Review guide: Unit 2. Formation of the solar system

To the student: You can expect probably 20 multiple choice questions and up to five 'short answer/essay/draw me pictures' questions. This review guide is broken down into the 'major divisions' of our discussion over this last grading period starting with how matter is distributed in our universe and ending with how our Earth and solar system formed. Please use your notes, the various handouts and articles I've given you, and consider reviewing the several videos and websites I've shared with you in your studies. For most students, talking with friends about topics on the review guide, sharing ideas and questions and of course, thinking about how to incorporate these ideas into your "historical fiction' project are excellent ways to study. Good luck! Test is this coming Thurs/Friday.. (November 5th/6th).

Broad topics we've studied during this grading period include:

1. **The materials and events which created our solar system.**
2. **Black holes and their role in redistributing matter**
3. **Stars exploding and their role in redistributing matter.**
4. **The early solar system and its formation.**
5. **Meteor Science**
6. **The present structure and the evolution of our understanding of our solar system**
7. **Ellipses**
8. **The Moon**

1. **The materials and events which created our solar system.** What role do Quasars play in redistributing materials in our universe? What is a Quasar? How do dying stars form water? How do new stars (proto-stars) form water?

2. **Black holes and their role in redistributing matter** The Very Large baseline array: Observing a black hole. What technique did scientists use to create an image of this very distant object? How did the Earth's rotation play into this process? What was the 'effective diameter" if this telescope? What aspect of the black hole created 'the shadow' in the center? What role to merging black holes play in star formation?

3. **Stars exploding and their role in redistributing matter.** What triggers stars to explode? What does this process usually look like? What is the Crab Nebula an example of? What are the possible outcomes for a star at the end of its life? What conditions are required for 'double-star' systems to form? (also called binary stars). What evidence do we have that our current star is the third star to inhabit this region of space? What kinds of material are created by exploding stars?

4. **The early solar system and its formation.** What is the Oort Cloud and how big is it compared to our solar system? What is the Kuiper belt and how is it related to our solar system? What kinds of materials are found in these regions? Roughly how long ago did the Earth start to form? What causes grooves to form in the early, 'disks' of dust which surround young stars? How does our star create water in our solar system? What role does water play in the formation of a solar system? When Earth first formed, 4 billion years ago.. what was the average temperature of the planet? What were the primary gasses in the atmosphere? What did the surface look like? How large was Thea, the object which struck Earth early on? As the materials which was ejected from that collision first formed into the new Moon, how far away was it?

5. **Meteor science.** What is a carbonaceous Chondrite? Why are scientists excited about them? How do these kinds of meteors differ from the vast majority of meteors which strike the surface? What kinds of 'building blocks of life' are found in meteors like this? How can meteors become contaminated as they enter Earth's atmosphere and fall into the ground? What are the three phases of the history of our solar system which meteors like this can give us insight into? What was unique about each phase? What kinds of materials can one expect to find from each phase? What are 'condrules'? How did compounds such as amino acids likely form? Where do scientists think this meteor came from? What evidence did they consider? How much material continues to rain down on Earth from space each year? (dust, meteors, comets, etc.) In addition to water ice in our solar system, what other, common material forms ice in outer space? (found on comets, in the rings of Saturn and Uranus, in the Moons of Jupiter, etc.).

6. **The present structure and the evolution of our understanding of our solar system**. How has the Earth's rotation changed over time? Why did this happen? How does the Earth's Core rotation differ from the rotation of the outer mantle? Why is this? How does the core of the moon differ from the Core of Earth? Why is this? **Johannes Kepler.** When was he alive? What were the prevailing theories of stars and 'the heavens' in his day? What was his first idea about 'the structure' of our solar system? What did he finally realize about that structure? What was Ptolemy's view of the solar system? What observed behavior of the 'wandering stars' led to confusion about the structure? What did Martin Luther say about Kepler's ideas? Who was Tycho Brahe? What did he have that Kepler needed? What kind of equipment did Tycho Have to create his data set? What are Kepler's three laws? How do they work? What idea that Kepler had inspired Isaac Newton?
7. **Ellipses.** How does an ellipse differ from a circle? What defines the major and minor axis? Given a basic ellipse drawing, can you figure out what the eccentricity is? Given the eccentricity of an ellipse, can you describe how close to being a circle it is? What is the likely future of our solar system with regard to the Sun, the Earth and the moon, specifically.

8. **The moon.** What was the rotational velocity of the early Earth, just after the moon formed? (i.e., how long did it take to spin once on its axis?). Why did the Moon slowly drift away? Why did the Earth slow down? Why is the Moon gravitationally 'locked' in its rotation such that the same face of the Moon always faces the Earth? What are the phases of the moon called? What does each phase look like? What time would you expect to see each phase 'rise'? What time would you expect each phase to be the 'highest' in the sky? Given a day between the middle of October and the Middle of November, can you estimate what phase the moon will be in?

Use the space below to draw a picture of a spaceship which you imagine flying around our solar system and Galaxy to explore exploding stars, black holes and other, interesting planetary systems.
