Questions for study IV
(be prepared to discuss Tuesday, April 25, and turn in these questions thereafter)

Davies, The Last Three Minutes

1. (page 9) What is a molecule? Is there such a thing as an ice molecule? How is a molecule related to atoms?

2. (pages 10 and 11) The second law of thermodynamics, in one form, states that entropy in a process always increases. This law has been cited by some creationists that biological evolution could not possibly be occurring, since the increasing orderliness of evolving complex organisms would violate the second law. Is this a valid objection, or is there some point about the second law that these people are missing (if so, what is the particular point?)?

3. (page 15) Using some simple math, connect the phrase “inverse-square law” of light intensity with the sentence “This means that at twice the distance the star is one-quarter as bright, at three times the distance it is one-ninth as bright, and so on.” Give another example to replace the “and so on.”

4. (page 15) I used paste flux to prepare a metal surface for soldering some jewelry; Davies mentions “an infinite flux of light”. Are these equivalent usages of the word “flux”? If not, what does Davies mean?

5. (page 18) Davies says that “the bright star Betelgeuse is about six hundred and fifty light-years away.” Is he referring to a time or a distance? Whichever way you decide, define a light-year in terms of more human-scale units.

6. (pages 21 and 22) Is the relationship between the distance a galaxy is away from us and the speed at which it is receding away from us linear or inverse square? Find a phrase or sentence in the text that supports your choice.

7. (page 23) Many people ask: “What space did the Big Bang explode into?” and “What was there before the Big Bang?” Give a reason why these questions are meaningless.

8. (pages 25 and 26) What evidence exists of a more uniform (less clumpy) universe long ago, just after the Big Bang? How can we know this after all this time?

9. (pages 30 and 31) The Heisenberg Uncertainty Principle is one of the cornerstones of modern quantum mechanics, the branch of physics that deals with motion at the subatomic level. Davies gives as an example the idea that an electron’s position and its momentum (basically, its speed) can never be precisely determined. Find a resource that will answer the question, “how can I tell that the Randy Johnson fastball coming at my face at 100 mph (so says the radar gun)
is really going to hit me? Doesn’t the Heisenberg Uncertainty Principle say that we can’t really tell the fastball’s position or its speed?” Cite your reference.

10. (pages 33 and 34) When is a vacuum not a vacuum? In other words, how can space that has no particles at all in it suddenly teem with particles? Though the energy expenditure would be enormous, we could all be composed of “virtual” particles; in that case, what would our inevitable end be, and would there be any warning?