Astronomy Introductory Online Activity
Origins: Back to the Beginning

Astronomers point to an initial explosion called the “Big Bang” as the beginnings of our Universe. The PBS Television program Origins: Back to the Beginning gives an in depth look at the Big Bang’s implications.

Directions:
1. You will be going to the Mac lab.
2. Divide into groups of three to four for viewing purposes. The school does not have enough bandwidth for everyone to view the program at once.
   Everyone must complete and turn in their own worksheet.
3. Using the Firefox or Safari browser, go to http://www.pbs.org/wgbh/nova/origins/program-3114.html
4. You will need to view each chapter in Quicktime format. There may be some pauses and “jerkiness” as each chapter buffers.
5. Its fine to pause the viewer to discuss the questions and work together on your answers within your group. Remember to write your answers on your own sheet.
6. Note the additional activity at the end of the worksheet.
7. This activity will be worth 60 points
7. Please clean up the computer lab before you leave.
   Write the number of the computer your group was using here: ______________
   (Points will not be given for this activity if you leave this space blank)

Chapter 1: Discovering the Big Bang

Chapter 1 Questions

1. What was the name of the traditional belief of astronomers that our cosmos had always existed, eternal and unchanging?

2. What song, named after the first satellite to transmit transatlantic phone calls rocketed up to number one on the charts in 1962?

3. In a telephone, what are sound waves converted into?

4. What color of visible light has the shortest of all wavelengths? What color has the longest?

5. What type of radiation do we feel as heat?
6. What field of astronomy was launched after World War II when astronomers began looking at the sky in a new way?

7. What did AT&T's Bell Labs ask Robert Wilson and Arno Penzias to help figure out in 1964?

8. What did Wilson and Penzias climb into the horn to clean up while looking for any possible source of stray microwaves?

9. What was Princeton scientist Bob Dicke and his team trying to prove?

Chapter 2: A 30-Year Search
Chapter 2 Questions

1. The Big Bang theory has been called the greatest discovery in cosmology. Describe it.

2. What is all that remains of the Big Bang’s flash of light as detected by Wilson and Penzias?

3. In an ordinary TV set about one percent of the snow and noise comes from microwaves produced in the Big Bang. Where does most of that static comes from?

4. In the modern universe, matter is concentrated into lumps, vast webs of galaxies with hardly anything in the voids between. But what was the nagging problem with the microwave glow that Penzias and Wilson had seen?

5. What was the COBE satellite designed to find?
6. When it accumulated enough data, COBE revealed a blotchy pattern. What do the blue colors reveal?

7. What was COBE’s major limitation?

Chapter 3: Race for a Sharper Image

Chapter 3 Questions

1. Why did NASA build the WMAP satellite?

2. What is the instrument called that Tony Readhead and his team built?

3. At what altitude is the instrument built in order to do observations of the microwave background? Why?

4. What key component of Readhead’s instrument gets knocked out in a three day blizzard. Why is it important?

5. Where is the WMAP tested repeatedly. What are the conditions inside?

Chapter 4: The Picture Emerges

Chapter 4 Questions

1. How long will it take for WMAP to reach its final destination? What is this point called? What makes it unique?
2. After reaching its destination, how long will it take WMAP to produce its first results?

3. What major discovery does Tony Readhead make while WMAP is gathering data?

4. What do the brighter spots in Readhead’s data represent? Over billions of years what will gravity transform these into?

5. By February 2003 how many points in the sky has WMAP sampled? What does the satellite deliver?

6. According to WMAP data, when did the universe's birthday take place?

7. What is the best current idea as to what came next called? Describe what happens during this event.

8. What happens 380,000 years after the Big Bang?

9. What were the only two elements found in the early universe?

10. What causes the billowing clouds of hydrogen in the infant universe to condense?

11. As hydrogen piles on, the central region growing more and more dense, what new object lights up the universe?
12. How much larger than our sun were the first stars? How long did they “live”? What do astronomers call the explosions that end their “lives”?

Chapter 5: Forging the Elements
Chapter 5 Questions

1. Where do all the atoms in the universe heavier than hydrogen and helium originate?

2. What percent of our sun is hydrogen? What percent of our sun is helium?

3. What two forces combine in a star's core to cause hydrogen atoms to fuse together to make helium?

4. If you add one more helium to carbon you get element number 8, which is what?

5. Organic chemistry is the chemistry of compounds all containing one element. What is organic chemistry the chemistry of?

6. In the core of a massive star, what element is really the “end of the road”, the nuclear turnip out of which you just cannot squeeze anymore?

7. What happens when there's radiation going out from the outside of a star, but deep in the inside there's no more fuel?
8. What do we call the cataclysmic destruction of a star that reaches the “iron barrier”? How bright can one of these explosions be in comparison to the light from our sun?

9. Explain how making soup is analogous to what happens in the real universe?

10. What is perhaps the most famous astronomical image ever made? What did this image reveal to astronomers?

11. Where is the one place in the universe we know that life exists?

Chapter 6: A Universe Hospitable to Life

Chapter 6 Questions

1. What is the question that has brought Sandra Faber to the Keck Observatory in Hawaii?

2. How large is the Keck Telescope’s giant mirror?

3. What does Sandra Faber’s spectrograph, called DEIMOS, do?

4. How many galaxies does Sandra Faber and her team ultimately plan to examine? What is this massive census called?
5. After two years, what has the deep survey team detected in thousands of distant galaxies?

6. What story does the study of cosmic origins tell us?

**Culminating Activity**

*Directions:*

1) When you are finished viewing the program and answering the chapter questions go to the Origins homepage at [http://www.pbs.org/wgbh/nova/origins/](http://www.pbs.org/wgbh/nova/origins/)

2) Choose one of the following interactives under “Interactives and Slide Shows”-

   - **Decoding Cosmic Spectra**
     Play astronomer and analyze the spectral fingerprints of a planet, star, galaxy, and nebula.
   - **The Pillars of Creation**
     Assemble the famous image of the Eagle Nebula from raw data.
   - **The Origins Game**
     Where are scientists making the great discoveries in origins research?
   - **History of the Universe**
     Chronicle the evolution of the universe from the big bang to 10,100 years from now.

3) Describe what you learned from utilizing the interactive in a paragraph or more below: