found: <https://www.uen.org/literacyresources/downloads/CRM-ELA.pdf>

## **Ignite (Engage)**

* + An Introductory phenomenon-related question or simple task. Simple task means that it may not have the rigor of an actual scientific investigation, would not be used for assessment purposes, and does not require a rubric (some differentiation strategies could be included in the TG, such as for hard-of-hearing students or students with vision or mobility impairments) to ensure that all students could perform the task at some level and no student gets excluded). The purpose of this phenomenon-related question or simple task is only to capture the students’ interest and attention, setting the stage for learning
  + The use of AI must be introduced at least once per chapter through a task under Ignite and should encourage students to ask related questions about the topic.

## **Direct Instruction (pre-Explore section)**

Add content needed to help students build background knowledge and make sense of the Explore section. This content should help students understand why they are doing what they are doing.

* Avoid long portions of reading without students doing something (answering a question/s from Progress Check, taking notes of observations, discussion with peer, etc.)
* Reference the phenomenon often, extracting examples from it to strengthen the storyline.

## **Progress Check**

* Up to 3 scaffolded questions of DOK levels 1, 2, and 3 that can be posed by the Questioneer (in this case the questioneer ask students to give an answer not to ask questions).
* Questions aim at making sure students can connect procedures to content in the Explore section (otherwise, the Explore hands-on activity loses most of its instructional value).

## **Pathfinder (Explore)**

This is mostly the hands-on section. Students will engage in active learning activities (hands-on, labs) as described in the [Writing Style](#_Writing_style) section.

* At least 1 virtual Lab to be included per Chapter.
* Write step-by-step instructions for activities focused on data collection and analysis.
  + Write clear instructions for how students should collect, organize, and interpret data (e.g., in a lab report format).
  + Include prompts for critical analysis of the data and guide students to draw conclusions that connect to the overall inquiry.
* Foster group discussions to encourage collaborative learning and critical thinking.
* Where appropriate, include opportunities for Retrieval Practice by integrating questions, quizzes, or prompts during or after hands-on activities or lab experiments that require students to recall specific concepts from previous lessons applicable to the task at hand.
* Include the Questioneer to help students ask the questions needed to expand their understanding of the concepts. Questioneer asks students to write prompts that contain questions and instructions for an AI tool. For example, the Questioneer may ask students to come up with questions related to the materials used or the procedure.

## **Lightbulb (Explain)**

This is the minds-on section, so it should always follow the Explore (and any hands-on) activity.

* Write prompts to help students make sense of the hands-on activity by themselves, based on their prior knowledge, the evidence they gathered in their inquiry activities, and discussions with the classmates.
* After students made their attempt, provide expansion of concepts explored in the Explore section to build a tight connection to the lessons’ LOs.
* For every main concept explained, one sample solved problem is introduced where applicable and then one question for students to solve as a Progress Check.

## **Progress Check**

* Up to 3 scaffolded questions of DOK levels 1, 2, and 3 that can be posed by the Questioneer (in this case the questioneer ask students to give an answer not to ask questions).
* Questions aim at making sure students understood the Explain.

## **Power Up (Elaborate)**

* Activities (mini-tasks) or questions to prompt students to think critically and creatively to relate the content of the lesson to the Chapter Phenomenon and STEM Task.
* The Questioneer can pop up to help students ask the questions needed to expand their understanding.

## **Progress Check (Evaluate)**

This is the lesson quiz.

* Includes just enough questions to cover all main concepts in the lesson.
* Questions are designed to measure students’ understanding of the lesson content, as well as their readiness to complete more complex task or to move to the next lesson.
* Questions vary in difficulty (DOK levels 1, 2, 3).
* Assesses attainment of PEs, DCIs, SEPs, and CCCs.

## **Beyond the Lesson (Extend)**

* + Activities (could include readings) and/or questions that challenge students to think about the application of what they’ve learned to new real-world situations, applications, or problems enhancing their understanding of the chapter and unit tasks.
  + Set up the stage for future lessons.
* Provide opportunities for spaced practice, i.e. students review and reinforce previously learned key concepts, allowing students to revisit and reinforce their understanding over time. Spaced practice involves distributing practice and review sessions across several days or weeks to improve long-term retention of material.

# **SB – Chapter Wrap Up**

## **Summary**

Revisiting the chapter’s main ideas

## **Revisit Phenomenon**

Wrap-up of the phenomena/case/problem presented at the beginning of the chapter

## **Extended STEM activity (optional)**

Experiment, further tasks, or research if needed to support the main Chapter STEM Activity.

