Teacher's Guide for ODYSSEY

January 2014: Mysteries of Science

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Teacher's Note:
This guide contains project ideas, short answer, extended response, fill-in, and true/false with correction. The variation is designed to have the students think critically, as well as to test their comprehension. An answer key to the short answer sections can be found at the end of the guide.

Extended Response: Comprehension & Critical Thinking
The questions below can be used as written, simply answered in complete sentences or easily transformed into longer essay (ELA) style questions, or even research topics. In any case, have the students support their answers with details from the text or use critical thinking skills to create a thorough and interesting answer. The questions, essays and projects have been aligned with the **Common Core Standards**. Consider the level of your students when deciding how to use the questions.

"Calling All Martians" p. 6-9

1. What are extremophiles?
2. What is meant by the following statement: "Although extremophiles and survive and thrive almost anywhere, even these creatures follow the same recipe as all other life on Earth."?
3. How are Mars scientists scouring the planet for elements similar to those found on Earth?
4. Why do we think that Mars was once a wetter planet?
5. What kind of work is the Curiosity rover responsible for?
6. What is the result of the fact that Mars lacks a thick atmosphere?
7. Why are scientists confident that even if Mars was never as warm as Earth, it could still be home to life?

Essay: *Develop your own theory regarding life on Mars. Support your theory with facts presented in this article.*

"Now You See it, Soon You Won't" p. 10-12

1. What are the two things that need to happen in order for us to see something?
2. What two things do engineers need to do in order to make an object invisible?
3. What is 'microwave vision'?
4. What happens when light waves pass through a prism?
5. Why do we see rainbows?
6. What are metamaterials?
7. Explain the challenges that arise when trying to make an object vanish for our human eyes?

8. How would Dr. David Smith, a metamaterials engineer, prefer to use this science for?

"Clash of the Titans" p. 13-15

1. What do the scientific methods of *induction* and *deduction* have in common? What are the differences between the methods?

***Activity**: Read the theories below. Label each theory as one of induction or deduction and name the scientist responsible for the theory.*

_____,_____ 1. This scientist argued that a material cannot be divides into smaller pieces forever. He called its smallest possible unit an atom. He had no real means to test his theory, but later experiments proved him right.

_____,_____ 2. This scientist spent years recording variations in the appearance of peas and other living things. He identified mathematical laws that govern genetics.

_____,_____ 3. This scientist formulated the scientific law which states that the atom is mostly empty space.

_____,_____ 4. This scientist made the bold proposal that Earth's land masses began as a single, giant continent. We call this proven theory "continental drift".

_____,_____ 5. This scientist's study of bacteria led him to discover penicillin, the first effective antibiotic.

_____,_____ 6. This scientist used his calculations to prove that his idea of 'universal gravitation' is true.

"One Fabulous Physicist" p. 16-20

1. To the best of your ability, explain Dr. Gianotti's statement, "Physics is art, aesthetics, beauty, and symmetry."
2. What does the Large Hadro Collider (LHC) do?
3. What happens when one proton hits another head-on, one billion times every second?
4. Draw a diagram depicting the parts of an atom.
5. What do Gianotti's team of physicists studying the proton-proton collisions look for?
6. What was the major discovery announced by Gianotti on July 4, 2012?
7. Dr. Gianotti stated, "Nature is always more clever and more interesting than all our speculations." What does she mean by this? Do you agree?

"Diary of a Wimpy Particle" p. 21-24

1. What does WIMPS stand for? Explain.
2. Explain why the laws of physics say WIMPS should occur everywhere?
3. Why would an individual WIMP have very little energy?
4. Define the following terms: *gravity, electromagnetism, the strong force, the weak force*
5. What could finding just one WIMP help reveal?

"Grappling with Gravity" p. 25-28

1. What is gravity?
2. How are Isaac Newton and Albert Einstein responsible for our understanding of gravity?
3. What types of experiments are being done that may detect gravitational waves within the next few years?
4. Why is gravity the hardest force to measure?
5. What is Quantum mechanics?
6. How did Galileo demonstrate the rate of the force of gravity? What is the rate of gravity on Earth?

"Taz in Trouble" p. 29-31

1. Why are researchers trapping the Tasmanian devils?
2. What are the physical characteristics of the Taz?
3. What do devils usually eat?
4. Why is the population of the Taz decreasing so rapidly?
5. How do scientists believe that DFTD started?
6. How does DFTD spread?
7. Although, cancer is typically not contagious, how are the DFTD cancer cells evading the devil's immune system?
8. What is the government of Tasmania doing to preserve the devils?

"How does your Fungus Glow?" p. 32-35

Mark the following statements TRUE or FALSE. Provide the correct answer if false.

_____ 1. Bioluminescent refers to something that glows after exposed to sunlight.

_____ 2. A mushroom scientist is called a mycologist.

_____ 3. Lucion is a chemical found in the cells of some organisms that produces light when sparked by enzymes.

_____ 4. The mycelium is the 'plant body' of a mushroom.

_____ 5. Luciferase is an enzyme in certain organisms that initiates reactions that produce light.

_____ 6. Currently, there are two theories about how these luminescent mushrooms grow.

_____ 7. Antioxidants are substances that hold back reactions promoted by carbon dioxide.

_____ 8. A symbiotic relationship is a close relationship between organisms of different species that may benefit each member.

"The Mysterious Art of Protein" p. 44-47

1. What are amino acids?
2. What proteins drive the chemical reactions going on inside living things?
3. What are hormones?
4. Explain protein synthesis.
5. Why are proteins and their targets often compared to locks and keys?
6. What happens if a protein doesn't fold into the 'right' shape?
7. What is DNA replication?

ANSWER KEY

"Clash of the Titans/6 Top Scientists"

1. *Deductor, Democritis*
2. *Inductor, Mendel*
3. *Inductor, Rutherford*
4. *Deductor, Wegener*
5. *Inductor, Fleming*
6. *Deductor, Newton*

"How does your Fungus Glow?"

1. *False, glow on their own*
2. *True*
3. *False, luciferin*
4. *True*
5. *True*
6. *False, three*
7. *False, oxygen*
8. *True*