**Earth and Space Science with Mr. Lanik**

**Study Guide for Semester 1 midterm exam**

**January, 2019**

Hi. I hope that you aren’t too stressed out about mid-term exams in general, or the Earth Science exam in particular. I have prepared this study guide to help you understand what you need to know for our mid-term exam, and how you should go about studying for the exam. The most important pieces of information for you to keep in mind as you get ready for the exam are that a) the exam is open-note, and b) you will need to take time to organize your notes prior to the exam in order to do well on the exam. The questions and comments on this study guide are intended to let you know what I think are the most important Earth Science ideas that you’ve learned over the past 4 months. By the time you sit down to take the exam, you should be able to come up with a quality response to EACH of the items listed in this study guide. That is your goal while you prepare for the mid-term exam.

Please use the following guide to help you prepare your notes for the exam. As you work through each unit topic and graduation standard, create a new page of notes in your notebook/binder that summarizes the important ideas and information about that topic. Use the notes, activities, assessments, websites, and assignments that we worked on during the semester to help summarize each subject. Once you have worked through this study guide and ***prepared/organized a new set of notes based on this study guide***, you should arrange all of your study materials in your binder so that you can find the information quickly and easily when you sit down to take the exam. In addition to these notes, you should also bring the rest of our work from the semester with you in case you want to look it over during the test—just be sure to organize it all so that you don’t get lost trying to use it on the exam.

**Please note that preparing and bringing notes (using this guide) will give you a boost of up to 10 points on your Final Exam score!!! *These points will be earned only if you produce new notes for the exam (you need to do more than just organize previous notes from the semester).***

Remember, I am confident that you learned a lot this semester, and that you can demonstrate what you’ve learned on this exam. And if you get stressed or anxious while working on the exam, remember to take deep breathes and relax… it’s all gonna work out just fine in the long run. Trust me on that. Good luck!!!!

**Science Graduation Standards that we learned in the first semester**

As you (hopefully) know, much of our work in the first semester was focused on learning and practicing specific scientific skills that you need to master in order to earn a diploma from WHS. Please take the time to review each of the graduation standards listed below: they made up 50% of your grade for the first semester, and will make up a similar percentage of what you will be tested on during the mid-term exam.

**Part I: Science Graduation Standards**

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| **Graduation Standard** | **Graduation Standard #1: Asking scientific questions & defining scientific problems** | | | |
| **GS#1 Skills** | **Students will be able to ask scientific questions about the text they read, observed phenomena, and conclusions drawn from models or scientific investigations.** | | | |
| **Indicator** | **1** | **2** | **3** | **4** |
| **GS1-A**. Ask questions that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information. | I can ask questions based on observation to find more information | I can ask questions that arise from careful observation of phenomena, or unexpected results, to seek additional information. | I can ask questions to clarify a model, an explanation, or an engineering problem. | I can ask questions to refine a model, an explanation, or an engineering problem. |
| **GS1-C.** Ask questions to determine relationships, including quantitative relationships, between independent and dependent variables. | I can determine the difference between independent and dependent variables | I can make a relevant prediction of the effects of changing a variable | I can ask questions to determine relationships, including quantitative relationships, between independent and dependent variables. | I can ask questions that can be investigated and form a hypothesis based on a model or a theory |

1) Please identify the specific characteristics that make a question a “Good” scientific question. List at least three things.

a)

b)

c)

2) What are the characteristics of a “bad” scientific question?

3) Identify two different activities that we did in class in which we practiced the skill of “Asking scientific questions”.

4) On the test for Unit 1, what were you asked to do to demonstrate proficiency in Graduation Standard 1, Asking Scientific Questions?

5) It’s winter in Maine, and we all know what that means. Or do we? Think about weather that we’ve had this year, and think back to previous winters as well. Winter in Maine can actually mean a range of different types of weather. In the space below, write down an example of some specific weather event that you’ve experienced during the winter here in Maine.

I remember one winter day when the weather was …

Now, right down a broad, general “Why” question that you have about that particular weather event.

