**Assessment for Module 6: AD Feedstock**

**6.1: Organics & organic waste (or residuals)**

1. Use Gerardi (2003) to find three synthetic organic (ie carbon-based) molecules that can be degraded by AD.
2. Describe the difference between food processing residuals vs. pre- and post-consumer food residuals by answering the following questions about each:
3. Where does the material come from?
4. What does it consist of?
5. Which is more consistent and why?
6. Who regulates each in Vermont?
7. Who is required to have a permit for each?
8. What do the terms ‘recalcitrant’ and ‘refractory’ mean?
9. Why do you think some states regulate the amounts of high-strength feedstock materials like ethanol syrup and FOG that can be accepted by anaerobic digesters?

**6.2: The ideal feedstock?**

1. What is the definition of volatile solids? Do all volatile solids become methane during AD?
2. Describe a simple method for the determination of the volatile solids content of feedstock material, mixture or AD slurry.
3. How many cubic meters of biogas are produced by digestion of 1 kg of volatile solids.
4. BOD vs. COD:
5. Which method, BOD or COD, most closely approximates anaerobic digestion?
6. Which test is faster?
7. Which test typically gives higher values?
8. The 3-carbon VFA can be converted into methane, but high levels of this VFA can also inhibit methanogenesis.
9. What is the name of this VFA?
10. How does this VFA inhibit methane formation?
11. What is the optimal VFA concentration for AD?
12. Can lack of trace elements lead to AD failure? How can diet help maintain sufficient levels of trace elements?
13. C:N ratios are critical diet parameters. Why do microbes have differential need for carbon vs. nitrogen?
14. Shortages of C and N both decrease biogas production. So, how can you tell which element is lacking without testing the C:N ratio? In other words, what specific symptoms would you look for?
15. What visual clue can give you information about a feedstock’s C:N ratio?
16. A 2010 study of AD of manure and food residuals found that co-digestion was synergistic. What did they mean by this?

**6.3: Vermont – on-farm vs. off-farm feedstock materials**

1. Vermont classifies AD as either on-farm or biomass. What’s the difference?

**6.4: Feedstock values of manure**

1. While manure has low energy values it is a valuable feedstock material. Why?
2. What is buffering capacity?
3. Why do horse and heifer manures have higher energy values than cow and pig slurry?

**6.5: Off-farm feedstock energy values**

1. While off-farm feedstock materials can add energy to AD diets they also pose some challenges. List three potential challenges.

**6.6: Inhibitors: the dark side of feedstock**

1. Feedstock materials may contain inhibitors or toxins. List three substances (or types of substances) that you would test for to ensure that your feedstock did not contain high levels of inhibitors.
2. How can pH be used to reduce ammonia toxicity?

**6.7: Predicting feedstock energy production**

*See Exercises for Module 6!*

**6.8: Goal: consistent diet and homeostasis**

1. Why is homeostasis the goal of feedstock preparation?
2. What are the optimal values for these operational parameters?
3. C:N
4. VS loading rate
5. pH
6. alkalinity
7. Ripley ratio
8. TAN
9. VFA destruction (= effluent VFA concentration)