AST 105IN ANSWERS TO ASSIGNMENT 3

Chapter 3.4, "A Universe of Matter and Energy"

Does it Seem Reasonable?

26. Not reasonable. The planet "target" is sooo small as to be beyond insignificant. More like infinitesimal.

27. Not reasonable. There is just too many. At about one name per second, how long would 100 billion seconds be? I don't know, but a *million years* might be in the ballpark!

28. Reasonable. We're doing it all the time and can only get better at it.

29. Not reasonable. Gold can separate itself from its rocky matrix (ore), but the rock is still around it. There is no conceivable natural process that would get rid of all the other refractory materials and leave one element, much less the relatively rare gold, as the sole constituent of a planet.

Quick Quiz **(Remember, no rationalizations needed for Quick Quiz responses.)**

44. c

Quantitative Problems

58a. Closest distance is 56×10^6 km. This is a distance = rate times time problem. The time is the distance divided by the rate. So, dividing 56×10^6 km by 3×10^5 km/s yields 18.7×10^1 or 187 s. Seconds is not so relevant a unit here, so we should convert to minutes (or minutes and seconds). This conversion reduces our answer by a factor of 60, yielding 3.12 minutes. Even better, convert to minutes and seconds. The quick and easy way is to recognize that 60 goes into 187 3 times with a remainder of 7. So 187 s = 3 m 7 s. The grind it out way is to determine how many seconds are represented by the 0.12 minutes beyond 3. That would be 0.12 of the way to 60 s or 7 s.

b. The process is identical here for 400 million km. Here, the time is 400×10^6 km ÷ 3×10^5 km/s = 133.3×10^1 s or 1333 s. Seconds are even more inappropriate here, so we divide by 60 to get 22.22 m or 22 m 13 s.