Science 10 Inquiry Learning Guides

For Learning Guides 4, 11, and 16 you will be given a choice in determining what to learn and how to demonstrate your learning. The guides will allow you to demonstrate what you can *do* in science by meeting a wide range of curricular competencies. For each guide you will have work to complete which you will then presented to your teacher in either written or verbal format (your teacher will tell you which are possible). **Each guide requires you to pick a different option…so 3 guides will require 3 different choices.** Your teacher will let you know if any of the below guides are mandatory for a specific unit, or if there are limits on how many of each type of guide you can complete throughout the year.

Here are some **possible** topics for each unit:

- **Biology Inquiry (LG 16):** Genetically Modified Organisms; Cloning; Stem cells; Reproductive technologies; Forensics; Genetic counselling – how it works, its effects, and ethics; An important gene/protein of your choice that has not been discussed (should include how it is inherited); Macro-level evolution and phylogenetic trees; Genetic engineering – the basics and the uses; RNA splicing; Protein folding; Other uses for RNA and DNA than transcription and translation; Other types of mutations not previously discussed; Human impacts on evolution and natural selection (not artificial selection); Evolution of viruses

- **Chemistry Inquiry (LG 4):** Household chemical safety (e.g., ammonia and bleach), Combustion (e.g., forest fires,, kindling temperature, ignition point, oxygen concentration), Polymer chemistry, Semiconductors, Resource extraction (e.g., ore, fracking), Pulp and paper chemistry, Food chemistry, Corrosion/prevention, Tanning, Traditional medicines, Phytochemistry, Pharmaceuticals, Environmental remediation, Water quality, Oil spill cleanup

- **Physics (LG 11):** Nuclear technologies and implications (e.g., nuclear power, medical isotopes, tanning beds, dental X-rays, food irradiation, radioactive dating); Positive and negative impacts of nuclear energy including environmental, health, economic, etc.; Local and global impacts of energy transformations (pollution, habitat destruction, carbon dioxide output, etc)

Here are some trustworthy sources that that might give you some ideas for research topics:

Articles: Wired's Rhett Allain has lots of great articles that high school students seem to enjoy. Scientific American has a lot of great articles and blogs. For astronomy, the "Bad Astronomy" blog is great. The Science sections at the New York Times, The Atlantic, CBC, and National Geographic are also worth checking out.

Youtube: Veritasium, Minute Physics, Minute Earth, Vsauce, Sixty Symbols, PBS Space Time, Kurzgesagt – In a Nutshell and Ted Ed (Science & Tech videos, high school level).

Here are **some options** you can choose from for your projects **for LG's 4, 11, and 16**.

1. **Research Project Guide:**

   Choose a topic or question that interests you and create a visual presentation (Digital (PowerPoint, Prezi, etc), poster (no glitter!), art work, comic strip, etc.) that includes a description, picture and explanation of the topic as well as an explanation of how your topic relates to the unit under study (ie. biology, chemistry, astronomy, or physics). **The presentation will be marked the same as the "Write-Ups" in the other guides.** You must have at least two different types of sources referenced (ie. books, articles, websites, Youtube videos, etc).

2. **Book Guide:**

To complete this guide you must read a book about science and give a report on in. Your report should include your impressions of the book, what it was about, and what you learned from it. **Please clear your book in advance with your teacher. If you read a book without clearing it with your teacher in advance, it won't be approved. Complete a Write Up** to summarize the book. Both the school library and the Maple Ridge Public Library have a great selection of science books.

3. **Science In Public Guide:**

To complete this guide you must physically (or virtually) attend a science related event outside of school in the general community. It could be a science lecture, a science discussion panel, a science competition, a university Open House, a community invasive species clean-up event, etc. Do a **write up** of what the event was about, and what you learned by attending it. Be sure to take a photo/selfie of yourself at the event to prove that you were actually there!

4. **Fermentation Guide:**

To complete this guide you must ferment a food product at home and take pictures of yourself doing so. You must also do a **write up** on fermentation and the science behind it. Where do the bacteria come from? What do they do? Why isn't it dangerous? You also need to **make a link** between fermentation and what you learned in our Chemistry and/or Biology unit this year. You could make pickles, kimchi, sauerkraut, kombucha, or even true sourdough bread! **You will HAVE TO share the products of your fermentation with your classmates**. Some basic information on fermentation can be found here or here. Please ensure you are actually doing fermentation, and not just pickling something using vinegar. No vinegar should be added. No yeast should be added.