## **Bring It Together**

A small paragraph showing students how the mini tasks in the lessons fit into the Chapter STEM project; in essence, Bring It Together! synthesizes learning from across the chapter. Be specific in how the lessons’ mini- STEM tasks contribute to the larger chapter project. Ensure the learning progression along the chapter integrates knowledge from previous lessons, reinforcing the connection to the overall unit phenomenon.

## **Chapter Reflective Journal**

A checkpoint where students reflect on and revise their work based on ongoing feedback.

## **Formative Assessment**

Up to 5 formative assessment questions that include the Chapter’s EQs and just a few more if needed to cover the main concepts learned in chapter content.

# **SB –Unit Wrap Up**

## **Summary of the Unit**

Summary of the unit connecting the lessons and chapters’ key concepts, big ideas, and essential questions.

## **Mini-Index of Terms**

**Review of the definitions of the most important terms in the unit.**

## **Key images**

**Review of the most important images in the unit.**

## **PSA**

**Public Service Announcement (PSA) or other opportunities for students to present their findings or work throughout the unit.**

# **Digital - Unit Opener Components**

## **Unit Readiness Assessment (Digital + Answer key in TG)**

* Measures prerequisite prior knowledge needed to success in the current unit.
* Followed by remediation
* NGSS 3D alignment
* 5 questions including Mathematical Skills in Physics and Chemistry as needed.

## **LOs**

Includes all LOs from the unit classified per chapter and lesson.

## **Math & Literacy Connections (Digital + reference in SB)**

List of related skills or concepts (standard correlations to be mentioned in the TG only).

## **Social Science and Science & Society Literacy Connections (Digital + reference in SB)**

List of related skills or concepts.

## **Study Strategies**

2 per unit. Classify the proposed study strategies as per Collaborative for Academic, Social, and Emotional Learning, CASEL’s Five Core Competencies framework (https://casel.org/fundamentals-of-sel/what-is-the-casel-framework/CASEL's Five Core Competencies

1) Self-Awareness: Strategies that promote resilience, motivation, and a passion for learning (Growth Mindset)

2) Self-Management: Tips that aim to improve students' mental health and learning capacity. (Supports Mental Well-Being and Mindfulness Practices, examples deep breathing exercises, meditation, and guided visualization to help students focus and manage stress during Science classes and labs)

3) Social Awareness: for example, connect learning to current events and social issues

4) Relationship Skills: for example, valuing all group members’ ideas, learning to express their own viewpoints during discussions and debates respectfully and finding win-win solutions to disagreements.

5) Responsible Decision-Making: for example, learning to make the best option for a specific scenario given certain data or evidence or considering pros and cons of scientific advancements and applications.

## **Once Upon a Time in History (Digital + reference in SB)**

Scientists’ biographies and interesting events in science history with attention to sensitivity guidelines.

# **Digital - Chapter Opener**

## **Chapter Overview**

An account of how this chapter fits in the learning sequence. Provides the main ideas covered in prior units or chapters that lead to the current content. It includes the learning objective for the current content and ends with a short sentence of what will come next.

# **Digital – Lesson**

## **Pathfinder (Explore)**

Lab activities

## **Progress Check (Evaluate)**

Practice problem, task, or question set:

* A minimum of 10 questions, where there is at least 3 problems or questions per concept (at various DOK levels)

In the set, at least 5 problems, tasks, or questions should be SEP related and 5 should be CCC related.

# **Digital – Chapter Wrap Up**

## **3D Assessment (Digital)**

A series of questions that

* + assess attainment of all important content, conceptual learning and enduring understanding
  + include a variety of types (written response, fill-in-the-blank, calculations, open response, etc.; not all types required in each lesson)
  + align to LOs and does not go beyond
  + vocabulary practice, comprehension, applications, comparisons, analysis, synthesis, evaluation, and critical thinking
  + written in increasing levels of complexity when possible
  + supporting questions for the Essential Question
  + STEM connection to help answer the Big Idea Question/tie to project
  + Avoid questions that are vague, ambiguous, and do not support contextual learning.
  + Avoid questions that repeat exactly the lessons verbatim; reword content in a new way.

For MC questions refer to the [Guide for Writing MC Q’s](#_Guide_for_Writing) in this document)

* Solution manual showing the important steps of solving or necessary explanations for teachers
* DOK and Bloom’s Taxonomy levels indicated for teachers

• For MC questions refer to the guide given at the end of the document.

