How similar or different are your questions when compared with those of the astronomers?

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## I. Compare your estimate with the astronomers'

How similar or different is your estimate when compared with the astronomers' estimate? If your estimate is different, explain why you think this difference occurred.

## I. Compare the astronomers' chart with yours

1. List three objects on which you and the astronomers agreed.
   Use their numbers to identify them.

   _____        _____        _____

2. List three objects on which you and the astronomers disagreed.
   Use their numbers to identify them.

   _____        _____        _____

3. If applicable, give two reasons why you think you and the and the astronomers disagreed.

A. _____

   _____

   _____

   _____

B. _____

   _____

   _____

   _____

   _____

## II. Studying the astronomers' classification of HDF objects

1. In the astronomers' chart, how many groups contain at least five objects?

2. Choose any one group and describe the characteristics of its members.

3. What do you think the objects in your group are? Give a reason to support your hypothesis.

## III. Comparing astronomers' findings with your own

1. List one similarity that exists between your hypothesis about what the objects are and the astronomers' explanation of what the objects are.

2. List one difference between your hypothesis and the astronomers' explanation.

## I. Estimate distances to six labeled objects

1. Explain why you arranged the objects as you did. Be sure to mention any particular trait upon which you based your decision.

## II. Distance: The reality check

1. Explain how the object labeled "F" can be smaller, yet closer, than the object labeled "C."

## III. Comparing results

1. How is your explanation regarding estimating distances in space similar to the astronomers' explanation?

2. How is your explanation regarding estimating distances in space different from the astronomers' explanation?

3. If we were to visit these six objects (F, D, C, A, E, B), in what order would you recommend we visit them? Please justify your recommendation.

## I. Review questions:

1. What is the difference between a galaxy and a star?

2. What does the color of a galaxy indicate?

3. What does the shape of a galaxy indicate?

4. Why isn't a galaxy's size alone useful in determining its distance from Earth?

5. Explain why the same galaxy can appear to have different shapes to different observers.

6. Describe the process used by astronomers to estimate the number of galaxies in the universe. Be sure to explain what mathematical operations must be performed.

7. Why is it better to observe the sky from space rather than from Earth?

## II. Hubble Deep Field Academy final challenge: Identify the HDF object

1. What does the color of the "oddball" object tell you?

2. What does the shape of the "oddball" object tell you?

3. What do you think this object is? Justify your answer.