Finally, narrow that broad question down to a smaller, more focused and specific Scientific Question that you could answer by doing some sort of research. What makes your question a “good” scientific question?

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| **Graduation Standard** | **#5 Constructing Explanations and Designing Solutions** | | | |
| **GS#5 Skills** | **Students will be able to use valid and reliable evidence to develop and evaluate claims and/or solutions that are consistent with scientific ideas, principles, and theories.** | | | |
| **Indicator** | **1** | **2** | **3** | **4** |
| **GS5-B.** Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students’ own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. | I can use evidence to construct or support an explanation or design a solution to a problem | I can construct a scientific explanation based on valid and reliable evidence obtained from sources. | I can construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students’ own investigations, models, theories, simulations, peer review). | I can construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students’ own investigations, models, theories, simulations, peer review) operate today as they did in the past and will continue to do so in the future. |
| **GS5-D.** Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. | I can use evidence (measurements, observations, patterns) to construct or support an explanation | I can apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real world phenomena, examples, or events | I can apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. | I can apply scientific reasoning, theory, and/or models to link evidence to the claims to evaluate and/or critique the extent to which the reasoning and data support the explanation or conclusion. |

6) What does CER stand for?

7) What is a scientific claim?

8) How specifically do Evidence and Reasoning work together to support scientific claims?

9) What are two activities that we did in class in which we evaluated scientific explanations?

10) Describe the assessment that we used in class to evaluate your proficiency in the Constructing Explanations graduation standard.

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| **Graduation Standard** | **#7 Obtaining, evaluating, and communicating scientific information** | | | |
| **GS#7 Skills** | **Students will interpret information obtained through diverse media, assess scientific validity, and effectively express their findings.** | | | |
| **Indicator** | **1** | **2** | **3** | **4** |
| **GS7-A.** Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. | I can read appropriate scientific texts and identify the central idea(s) | I can read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s). | I can critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. | I can critically read peer-reviewed, scientific journals to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |

11) Restate this graduation standard in your own words.

12) Describe the reading technique that we learned and practiced in class in order to help us understand complicated, confusing science articles.

13) For the summative assessment on this graduation standard, you read an article entitled “Why does the Sun shine?” What did you need to do with this article in order to demonstrate proficiency in this standard?

**Part II: the Earth and Space Science Content**

*The Process of Science*

14) In science, what is an observation?

15) In science, what is an inference?

16) What is the role of each in the process of science, and what is an example of each?

17) Dr. Smith wants to examine whether a new drug increases the maze running performance of older rats. Just like aging humans, older rats show signs of poorer memory when learning new things. Dr. Smith teaches two groups of older rats to find a piece of tasty rat chow in the maze. One group of rats is given the new drug while they are learning the maze. The second group is not given the drug.

One week after having learned the maze, he retests both groups of rats and records how long it takes each rat to find the rat chow.

a) What is the scientific question?

b) What is the independent variable?

c) What is the dependent variable?

*The Four Earth Systems*

18) Name and briefly describe each of the four Earth systems.

19) Give one example of…

-The hydrosphere interacting with the atmosphere

-The biosphere interacting with the geosphere

-The atmosphere interacting with the biosphere

-The geosphere interacting with the hydrosphere

*The Evolution of our Universe*

20) Which chemical elements were formed in the Universe in the first second after the Big Bang?

21) Why did the chemical composition of our Universe begin to change as the first stars began to die (about 1 billion years after the Big Bang)?

22) How are the biggest chemical elements, like gold and silver, created?

23) Name, and then briefly describe, the process that generates energy in stars like our Sun.

24) State and briefly describe the two most important pieces of scientific evidence that our Universe began with the Big Bang.

*The Birth of the Earth*

25) How did the Earth first form, and what evidence supports this theory?

26) How old is the Earth, and how do scientists know this?

27) How did the Moon form, and what is the scientific evidence supporting this theory?

28) Where did the Earth’s water come from, and how do we know?

29) When did the first rocky crust of the Earth form, and how do we know?

30) How did the amino acid building blocks of life appear on Earth, and how do we know this?