# **Digital – Unit Wrap Up**

## **Push Forward**

**Connection of the knowledge of the current unit to the next topics.**

* **It explains how the unit ideas are related to advanced level of knowledge such as those attained by professionals or at a University level.**

## **Careers in Chemistry/Biology**

Describe (short paragraphs) 2 or 3 Chemistry/Biology related careers that align with the content of the unit.

## **3D End-of-Unit Assessment**

Performance Based Assessments (SEPs) and Evidence Based Assessments (supporting Measures of Academic Progress – MAP- and other benchmark assessments. For MC questions refer to the [Guide for Writing MC Q’s](#_Guide_for_Writing) in this document.

* + assess attainment of all important content and skills in the unit
  + include a variety of types (essay, fill-in-the-blank, calculations, open response, etc.)
  + align to LOs and does not go beyond
  + vocabulary practice, comprehension, applications, comparisons, analysis, synthesis, evaluation, and critical thinking
  + written in increasing levels of complexity when possible
  + supporting questions for the Essential Question
  + STEM connection to help answer the Big Idea Question/tie to project
  + Avoid questions that are vague, ambiguous, and do not support contextual learning.
  + Avoid questions that repeat exactly what’s written in the lesson; reword content in a new way.

A solution key showing the important steps of solving or necessary explanations is to be provided for teachers.

# **TG – Unit Opener**

## **Unit Overview**

Chapter List + Lesson List

Account of how each chapter fits into the unit.

Query from Alpha: Refer to the Bio\_Digital Resources plan section: Planning Documents that QBS will Create.

This will give a clear idea about the planning documents that will be needed across all Science subjects.

# **TG – Lesson**

## **Ignite (Engage)**

Differentiation strategies for hard-of-hearing students and students with vision or mobility impairments.

## **Pathfinder (Explore)**

Differentiation for students needed English Language Support through language accommodations, accommodation for other students with special needs, and scaffolded tasks (guided activity instructions) to facilitate performance of students who lag academically.

## **Lightbulb (Explain)**

Differentiation to ensure all students can access the content, with additional language support for ELLs.

## **Power Up (Elaborate)**

Differentiation and English Language Support are embedded to cater to various learning levels and language needs.

## **Progress Check (Evaluate)**

Differentiated assessments and language accommodation are provided in the TG to ensure all students can demonstrate their learning.

## **Beyond the Lesson (Extend)**

Differentiation and English Language Support to ensure all students can participate fully.

# **TG – Chapter Wrap-Up**

# **TG – Unit Wrap Up**

### **Assessment Solution Key**

**Showing the important steps of solving or necessary explanations is to be provided as a digital Teacher Resource.**

# **Images/ Art Spec**

* Follow the Art Process and trackers outlined here: [Art Spec Process [updated].docx](https://erpcloud365-my.sharepoint.com/:w:/g/personal/suzan_riad_alphapublishing_com/EV-SmPzfxUlGjQD7BB8TWP4B5H9GnJ-fYjKaP2iq8pHxJg?e=HotTza)
* Captions: for every figure.
* All figures should be numbered as **Fig. X.n**, where X is the Chapter number, and n is the image number. For example, Fig. 1.4 is the 4th figure of Chapter 1.
  + If the figure is at the Unit opener and closer, for example, Fig. U1.4 is the 4th figure in unit 1 opener and closer.
  + If the figure is at the Chapter opener and closer, for example, Fig. C1.4 is the 4th figure in chapter 1 opener and closer.
* All figures should clearly relate to the topic at hand and are referenced in the text (are preceded by an introductory and descriptive sentence or paragraph that refers to the image, avoid statements such as “Look at the graph”).
* Figures are needed/useful for the understanding the content/question and add to the content (not for decorative purposes)
* are referred to as “figure” (avoid terms such as diagram, chart, picture, etc.) Model is also acceptable when the art is indeed a model.
* Clear instructions for new art are included, artists do not know science (don’t say “change carbon for sodium” but rather “change the letter C for letters Na”). Include scrap/ source of scrap so that artists can more easily reproduce it and indicate what can be changed to avoid copyright infringement, for example change the color of the car.
* Possible sources of art
* Shutterstock – [www.shutterstock.com](http://www.shutterstock.com/) ( Do not use
* NASA - <https://images.nasa.gov/>
* NOAA - <https://photolib.noaa.gov/>
* Pixabay - [www.pixabay.com](http://www.pixabay.com/)
* Pexels - [www.pexels.com](http://www.pexels.com/)
* Dreamstime – [www.dreamstime.com](http://www.dreamstime.com/)
* Other publicly available & free sources (published under “Creative Commons” license, with permission to use it for Commercial purpose).