5. **Gardener Guide:**

To complete this guide you must plant a variety of vegetables and/or herbs in a home garden, school, garden, community garden, or indoor/patio garden. **Take lots of photos** of the various stages of soil preparation, planting seeds, and the various stages of growth of the plants (make sure you're in some of the photos) and include a short writeup for each series of photos. You can even include photos of the meals you made with the plants you've grown! When you **submit the final write up** including what you liked/didn't like about gardening and about what you learned along the way. You also need to **make a link** between gardening and what you learned in our Biology unit this year (ie. artificial selection).

6. **Smartphone Guide:**

To complete this guide you must download and use the Arduino Science Journal app on your smartphone and use it to carry out an experiment to demonstrate your knowledge of science that we have learned this year, or some new learning regarding science. There are many types of sensors built into your phone that Science Journal can access and then measure quantities such as acceleration, temperature, pressure, frequency, amplitude, and magnetic field. **Your write up should include:** screenshots from your app along with **a description** of how you used it in your experiment to **demonstrate your understanding**. In your experiment be sure to change only one variable (the independent variable) to see how it affects one other variable (the dependent variable) while keeping every other variable constant. Please note, if you used Arduino Science Journal for your design lab, you won't be able to complete this guide. There are other apps you could use instead such as PhyPhox.

7. **PhET Guide:**

To complete this guide you must use a science simulation from the University of Colorado's PhET website to **demonstrate your knowledge** of science that we have learned this year, or some new learning regarding science. **Your write up should include: screenshots** and/or video of your simulation in action and a **detailed description** of how you used it to demonstrate your understanding.

8. **Coding Guide:**

To complete this guide you **must write code** (or modify existing code) to demonstrate your knowledge of science that we have learned this year, or some new learning regarding science. The library has some Arduino devices which you can sign out to make all sorts of cool devices with (lights, speakers, robots that respond to various inputs like motion, sound, temperature, brightness, etc). Wired's Dot Physics has a lot of posts showing how you can use coding for physics problems in Python, VPython, GlowScript, and Trinket as summarized in this post, this post, and in this post. **Your write up should include screenshots** of your code and a description of how you used it to demonstrate your knowledge of science that we have learned this year, or some new learning regarding physics. **You should also include a Trinket link** so that I can actually run your code.

9. **Video Analysis Guide:**

To complete this guide **you must film a moving object and analyze it's motion** using video analysis on Logger Pro. It could be a video of a ball moving through the air or it could be a video of you playing your favourite sport. Be sure not to move the camera when filming and be sure you are filming the moving object from an angle of 90 degrees and not at any other angle. You can also film it in slow motion if the object is moving really fast. **You must have something in your video you know the length of** to set a scale so that the software knows how big your object is in real life. During your interview you'll have to **show me your video and graphs** AND **do a write up** of things like horizontal and vertical position and horizontal and vertical velocity and explain to me what the graphs tell you about the motion of your object and what you learned. You can also use the "photo distance" function to measure heights and use the velocities to **calculate the gravitational potential energy and kinetic energy** of your object at various points. You can download the Windows or Mac version along with the Video Analysis Instructions sheet.

10. Design Lab Guide:

There are 30 curricular competencies in Science 10. Over half of them can be demonstrated through designing and carrying out your own scientific experiment. To complete this guide you must come up with a testable question where you will be attempting to find the relationship between your chosen independent and dependent variables. You must design and carry out a lab procedure and collect relevant data. You must analyze this data to form a reliable conclusion and you must reflect on your data and conclusion to identify any sort of error in your work. Your teacher will be there to assist you in all aspects of this multi month project.

11. Propose your own guide:

There are other curricular competencies that aren't directly addressed by the choices above. If you would like to design a project/task/action of your choosing that addresses these other guides please see your teacher. **This will need to include a write up (report**). Here are some of the competencies that could lend themselves well to interesting student work:

**** Possible Marking Criteria (Things you could include)****

Guide Write up/Presentation CRITERIA:

Concept/Description (What you need to do)

Mark

Description, **Picture**, and **Explanation** of topic.	**20**
Explanation of how **topic is related to CHEMISTRY**.	**15**
Presentation is **APPEALING** and **Colourful** Showing effort.	**5**
Presentation is **ORGANIZED** and **LOGICAL**.	**5**
A REFERENCE PAGE (SOURCES)is included.	**5**
Total	**50**