LST Lab Applications VI – Digging Into Asphaltenes (20 points)
Discussion Questions and Homework Assignment

Name _____

Answer the following questions on a separate sheet of paper as we discuss these two articles in class. **You must write complete English sentences in your own words for all answers.** Read the accompanying article and answer these questions so that you are prepared for the in-class discussion.

In-Class Questions (10 points)

Vocabulary Words
Provide definitions for these words as you read through the assigned articles:
1. black gold
2. viscosity
3. aggregate (aggregation)
4. Dalton (the scientific unit)
5. petroleum

Questions

1. What is the main use of the fraction of petroleum known as asphaltenes?

2. Why are asphaltenes growing in importance as a replacement fuel source? Where are asphaltenes being found?

3. What spectroscopic technique is being used to better understand the molecular structures of asphaltenes?

4. What property of crude oil is asphaltene content known to affect?

5. Why are asphaltenes called "the cholesterol of petroleum"? How does this property affect how asphaltenes are extracted from the ground?

6. Understanding what two properties of asphaltenes will help people to be able to extract these compounds from the ground?

7. How can FTICR be used to help scientists learn more about asphaltenes?

8. What molecular-weight range have scientists estimated for the various components of asphaltene mixtures?

9. What problem is expected to occur with studying asphaltenes when a technique such as electrospray ionization is used?

10. Why is the argument over the upper limits of asphaltene molecular weights so important?

11. What three problems are expected to occur when using mass spectrometry to study asphaltenes?

12. What molecular-weight range for asphaltenes have scientists found when using the two-step laser desorption ionization method?

13. Explain the term "wettability state" as it pertains to asphaltenes.

14. What molecular-weight range for asphaltenes have scientists found when using laser-induced acoustic desorption?

15. Prior to Boduszynski's work at Chevron, what had people assumed about the boiling points of asphaltenes? What idea did he propose about asphaltene boiling points?

16. What is the main structural similarity and difference between asphaltenes and nonasphaltenes in petroleum?

17. What are maltenes?

18. What data suggests that the natural state of asphaltenes in oil reservoirs is aggregation? How many asphaltene molecules tend to aggregate together at once? What causes this aggregation?

19. How is having a better understanding of asphaltenes expected to help the oil industry? Why would this be such an improvement over the current state of oil extraction from the ground?

20. What are the economic implications for having a better understanding of the chemical nature of asphaltenes?