# **Chemistry Specific Guidelines:**

## **Chemical Compound Names**

When roman numerals in parentheses are used in the name of a compound, close up the space in front of the roman numeral. For example: iron(III) oxide. These is not hyphens (e.g., carbon dioxide gas).

## **Equations**

Labels are used to indicate the physical state:

(g) gas

A diagram of chemical formulas

Description automatically generated(l) liquid

(s) solid

(aq) aqueous [dissolved in water]

## **Fractions**

MathType must be used to create fractions and mixed numbers, which ensures proper formatting and spacing, as well as correct alignment of the numerator and denominator.

These activities may include performing experiments (both in the lab and virtually), evaluating real and hypothetical scenarios, authentic reading, modeling, discussions and debates, hands-on projects, and other authentic science learning strategies.

# **Guide for Writing Multiple Choice Items**

### **Language**

* Keep the reading load low to make sure the question assesses science attainment and not reading skills.
* In general, use an active voice and avoid passive voice.
* Avoids names as well as gendered pronouns. For example, refer to a student or a child, rather than a boy or a girl. Use the plural (they) instead or he/she.
* Lexile reading levels are appropriate
* Avoid negative worded questions that use terms such as NOT, EXCEPT, WORST, etc. (example: Which of the following is NOT …..?)

### **Item Content**

* is unique and original, plagiarism check will be run
* is grade level appropriate and appealing to high school students (not childish, not overly professional)
* is aligned with lesson content and standards
* assesses important concepts
* presents a different context from the one covered in the lesson to apply the concepts or skills.
* is realistic
* is unambiguous, not open to interpretation
* does not assume students have specific knowledge other than what is reasonable to assume or has been covered in prior lessons. For example, it is reasonable to assume that students know what a swing is, because many schools and public playgrounds have swings, but students may not know what a pullback toy car is (some students may not have access to toys). Similar issues with celebrations, especially if those are not school holidays. The same stands for devices; it is reasonable to assume that students know what an oven is (most school kitchens have ovens), but they may not know what a solar oven is.
* Figures, data tables, and other visuals are used profusely and when necessary to clarify the question (not decorative).
* Stems/stimuli incorporate diversity and cultural sensitivity and are sensitive to broader student population (encompassing all socio-economic backgrounds)
* Question type tips:
  + Use complete sentences or questions (not incomplete sentences such as “The pH of a neutral solution is…….”) except for fill-in-the-blank questions.
  + Fill-in-the-blank questions cannot have the blank at the beginning of the sentence.
  + For multiple select questions, make sure the keys cannot be interchanged (for example: Two examples of strong acids are <b1> and <b2>. The blanks can be interchanged, and the items would remain correct which poses difficulties for digital corrections)

### **For multiple-choice questions**

* matrix multiple-choice or grid multiple-choice format where two variables are crossed in a 2x2 grid, is particularly useful for assessing understanding of relationships between two concepts or categories, as it requires students to consider both variables simultaneously. Examples include: Yes, because ….. /No, because …., Example1-2/Explanation 1-2, Application 1-2/Case 1-2)
* are similar in length or increase in length (ideally short, if all ACs start with the same phrase, see the stem can be worded to include the phrase and avoid repetition in each AC).
* are ordered logically (increasing numbers, chronological order, etc.)
* single word answers are ordered alphabetically

### **Answer choices/Distractors**

* Answer choices do not hint (either all ACs repeat terms from the stem or no AC repeats terms from the stem).
* All distractors are plausible and closely relate to the content
* Distractors address common misconceptions, such as: <https://newyorkscienceteacher.com/sci/pages/miscon/subject-index.php>
* No distractor denies the question (for example: What is the change? Distractor: No change)

# **How to choose and write a unit phenomenon?**

The phenomenon should spark curiosity and set the stage for learning that unfolds over several chapter and lessons.

|  |  |
| --- | --- |
| **Criterion** | **Explanation** |
| Real-world | Event or case that students are likely to encounter in daily life, movies, or news. Avoid “cases” like *the molecular structure of water;* while real in the world, it is not something that would spark students’ interest. In contrast, “*rain falling onto your car windshield and instead of spreading out evenly, rainwater gathers into small, round droplets. You turn on the wipers, and the droplets sweep away but keep re-forming as new rain hits the glass. Why does the water behave this way?*” is real-world and daily-life event. |
| Relevant / Engaging | Event with potential to affect the target students (in the UAE). For example, issues near the UAE are more relevant than same issues in other parts of the world. |
| Specific | Provide details to bring the case to life. Ideally, look for events that actually happen and provide dates, locations, and extent of the issue.  Non-example, *Oil spills* that occur in general throughout the world   * Example: More engaging, interesting, and motivating example: *the oil spill that happened in 1991 in the Arabian sea, the largest oil spill in history*.   Non-example: Why does rust affect some metals and not others? is too generic and abstract   * Example: More engaging, specific, and relevant for HS UAE students is “*In the UAE, the intense heat and humidity, particularly near coastal areas, pose challenges to metal infrastructure like bridges, buildings, and cars. Students often observe rust on certain metal objects, such as the gates around their homes or parked cars, but not on others like aluminum-framed windows or street signs*”. |
| Student language | Write the phenomenon in language that students use, kind of as if one friend was telling another friend of the event. Avoid scientific jargon and teaching within the phenomenon (example to avoid: … *rainwater gathers into small, round droplets because of a property called surface tension that results from cohesive forces between water molecules, which are primarily due to hydrogen bonding.)* |
| Multifaceted / holistic / interdisciplinary focus | Includes several aspects that will be explored in the chapters and lessons of the unit. For example, an oil spill phenomenon and measures to clean it talk about scientific methodologies, water and water pollution, the composition of oil (organic molecules), ecosystem balance (living things), etc.  These different themes are the main topics of chapters and lessons.  Examples given in lessons and chapters should related to the Unit Phenomenon.  Be clear (explicitly if needed) how each chapter/lesson relates to the Unit Phenomenon. |
| Iterative development (may take some time) | Write a first draft of the phenomenon that is likely to cover all chapters and lessons in the unit. If the writer encounters that this draft does not address some chapter/lesson, see if the draft can be improved/extended. For example, Unit 1 first case draft may be:  “*A prestigious bracelet, insured for a large sum, has been reported stolen. The owner described the bracelet as made of pure gold, adorned with diamonds and other precious materials. Weeks later, the police located a bracelet matching the description. However, when the police returned the bracelet to the owner, the owner claimed it was a fake, that the stones were not diamonds but rather cubic zirconia and that the metal was not gold but rather gilded copper. The insurance company refuses to pay until a scientific analysis is performed to determine if the found bracelet is indeed the stolen one.*  *The insurance company hired a forensic chemist to analyze the bracelet and determine its authenticity. The chemist set out to test some properties of the bracelet, such as repeated measurements to calculate the density of the metal, and compare it to the density of pure gold, which is 19.32 g/cm³. The density of gilded copper is much lower. But some decisions had to be made before testing. What conclusion would the chemist reach if the density found for the metal were 18 g/cm³? What if it were 19 g/cm³? Would 19.3 g/cm³ be close enough? Would it have to be 19.3200 g/cm³?”*  However, as written, this case may not address L3 in Ch 2 Compounds and mixtures. So, the draft can be modified as follows (marked in red the parts that are modified and below explained why):  “*A prestigious bracelet, insured for a large sum, has been reported stolen. The owner described the bracelet as made of pure gold, adorned with diamonds and other precious materials. Weeks later, the police located a bracelet matching the description. However, when the police returned the bracelet to the owner, the owner claimed it was a fake, that the stones were not diamonds but rather a mysterious compound and that the metal was not gold but rather brass. The insurance company refuses to pay until a scientific analysis is performed to determine if the found bracelet is indeed the stolen one.*  *The insurance company hired a forensic chemist to analyze the bracelet and determine its authenticity. Being made of metal and stones, the bracelet did not look uniform, and the forensic chemist had to test each component separately. First, the chemist started with the metal. The chemist set out to test some properties of the metal, such as repeated measurements to calculate the density of the metal, and compare it to the density of pure gold, which is 19.32 g/cm³. The density of brass is much lower. But some decisions had to be made before testing. What conclusion would the chemist reach if the density found for the metal were 18 g/cm³? What if it were 19 g/cm³? Would 19.3 g/cm³ be close enough? Would it have to be 19.3200 g/cm³?*  *After the metal, the chemist moved on to analyze the stones. If they were diamonds, they would have a refractive index of 2.42, but if the measured refractive index was lower, then it would be a mysterious compound as claimed by the owner. A compound commonly used to fake diamonds is cubic zirconia, which has a refractive index in the range of 2.15 to 2.18*.  *brass addresses alloys*  *Being made of metal and stones, the bracelet did not look uniform, and the forensic chemist had to test each the component separately addresses mixtures*  *a mysterious compound will address compounds, cubic zirconia ZnO2* the lesson could start by asking what the differences between diamond and cubic zirconia. |